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MY NOTES ON OPERATION BARBAROSSSA
(The Complete Organisational and Statistical Analysis, and Military Simulation)
(VOLUME IIIA)
(By Nigel Askey)

Introduction to this document by Craig W.H. Luther:

I have elected to add this PDF file to my "Craig W.H. Luther Papers" at the Hoover Institution. As a military historian who has spent this entire century researching, writing, and publishing about Operation Barbarossa (Nazi Germany's surprise attack on Soviet Russia on 22 June 1941), I have found these volumes of Nigel Askey's—entitled *Operation Barbarossa: The Complete Organisational and Statistical Analysis, and Military Simulation*—to be among the finest works I have ever read about about this incredibly significant historical event. As a result, I have gleaned the "essence" from Volume IIIA of Askey's work so others don't have to! (His books are massive and it took weeks to prepare this document based on them.[1]) In this volume of his series, Mr Askey (a physicist by trade) focuses on the state of the Red Army in June 1941; in the process, he offers more detailed information the Soviet military on the eve of Operation Barbarossa than I have ever seen in any other source material(s). Moreover, he deftly challenges the conventional wisdom of what one might characterize as the Western Eastern Front Mafia (myself included!). What follows is the description of Vol. IIIA on Amazon.com.

> Volume IIIA is the first of two volumes relating to the Soviet armed forces, mobilisation and war-economy from June to December 1941. All the significant Soviet weapon systems and combat squads used in the campaign are analysed using the quantitative methodology detailed in Volume I, along with the contextual history. An assessment of each weapon system's inherent 'combat power' is provided, as well as attributes such as the relative anti-tank, anti-personnel and anti-aircraft values.
>
> Volume IIIA then focuses on the detailed Shtaty (TOEs) for all the Soviet land unit types fielded across the USSR during 1941. All significant units in the RKKA (Red Army), VVS, VMF, PVO and NKVD are included; ranging from the largest mechanised corps and tank divisions, down to small mortar battalions, PVO anti-aircraft battalions and NKVD security companies. In all cases the data is presented in detailed tables, using the weapon systems and combat squads previously analysed. Volume IIIA also includes the most detailed Orders of Battle ever published on the Red Army, PVO and NKVD forces on 22nd June 1941. Even small and obscure units are included down to battalion and company level. Lastly, Volume IIIA examines in detail every unit's actual personnel and equipment in each of the USSR's Western Military Districts when the Axis forces invaded.

[1] **Note:** For the most part, I have simply "cut and pasted" portions of Nigel's work into this document (being careful to include original page numbers. I have also added a number of his footnotes, while using the notes to make a few observations of my own. Askey's bibliography is at the back of this file.

Operation Barbarossa: the Complete Organisational and Statistical Analysis collates an immense amount of information from many sources, and presents it with contextual history and analyses. The professional or amateur scholar is provided with comprehensive details of all the armed forces on the East Front during 1941, as well as the relevant economic and logistical support. The complete work represents the most accurate and comprehensive quantitative analysis yet, of the East-Front campaign. Currently no other single work provides a comparable reference on what was the most decisive and destructive campaign of WWII.

Throughout my decades of research and writing, I have read innumerable books and articles on Operation Barbarosssa, I can assure any potential researcher, writer, or WW2 “buff” that this volume—and, of course, the others in the series—provides vital historical data that anyone would be hardpressed to find in a *single source material*. In fact, at this time (2026) I doubt that even possible! As the “professor emeritus” of eastern front historians has opined, “When complete, this series on Operation Barbarossa will be without peer." David. M. Glantz (Col., U.S. Army, ret.)

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[2] **Note:** This is my special TOC w/ which I've arranged specific material I want to capture. Page numbers of Askey's text in parentheses.

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[3] **Note:** This section includes Fortified Regions.

0. Introduction to Volume IIIB[4]

Of all the volumes in this Operation Barbarossa series, Volume IIIB, encompassing the Soviet armed forces mobilised during the second half of 1941, has proved to be by far the most complex and difficult. It has also taken the most research and the longest time, and has stretched the methodology developed for this series (the FILARM or Fully Integrated Land and Air Resource Model) to the limit. Volume IIIB has taken over three years to consolidate, structure and write, with several years of additional research thrown in before even embarking on such a project.

The Soviet forces deployed in the western USSR on 22nd June 1941 have been reasonably well documented prior to the publication of Volume IIIA of this series. This was largely due to the good quality of Red Army records being kept in peacetime conditions up to June 1941. However, immediately following the Axis invasion, the USSR embarked on what can only be described as the largest and fastest war-time mobilisation ever carried out by any country in recorded history. In terms of numbers of personnel and weapons in the field, the Soviet mobilisation effort in 1941 dwarfed every other major combatant in WWII. **From June to December 1941 the USSR called up (mobilised) around 11,790,000 conscripts and reservists**, which went into all manner of units in different organisations. These ranged from rifle, tank, cavalry and mechanised divisions and brigades for the Red Army or NKVD (*almost all with new TOE or Shtat structures*), down to individual militia fighter-battalions, construction battalions and other small para-military units assigned to various military districts. Similarly, the huge pre-war Soviet Air Force (the VVS) underwent a radical metamorphosis during 1941 into a very different organisation. (p. 1)

The enormous and rapid Soviet 1941 mobilisation process is best described as **organised chaos on a grand scale, which (unfortunately for history) was only partially recorded**. The very survival of the Soviet regime was at stake and, due to the extreme conditions and desperate situation across virtually the whole front, accurate record keeping was a very secondary priority. For this reason, chronicles and narratives of the Soviet war-time mobilisation have traditionally treated this topic in a qualitative fashion only, with very broad selected figures thrown in to provide apparent perspective. These might include total numbers on the army HQs, divisions and brigades mobilised, or selected Soviet 1941 war-production figures. The reader is always left with the impression of a German Army in 1941 fighting a limitless, amorphous and endlessly regenerative 'force of nature'. Even relatively sophisticated war games of Operation Barbarossa have, up to this time at least, similarly simulated the Red Army's mobilisation and replacement system in 1941.

Unfortunately this has also led to many ahistorical and misinformed works (and narratives in general) in regards to Operation Barbarossa. This has been largely due to the fact that many of the 'facts and figures' relating to the *Wehrmacht* forces operating on the East Front in 1941 are well known, mainly due to the *German archives being open to the public since the 1950s*. Consequently, the large majority of current Operation Barbarossa works focus almost entirely on the details of the problems faced by the *Wehrmacht* in 1941. These include discussions and facts on: German casualties, logistics, command and control issues, reinforcements, replacements, tank losses, truck losses, truck spares, horse losses, supply and POL shortages, etc... and the list goes on. At the same time, any equivalent analysis of the opposing Soviet situation and forces is either completely absent or is treated in a very cursory fashion. *This sloppy methodology* and thinking is only allowed because, after all, the Soviet mobilisation was apparently 'simply too big' for the *Wehrmacht* to defeat in 1941, and, after all, Operation Barbarossa did fail to
achieve its strategic goals before the Russian winter set in. *By treating the Soviet armed forces in a such a broad and ill-defined manner, and effectively as an endlessly regenerative and massive force, the reader is then left with the traditional 'conclusion' that Operation Barbarossa was doomed to never achieve its 1941 strategic goals*

[4] **Note:** Even though this introduction is meant for Volume IIIB, I've left it in.

before winter, and that Hitler was mad to ever consider invading the USSR in the first place (especially with the Western Allies still in the war).

Until now this has been the altogether very unsatisfactory state of affairs; but still one the Russian authorities and several well-known authors in the West have been happy to see maintained. **However, Volume IIIB represents the first ever attempt at fully analysing the entire Soviet 1941 mobilisation process in an entirely quantitative and precisely documented fashion.** This is why it is almost 800 pages long! Every major Soviet unit formed in the Red Army, Air Force, Navy, NKVD and PVO is included, and every minor unit down to battalion level if known. Most important, however, is that the entire Soviet mobilisation process, and the reinforcement and Replacement (R) systems, rigidly adhere to the FILARM model methodology as defined in Volume I of this series (and which is uniformly applied to all the combatants). This ensures that all the significant Soviet resources (human and equipment) that existed in the USSR on 22nd June 1941, as well as those produced to 31st December 1941, are accounted for within the pre-war and newly mobilised forces. In this way the actual personnel and equipment within the newly mobilised forces is determined as per the historical resource limitations (as well as the authorised levels or Shtaty). In addition, the historical resources used as Replacements (R) for existing combat units at the front is also determined and is set at the correct historical levels. For example, **2,680,000 Soviet recruits and conscripts** were specifically assigned as Replacements (R) for ground combat units during the second half of 1941. This is a huge number by any standards, and the FILAM model not only ensures this number is accounted for, but that the proportion used as crews for Replacement (R) equipment (such as tank and artillery crews) is also taken into account.

One might ask: why was the Soviet mobilisation so critical to the outcome of Operation Barbarossa? It is because Operation *Barbarossa essentially became a monstrous 'battle of attrition race'*: a race between how fast the *Wehrmacht* could inflict fatal damage on the Red Army and destroy the USSR's mobilisation base (with acceptable losses), and how rapidly the Soviets could replace the massive losses (including entire armies and divisions) they were suffering every week until around November 1941. Amongst other things, the final outcome of Operation Barbarossa largely hinged on these Soviet forces, and the timing of their mobilisation (i.e., when these units actually appeared on the battlefield and their strength when they were deployed). *This is also why there are currently so many ahistorical and misinformed works in regards to Operation Barbarossa*: how can this 'race' be properly analysed when one side is treated as a huge, amorphous and endlessly regenerative force? In this case there is no accurate method to assess just how close the *Wehrmacht* came to defeating the USSR in 1941, or at least placing the USSR in an unsustainable position leading into 1942.

That is, until now. With the publication of Volume IIIB, scholars, researchers, authors and war-game designers no longer have the excuse of insufficient data or modelling to hide behind when discussing the entirety of the Soviet forces that existed in 1941. They are now able to (and should if their analyses are to have any real meaning) examine the Soviet forces and problems to the same degree as the *Wehrmacht* in post war literature. *Now the problems and actual limitation faced by the Red Army in 1941 can be laid bare in detail*. These included: relatively small and 'front heavy' combat units (some extremely small), *widespread shortages of equipment at every level* (mostly due to so many units being formed so rapidly), *systemic and chronic shortages of all forms of transport (especially trucks, but also horses and tractors*), *huge logistical and supply distribution efficiency problems*, reinforcements, replacements, tank losses, truck losses, horse losses, etc... and, of course, absolutely massive ongoing Soviet casualties (including unprecedented numbers of POWs).

In short, with the publication of Volume IIIB, commentators on Operation Barbarossa will no longer be allowed to use 'facts' without context and sloppy thinking, supported by purely qualitative and ambiguous narrative, in *order to argue that the 'Red Army was simply too big' for the Wehrmacht to decisively defeat in 1941.* Similarly, qualitative statements about the ***Wehrmacht's*** **ongoing logistics problems in 1941 will now have to be set in the context of the *Red Army's even worse overall logistics situation*.** The reader need no longer rely on the traditional narratives on the probable outcomes of Operation Barbarossa as being correct or truthful, and now has the historical data, tools and modelling to draw their own (and probably more valid) conclusions.

Special Acknowledgements

I would like to especially acknowledge **Luc Belanger** in Canada for his amazingly detailed research and work on the Soviet artillery units (including rocket artillery units) fielded in 1941. Luc is probably one of the world's leading experts on Soviet rocket artillery (or Guards Mortar) units! Without his help, the relevant sections in this volume on Soviet RVGK artillery units mobilised in 1941 would be far less comprehensive than they are. I would also like to especially acknowledge **Del 'Jack' Bechtold** in the USA for his remarkable ongoing efforts to build an immense and historically accurate, 2.5km per hex, Operation Barbarossa military simulation. If the project and software developments continue, this work will form the basis of the largest and most realistic Operation Barbarossa military-simulation ever created.

* * *

Volume IIIA

Introduction

On 22nd June 1941 the *Wehrmacht* launched the largest invasion in recorded history, under the code name Operation Barbarossa. Operation Barbarossa needs no introduction to students of the Second World War, as it is unrivalled in military history for size, speed of operations, and the magnitude of its geographic objectives. The *Wehrmacht's* objective was no less than the complete defeat of the USSR, a nation possessing by far the largest army and air force in the world at that time. This study focuses on the period from 22nd June to 31st December 1941: the period when the Soviet Union came closest to defeat, and arguably the only period when Germany could still win WWII outright. Since the end of WWII, debate has raged about the key operational and strategic decisions made by the German and Soviet high commands, especially during the critical period from July to September 1941.

Operation Barbarossa: the Complete Organisational and Statistical Analysis, and Military Simulation *is essentially the history of the Axis invasion of the USSR during 1941, expressed in the form of a detailed statistical analysis and an accompanying military simulation methodology*. The objective of this work is to create the most historically accurate, advanced and comprehensive quantitative model yet, of the first six months of the largest and costliest military campaign in history (encompassing Operation Barbarossa and Operation Typhoon). The work includes full analyses of the belligerents' military, economic and logistical structure and capabilities, as related to their war effort on the East Front during 1941. This includes extensive data on: the structure of the relevant military and security organisations (land, sea and air), the available equipment and personnel, analyses of the weapons used, transport, logistics, economic production of war materials, mobilisation, and the replacements available and used during the campaign.

The user is not obliged to follow or even understand the details of the quantitative methodology used if they so choose. Operation Barbarossa: the Complete Organisational and Statistical Analysis, and Military Simulation is *structured so that the user does not need to be familiar with military simulation technology or terminology*: the historical data is presented and referenced for the user to conduct their own research or analyses, or extract specific historical data regarding the campaign. The analytical methodology employed is mostly transparent to the user in subsequent volumes (see below), and they may not even be aware that it is being employed. Nevertheless, the analytical discipline enforced by the methodology is present at each stage, and all the belligerent nations and their armed forces undergo the equivalent detailed scrutiny.

The work spans the disciplines of military history, operational research, applied physics and mathematics, statistical analysis, and analytical methodology (usually relating to modern military simulations or war gaming). Operation Barbarossa: the Complete Organisational and Statistical Analysis, and Military Simulation does not assume the reader has detailed knowledge of the history of the East Front in WWII or extensive knowledge of the disciplines mentioned.

The key rationales behind this work are:

● To bring together an immense amount of information from many disparate sources, and present it in the form of a large 'data-warehouse' in a single work. The professional researcher or amateur scholar of WWII is provided with a comprehensive data source, containing the details of all the armed forces involved on the East Front from 22nd June to 31st December 1941. ***Currently there is no single source detailing the actual land, air and naval forces involved in Operation Barbarossa and Operation Typhoon***.

● To fully analyse the belligerents' economic and logistical capabilities, as related to the East Front in 1941 and in the strategic context of their overall war effort.

● *To demonstrate the application of quantitative analysis to military history* (as opposed to largely qualitative analyses), and to demonstrate the potential power of modern military simulations in the study of military history. Selecting the largest land campaign in history as the historical case study, demonstrates the scalability of the methodology employed. In addition, incorporating the multitude of interrelated factors and circumstances faced by each of the belligerents on the East front during 1941, makes it evident how sophisticated and historically accurate operational-strategic military simulations provide a most powerful method of studying military history available today. In so doing, Operation Barbarossa: the Complete Organisational and Statistical Analysis, and Military Simulation produces a new perspective on a very famous, immensely important and tragic historical event. (p. 2)

* * *

1. The Soviet Personnel and Equipment Database

1A. Soviet Light Infantry Wpns:

Machine Guns

The Soviet standard Light Machine Gun (LMG) in WWII was the **7.62mm DP 1928** and the standard Medium Machine Gun (MMG) was the old **7.62mm Maxim 1910**.

The DP (Degtyarev Pechotnyi, or Degtyarev Infantry) LMG was designed by Vasily A. Degtyarev from 1921 to 1926, and was *probably the first MG to be designed in the USSR after the 1917 civil war.* It was adopted by the Red Army as their standard LMG around 1927-28, and was subsequently designated the DP 1928. It was designed around the standard Russian 7.62x54mmR cartridge (introduced into the Russian Army in 1891), was air cooled, came with a 47 round cylindrical drum magazine, weighed 9.3kg, and had a cyclic rate of fire of **550rpm.** The DP was gas operated and used a long stroke gas piston located under the 605mm barrel, which operated a bolt with two side-mounted locking flaps. On the down side the DP had quite a violent recoil action (for a gas operated weapon) and its return spring mechanism tended to overheat if used for extended periods. In addition, the circular-disc magazine, which fed from the top of the LMG, took some time to insert correctly into the LMG mechanism compared to contemporary 'box' magazines. It also took a relatively long time to load the 47 rounds into an empty magazine. *On the plus side the DP was simple to operate, was very robust and had only six moving parts.* In terms of overall firepower it was similar to most magazine fed LMGs of the day, but was an inferior weapon to the British Bren LMG and the German MG 34.

*The **DP 1928** became the standard Soviet infantry squad LMG from 1928 and remained so during WWII*. Table Sov Res Database 1 reveals an OCPC value for the DP1928 of 5.36, which is 63% of the MG 34 value. In practical terms this was one of several reasons why Soviet infantry squads (and their Western Allied equivalents) had considerably less fire power than their German counterparts. A modified version of the DP1928, the DT or Degtyarev Tankovii, was mounted in tanks and some motor vehicles. The DT had a 60 round magazine, a telescopic butt, pistol grip and a heavier barrel which was not quickly changeable. Otherwise its ballistic characteristics were unchanged.

On 22nd June 1941 there were approximately **170,400 LMGs** of all types available in the USSR. In the period 23rd June to 31st December 1941 a further 45,300 LMGs were produced (or became available) and approximately 134,700 were lost. This loss represented almost 62% of total 1941 LMG stock. Refer to the entry below on 'Rifles' as to the importance of these figures in the Soviet FILARM model.

The Maxim 1910 dated back to a demonstration of the basic design by *Hiram Maxim* at St Petersburg in 1887. *The Tsar's army used British made Maxims, until production started in 1905 in Russia at the Tula Arsenal.* The Maxim machine gun fired around 550rpm, used a short-recoil action, had a 721mm barrel with a cast bronze water jacket for cooling, could fire in automatic mode only, and was belt-fed with standard Russian 7.62x54mmR cartridges. All Maxim guns fired from a closed bolt. The Model 1910 was basically unchanged, except the bronze water jacket was replaced with a corrugated steel one, the water filler cap was enlarged and there were and some minor changes to the feed mechanism. *The Maxim 1910 was very reliable but was an extremely heavy and cumbersome gun*. To assist mobility, the Russians developed a special mounting called the *Sokolov mounting*. This consisted of a tubular steel trailer with wheels, which enabled two men to pull the gun forward into firing position. The gun itself weighed 23.8kg, and with the Sokolov mounting this went up to 73.7kg (excluding the water for cooling). (p. 20)

Overall the Maxim 1910 was a **WWI vintage weapon**, inferior to most equivalent weapons by the start of WWII. However, for want of a better weapon and to ensure uninterrupted manufacture, *production continued until 1945*.

The Maxim 1910 remained the most common Soviet MMG until the war's end. The data in table Sov Res Database 1 shows that in terms of combat power the Maxim 1910 was very similar to the bipod mounted MG 34 LMG and considerably inferior to the tripod mounted MG 34 (71% of the HMG 34's OCPC value). Like the LMG equipped rifle squads, ***this meant that Soviet MG companies had significantly less firepower than their German equivalents.*** It should be noted, however, that the Maxim 1910 was comparable to the British Vickers Mk1 and the US water cooled Browning M1917 in most respects, with the exception of the Maxim's inordinate weight. On 22nd June 1941 there were approximately **76,300 MMGs** of all types available in the USSR. In the period 23rd June to 31st December 1941 a further **8,400 MMGs** were produced (or became available) and ca. 54,700 were lost. This loss represented almost 65% of total 1941 MMG stock.

Small Arms

Rifles: The standard Soviet bolt action rifle in WWII was the **7.62mm Model 1930G**. It is sometimes called the Model 1891/30 and was based on the **Mosin-Nagant Model 1891**, using the 7.62x54mmR cartridge (which was, in fact, originally created for the Mosin-Nagant). The rifle was originally designed by the **Belgian Nagant brothers**, and modified for Russian use by Colonel S.I. Mosin of the Imperial Russian Army. The rifle's turn-bolt action was similar to most contemporary rifles, although the three piece bolt was an unfortunate complication caused by the need to satisfy (avoid) several rifle patents. The original 1891 model was a long weapon designed to use a bayonet, and was partnered by the slightly shorter 'Dragoon Rifle' version.

In 1931 the Soviets introduced the Model 1930G, which was essentially the Dragoon Rifle with improved sights and design modifications to increase production efficiency. In most respects the Model 1930G rifle was comparable to other countries' contemporary bolt action rifles. It used a five round integral box magazine, and the 729mm barrel had a four grove right hand twist. Numbers of the Model 1891/30 were fitted with 3.5 x PU sighting telescopes for use by snipers, and sometimes featured a longer bent-down bolt.31 There was also a mountain troops version of the Model 1930G produced, which had a shorter 519mm barrel and was designated the Carbine 1938G. **Most of the 1930G rifles in the Soviet armed forces during 1941 were produced (pre-war) at the Tula State Arsenal. In December 1941, most of this very large facility (then one of the largest in Europe) was hurriedly evacuated eastwards** which severely disrupted small arms production in the USSR for some time.

In addition to the Mosin-Nagant rifles, Soviet troops were sometimes issued with ex-Polish Mauser and ex-Lithuanian FN-Mauser rifles. These weapons mainly came from captured stock when those countries were invaded or 'annexed' in 1939 and 1940. *These rifles were chambered for a 7.92mm cartridge*, and so were generally issued to second line garrison units (or later partisan groups) where ammunition supply was not such an issue. (p. 21)

On 22nd June 1941 there were approximately **7,740,000** rifles of all types available in the USSR. In the period 23rd June to 31st December 1941, a further 1,570,000 rifles were produced (became available). However, the **losses during the same period were staggering, and amounted to approximately 5,550,000 rifles**. When one considers that most of these would have been in a Soviet soldier's possession when lost, it gives the reader some idea of the Soviet casualties and POWs suffered during 1941. This meant that by the end of 1941 the entire Soviet armed forces had only 3,760,000 rifles available (i.e. 60% of total 1941 rifle stock was lost). ***If ever confirmation is needed on how close the Soviets came to defeat in 1941, then this statistic is one of the most illustrative.*** This is because without rifles there would have literally been no Red Army, no matter how large the USSR's population. Also note SMG stock and production (see below) was relatively paltry during this period, and would not have compensated for rifle shortages in any way during 1941-42. (p. 22)

Sub-Machine Guns

The two predominant Sub-Machine Guns (SMGs) in service with the Red Army during 1941 were the 7.62mm **PPD 1940G** and the ubiquitous 7.62mm **PPSh-1941G**. All Soviet WWII sub-machine guns were based around

the Soviet 7.62x25mm Tokarev pistol cartridge, which was in turn derived from the similar 7.63x25mm Mauser cartridge.

The PPD (Pistolet-Pulyemet Degtyarev - Machine Pistol designed by Degtyarev) was originally based on the **German Bergmann design of 1928**. In total, only around 5,000 PPD Model 1934-1938s were manufactured from 1934 to 1939 (inclusive). In the Model 1940 PPD the drum magazine was redesigned to the Finnish Suomi pattern, and the weapon altered to allow the 71 round magazine to be pushed into place from the side. The barrel cooling slots were also simplified. This weapon had an internally chromium-plated 267mm barrel with a four grove right hand twist, weighed 3.7kg empty, and was capable of firing 800rpm. However, PPD 1940G production remained small by Soviet standards and only lasted from 1940 to 1941. During this time only around **86,986** PPD Model 1940s were produced, with 5,868 produced in 1941. This brought total PPD production to approximately 92,000 SMGs. Although a good SMG for its time and relatively easy to make, it was still not simple enough or cheap enough for the volume of production the Soviets needed in 1941 and 1942.

During WWII the Soviets put into service approximately 5,530,000 SMGs, of which over 4,500,000 were the famous PPSh-1941G. The PPSh (Pistolet-Pulyemet Shpagin) *was one of the few Soviet small arms which had a higher overall combat power compared to the equivalent German weapon, namely the MP (Maschinenpistole) 38/40.* The PPSh was developed in 1940-41 as a cheaper and easier to manufacture replacement for the PPD. The PPSh used stamped steel for the body and barrel jacket, although the weapon still used a wooden stock. A significant economy was the use of old rifle barrels: an old Mosin-Nagant rifle barrel could be cut in two and then machined so the chamber took the 7.62x25mm cartridge to produce two PPSh barrels. The entire assembly was by pinning and welding, and its parts (excluding the machined barrel) could be produced by a relatively unskilled workforce. The magazine initially used was the same **71 round drum magazine** developed for the PPD since production of this item was well established.

The PPSh-41 did have a few problems however. The first was the unreliable drum magazine. This was initially made of thin stamped metal and was prone to deformation which led to jams. It was also relatively expensive to produce and time consuming to fill by hand. Later in the war the drum magazine was largely superseded by a simpler box-type magazine holding only 35 rounds. **The second problem was that many production PPShs were not very accurate; even by WWII SMG standards**. The PPSh's simple blowback action meant there was no breech locking mechanism (so gas leakage was high), it fired from an open bolt (which in general also reduces weapon accuracy), and the mass produced barrels were often machined to low tolerances. Interestingly, the mass produced British Sten gun had exactly the same problems for the same reasons.

Mass production of the PPSh-41G commenced in the spring of 1941, and ultimately 98,644 were produced by the end of the year. On 22nd June 1941 there were approximately 100,000 SMGs of all types available in the USSR. From production figures we know this would have likely included 92,000 PPDs and around 8,000 PPShs. The only other SMGs known to have been in the Red Army were a few captured Finnish Suomi Model 1931s, but these would have only numbered in the hundreds. *By the end of 1941, the Soviet had already lost close to 100,000 of their total 1941 SMG stock. This loss therefore represented almost 52% of total 1941 SMG stock*. This was not as bad as the same figure for rifles, LMGs and MMGs (i.e. 60%, 62% and 65%, respectively), but it meant there were o*nly around 91,000 SMGs in the entire Red Army in early January 1942*. It wasn't until late 1942 that the mass production of the PPSh had any significant effect at the strategic level; with around 1.5 million PPSh-41Gs being produced in that year.

In 1941 the *Wehrmacht* captured so many PPSh-41G that they decided it was worthwhile having a proportion of them **rebored to take their 9mm Parabellum cartridge** (used in German SMGs). In *Wehrmacht* service these weapons were designated the **Maschinenpistole 41(r)** (or MP41(r)). Unconverted PPSh-41s were designated MP717(r) and supplied with captured ammunition or German 7.63x25mm Mauser ammunition (which was able to function almost as well as the 7.62x25mm Tokarev cartridge).

As a final aside on Soviet SMGs, it should be understood that the principal reason that the Soviets produced such huge numbers of SMGs was not specifically to increases the short range firepower of their average rifle squad, although this was the overall result. It was more to ensure that the average rifle man actually had a firearm at all. WWII **SMGs, and particularly the Soviet PPSh and PPS SMGs, were cheaper and much easier to produce than rifles.** This was largely due to the fact that it is much easier to produce a short and imprecise SMG barrel than a reasonable quality rifle barrel. To produce a high quality rifle barrel requires longer precision lathes and is relatively labour intensive. The fact that old Mosin-Nagant rifle barrels were often cut in half to make two 'new' PPSh barrels illustrates this point. In general, the Soviet SMGs had non-existent finishing, and rough welds and grinding marks were common. They were nonetheless excellent and reliable weapons, and later in WWII large combat units were often entirely equipped with them. (p. 23)

Side Arms

The two principal side arms issued to Soviet officers and security personnel during WWII were the 7.62mm Nagant **Model 1895 revolver** and, to a lesser extent, the 7.62mm Tokarev Model TT33. The 7.62mm Nagant 1895 revolver dated back to the imperial Russian government, which adopted the weapon in 1895 for the army and police force. ***Initially the weapons were imported from Belgium***, but in about 1901 the Russians purchased the patent rights and **started manufacture at the Tula Arsenal.** Within a short time the Tula Arsenal was producing around 20,000 revolvers a year. The weapon itself used a customised 7.62x38mmR cartridge, which meant its ammunition was not compatible with other Soviet small arms during WWII (e.g. the SMG's cartridge). The 7.62mm Nagant 1895 used a seven round chambered cylinder, weighed 0.79kg (unloaded), and had a 109mm barrel with a four grove right hand twist. It is unknown precisely how many Nagant 1895 revolvers were produced, but as many as two million is sometimes quoted in total (up to the early post-war era when production stopped). On 22nd June 1941 there were **1,240,000** revolvers and pistols in the Soviet armed forces, and the large majority of these were 7.62mm Nagant 1895 revolvers. Production continued during WWII, and the Nagant 1895 remained the most common Soviet military-issue side arm during the war.

A more powerful and modern pistol, the 7.62mm **Tokarev Model TT33**, was also widely issued during WWII. The weapon originated from a 1930 design by Fedor Tokarov for a self-loading semi-automatic pistol using a 7.62x25mm cartridge (which was derived from the 7.63x25mm Mauser cartridge). This was the same cartridge that would later become the standard type used in Soviet SMGs. The TT is generally understood to stand for **Tokarov and Tula Arsenal**; where it was initially manufactured. Around a thousand of the Tokarev TT31 were produced for evaluation, but the design was soon modified. The improved pistol commenced production in 1933 as the Tokarev Model TT33. The Tokarev TT33 used the same principle of operation as the **famous Colt M1911** (Browning) pistol: it used the same swinging link system of locking barrel and slide together for short-recoil operation. (p. 24)

From 22nd June 1941 to the end of the year, the Soviet armed forces received 130,000 revolvers and pistols, but over half of these were **Nagant 1895 revolvers.** Total side arm losses in the same period amounted to 440,000 weapons, which equates to approximately 32% of total 1941 stock.

Hand Grenades

We now come to the last light infantry weapon considered here, which is the hand grenade. In general terms, there are **two main types of hand grenade, normally classified as 'offensive' or 'defensive'**. There are also specialised grenades such as shaped-charge anti-tank grenades. An offensive grenade is used in the attack, by a man who is running forward. He needs to throw the grenade ahead and not have to seek heavy cover. Therefore the grenade should have a localised effect and not blast chunks of metal back at the man that threw it. Such a grenade needs a lightweight casing which breaks into tiny fragments that don't carry long distances. The offensive grenade derives most of its effect from the blast of the explosives. The defensive grenade on the other hand is for use by a man holding a position. In this case the defender has available cover after throwing the grenade. A good defensive

grenade needs to generate maximum possible lethal fragmentation over a large area. In this case a heavy casing is used which breaks into large lethal fragments, and less explosive is required.

Soviet Hand Grenades Fielded During 1941 [Note: This is a table that includes 4 offensive, 1 defensive, and 2 anti-tank type grenades.] We now come to the last two significant grenade types fielded by the Red Army in 1941; namely the **RPG-40 and RPG-41** anti-tank grenades. Both of these similar grenades were quite rare, and *neither was very successful.* They had no shaped charge (HEAT) capability and so relied entirely on explosive force to penetrate or buckle armour. The RPG-40 was produced in 1940 and was little more than an over-grown stick grenade. The **RPG-41** started production in 1941. It used the same handle and trigger mechanism as the RPG-40, including the same detonator delay assembly. The only significant difference was that the RPG-41 cylinder was larger and had around 1.4kg of filler. In ideal circumstances this could 'penetrate' 20-25mm of armour. The downside was the RPG-41 weighed over 2kg and its throw range was now around 10 metres. (pg. 27)

It is claimed the RPG-40 and RPG-41 were able to destroy or severely damage light tanks like the German *Panzerkamfwagen* I and II during 1941-42. Also, according to the armour thicknesses on these vehicles, this seems very possible on paper. ***However, I have yet to find any definitive proof that the German Army lost any tanks to Soviet hand held anti-tank grenades during 1941***, and certainly their losses to these weapons during 1941 were insignificant. There are several reasons for this, but it was largely to do with the fact that ***German tanks rarely operated against enemy infantry without close infantry support***. In addition, tanks are designed to withstand undirected explosive blast *which is why artillery firing HE rounds are relatively ineffective against armour*; and the average incoming HE artillery round is a great deal more destructive than a simple HE hand grenade. (pg. 28)

1B. Soviet Squads Equipped with Light Infantry Weapons

During WWII the infantry (or Soviet rifle) squad was normally the smallest tactical manoeuvre unit on the battlefield. The squad usually had 6-14 men (normally around 10 in an infantry squad), with a leader, independent equipment and ammunition, and (in some armies) individual communication. The term 'section' is sometimes used to describe the same unit, or sometimes a half squad. For our purposes a section will be used to describe a half squad. The crew of individual heavy weapons larger than a HMG were also similar in size to a squad, and were able to function similarly.

Soviet Light Infantry Weapon Equipped Squads (e.g.):

- Rifle Squad 11-12 man Squad with DP 1928 LMG.
- Rifle Squad (SMG) 11 man Squad, all with sub machine guns (PPD 1940G or PPSh-1941G).
- Light Rifle Squad 11-12 man Squad with no LMG, or 10 man Chemical Defence Squad with no LMG.
- Motor Cycle Squad 8 man Motorcycle Squad and DP 1928 LMG (includes motorcycles).
- Cavalry Squad 12 man Mounted Squad and DP 1928 LMG (includes riding horses).
- Light Eng. Squad 2 x 9-12 man Engineering Squads with no LMG, or 10 man Flame Thrower Squad.
- Rail Repair Squad 5 man Rail Construction and Repair Squad with no LMG.

The Shtat (or TOE) 04/401 for a rifle regiment in an April 1941 rifle division, indicates a rifle squad had 2 NCOs and 10 enlisted men, armed with 1 LMG, 1 sniper rifle, 9 rifles and 1 rifle grenade launcher. An alternative source states the same rifle squad consisted of 1 NCO and 10 enlisted men, armed with 1 LMG, 1 pistol, 2 SMGs and 8 rifles.[5] Both sources indicate the rifle platoon HQ (controlling 4 rifle squads) also had 2-3 men armed with pistols and rifles. Given that the Soviets only had approximately 100,000 SMGs in service in June 1941 and only received a similar number in the remainder of 1941, **it means the Soviets didn't have anything like sufficient SMGs in 1941 to fill their SMG requirements in SMG squads, security units, etc**. Therefore, almost all

[5] **Note:** S.J. Zaloga, L.S. Ness, Red Army Handbook 1939-1945, Sutton Publishing, Stroud, UK, 1998, p. 8, table 1.2.

available SMGs went to alternative squad types during 1941, leaving only pistols, rifles and LMGs in the rifle squads. In **July 1941 a new reduced rifle division Shtat** 04/600-616 was issued. The rifle regiment Shtat 04/601 now called for 2 types of rifle squad, each with 2 NCOs and 9 enlisted men, (11 men). The 'new' rifle battalion now had half its rifle squads equipped with LMGs and rifles, while the remainder had only rifles. The rifle squads with no LMG are termed 'light rifle squads' in the squad types listed above.

In October 1941 the Soviet issued new Shtat 04/730-744 to form separate rifle brigades. Shtat 04/740 also called for the brigade's rifle battalions to have rifle and light rifle squads, but each now had 2 NCOs and 10 enlisted men (12 men). In addition, the rifle brigade's rifle platoons each had 10 SMGs in their TOE (which equates to an average of 2.5 authorised SMGs per squad). However, given that rifle brigades were near the bottom of the ladder in terms of issued equipment, and given the **chronic shortage of SMGs throughout 1941**, it is very unlikely that many rifle brigades were issued with SMGs in 1941. (pg. 29)

At this point it is worth considering briefly the differences between a typical rifle squad and a rifle squad equipped purely with SMGs. **In 1941 the rifle squad (SMG) was relatively rare in the Red Army,** but this would change progressively from year to year as huge numbers of cheap SMGs became available. Some authorities, and a few tactical level simulations, attribute WWII squads equipped entirely with SMGs with considerably higher firepower than was historically the case. The idea simply being that they could collectively lay down a much more intense rate of fire. The reality was, unsurprisingly, different: *the SMG armed squad only had a tactical advantage in very specific tactical situations.* ***The WWII SMG was a very short range automatic weapon***: it had nothing like the accuracy or capability of an 'assault rifle' (such as the **StG 44** later in the war) which used a larger cartridge, and it was limited by whatever could be achieved with a relatively weak pistol cartridge. ***Consequently the typical SMG had a muzzle velocity marginally greater than military pistols of the day, and an accuracy to match. At ranges over 100m there was wide dispersion, and firing at ranges over 150m was usually a waste of ammunition.*** (pg. 30)

The German term '*Maschinenpistole*' was in fact a much more accurate description of functionality than 'sub-machine gun'. *An SMG armed squad had a tactical advantage in the final phase of a close assault where SMGs could be fired while on the move, during close combat in dense urban or forest terrain, or in the hands of troops with limited marksmanship skills*. Infantry equipped with SMGs received very limited benefit from being great marksmen and hence were easier to train and get to the front. **In many other tactical situations having only SMGs was a very severe handicap**. In any open or mixed terrain, an enemy equipped with accurate rifles or a LMG had a huge tactical advantage. They could inflict fatal damage on any SMG squad without danger of effective return fire until the range was considered virtually point blank for a rifle (and any half decent marksman). A SMG squad could be pinned down and picked off by a single sniper because they had to get very close to even supply reasonably effective covering fire. A predominantly rifle equipped squad with a LMG and 1-3 SMGs, was definitely a much more balanced unit capable of a much wider range of tactical missions.

Finally, it is worth mentioning the **relative shortage of hand grenades and other demolition devices available to most Soviet squads during 1941**. It is known that every Front in the Red Army in 1941 suffered a relative shortage of grenades and a **chronic shortage of mines**, although no detailed figures on available hand grenades has been found. For the purposes of this analysis it is assumed that the average Soviet squad (that was in supply and likely to be used in direct combat) was equipped with at least 20 hand grenades, while the average engineer-sapper squad had around 40 hand grenades. By the supply standards of the British and US armies in WWII, this would be considered minimal supply. However, for the Soviet rifle squads in 1941 this estimate is on the generous side **and it is highly probable that many Soviet squads, including engineer-sapper squads, had no grenades or mines available in 1941.** (p. 30)

In early 1941 the Red Army had around 1,000,000 anti-tank mines at its disposal, but lacked any delayed action or other types of mine. The Red Army estimated at this time that it would need at least 2,800,000 anti-tank, 4,000,000 anti-personnel, 120,000 delayed action and 350,000 trip mines, for a six monthly period of operations.

The production of the outstanding mines simply never occurred in 1941, and given the changing Soviet priorities before and then after June 1941, it is hardly surprising. *It does explain why Soviet minefields do not commonly figure in German combat reports from 1941 and why they were not the problem for the Wehrmacht that they would become in later years.*

1C. Heavy Infantry Wpns

Anti-Tank Rifles (AT Rifles)

The two types of Soviet anti-tank (AT) rifle available in WWII were the **14.5mm** PTRD 1941 and **14.5mm** PTRS 1941. The PTRD 1941 was designed by Degtyarev and was *capable of penetrating 25mm of vertical non-face hardened homogeneous armour at 500 metres*. The PTRS, developed at the same time as the PTRD, was designed by Simonov. It was a more advanced design than the PTRD, but was less robust as well as being heavier and larger. Relatively few PTRS were manufactured and when it became apparent the PTRD could reliably do the job, manufacture of the PTRS ceased.

The PTRD 1941 became available in **July-August 1941** and so was included in the **Shtat for the new rifle division structure, issued on 29th July 1941.** This called for the 3 rifle regiments in the division to each have an anti-tank rifle platoon, each with 6 anti-tank rifles. However, although some 17,700 anti-tank rifles were produced in 1941, no ammunition had been produced for them by August 1941. **Thus anti-tank rifles did not become 'general issue' in the Red Army until November 1941.** (p. 31)

By mid-1941 most of the world's armies had already decided the anti-tank rifle was essentially an obsolete concept. The average tank's armour had progressed to the point where anti-tank rifles were becoming relatively ineffective, even at close range. Furthermore, the nature of infantry vs. tank combat was such that infantry often didn't survive the contact unless they quickly delivered a seriously damaging or fatal blow to the tank. If the tank was well designed and the crew new what they were about, the infantry didn't get time to repeat their effort. *Anti-tank rifle ammunition rarely destroyed a tank even if the armour was penetrated, which meant the tank's crew were often left with an operational vehicle with which to neutralise the anti-tank weapon.* In short, using relatively ineffective anti-tank weapons was very expensive in terms of personnel casualties. *By late 1941 the Germans had started withdrawing their Panzerbüchse 38 and 39 anti-tank rifles permanently from service*, even though the penetrative performance at close range (**less than 350 metres)** was similar to the Soviet weapons.

Despite all this the 14.5mm PTRD 1941 continued to be produced in large numbers until war's end and *remained the Soviet rifleman's standard anti-tank weapon until 1945*. In all, some 471,500 anti-tank rifles were received during WWII, including 37,700 manufactured as late as 1944.[6] *When other army's infantry were using all sorts of lethal anti-tank rockets with hollow charge warheads*, the Red Army soldier had to make do with trying to get a lucky shot at any exposed tank crew or through one of the vision devices. **The failure of the Soviet authorities to even research and develop serious infantry anti-tank weapons during WWII (especially after 1943), is a disturbing indictment of the apparent willingness of the Soviets to sacrifice personnel**.

German panzer crews always considered the PTRD 1941 to be a 'dangerous nuisance' because the anti-tank rifle usually inflicted non-fatal damage and due to the sheer number they encountered. However, considering that *214,000 Soviet anti-tank rifles were lost in combat during WWII, mostly with their two man crews, the Soviet soldier payed a horrendous price to be a dangerous nuisance* instead of a lethal anti-tank force. There was one

[6] **Note:** Soviet Casualties and Combat Losses in the Twentieth Century, Col. General G.F. Krivosheev (ed.), et al, English Translation of the Russian General Staff 1993 Study, Greenhill Books, London, 1997, p. 247, Table 95. Amazingly, the authors have the gall to call these 'anti-tank rocket launchers' in this table.

thing that Soviet and Western Allied tank crews never thought; and that was that the word 'nuisance' ever applied to a German infantryman armed with a Panzerfaust[7] or a Panzerschreck. (p. 31)

Anti-Tank Guns (AT Guns)

The Soviet standard issue anti-tank (AT) Gun in 1941 was the **45mm M1937** gun, *which evolved from the series of German 37mm PaK guns produced from the late 1920s*. The first of these was the 37mm PaK L/45 produced from 1928. The Soviets initially *purchased some of these guns and then manufactured them in the Soviet Union under license* as the 37mm M1930 anti-tank gun. However, the Red Army desired a larger caliber so the 37mm gun carriage was modified to take the barrel of the Soviet 45mm L/46 tank gun (46 calibre barrel length), and the resulting gun was designated the 45mm M1932 anti-tank gun. In the meantime the German Rheinmetall company had commenced production of the improved *37mm PaK 36, which heavily influenced many contemporary armies' anti-tank gun designs.* The Soviets were no exception, and promptly adapted the 45mm L/46 gun to the PaK 36 carriage, and designated this gun the **45mm M1937** anti-tank gun. By 1 June 1941 there were 7,682 45mm M1932 and 7,255 45mm M1937 anti-tank guns in service with Soviet forces (**14,937** in total) (p. 32)

The 45mm M1937 had a weight in action of 560kg and could penetrate 35mm of 30deg sloped homogeneous armour at 500m, and 28mm at 1,000m, using its standard AP shot. This meant it could penetrate 6mm more armour at 500 and 1,000 metres than the German standard issue 37mm Pak 36 L/45 gun. *However, the Soviet gun was 128kg heavier in action, had a slower rate of fire and had inferior optics*. Fire control effects meant the maximum effective anti-armour range of both weapons was around **750 metres**. In addition, at ranges beyond 500 metres the 37mm Pak 36 was more likely to acquire and hit a small moving target, despite having a shell with less mass and hence less repeatable accuracy over longer ranges. Nevertheless, *the 45mm M1937 anti-tank gun had a considerably higher overall combat power compared to the standard German anti-tank gun in 1941* (the OCPC for the 45mm M1937 anti-tank gun is 113% of that for the 37mm PaK 36). This was largely due to the ability of the Soviet gun to fire a more useful high explosive round, and the OCPC calculation is based primarily on lethality to personnel.

In 1941 the Soviets were developing the potentially excellent 57mm M1941 anti-tank gun with performance approaching that of late war medium anti-tank guns. The 57mm M1941 had a very long barrel length of 73 calibre and could have been the best light/medium anti-tank gun in the world in 1941. In test firing it could penetrate 86mm of 30deg sloped homogeneous armour at 500m and 78mm at 1,000m using solid AP shot. The weight of the gun in action was 1,125kg, *which was only 139kg heavier than the German 50mm Pak 38 while possessing a significantly superior anti-tank capability.* The 57mm M1941 was *rushed into production from May 1941 but, fortunately for Axis armour, production ceased after only 320 had been produced*. There were several reasons for this. The gun proved to have major technical problems relating to accuracy and shot stability. The story goes that the original barrel rifling was calculated with mathematical errors! In parallel to this a **disagreement broke out among the Red Army's leaders over the purported thickness of German tank armour, which was grossly overestimated.** The Soviets preferred to concentrate on the 85mm and 107mm guns which never materialized as anti-tank guns. Finally, production was severely disrupted by the German invasion and a 'corrected' model wasn't produced until 1943 (p. 32)

German / Soviet Doctrinal Differences in AT gun use:

At this point it is necessary to digress and discuss **a key difference between the Soviet and German philosophy relating to anti-tank weapons.** *This was in the area of combining the roles of anti-tank guns and artillery. The German Army believed the anti-tank gun should be dedicated primarily to the task of destroying enemy tanks and*

[7] **Note:** The Panzerfaust 30-150 could **penetrate around 200mm of 30 degree sloped armour.** It was capable of destroying any tank in the Allied or Soviet inventory in 1944-45 (even if attacked front on), including the heavily armoured IS-2, ISU-122 and ISU-152.

was not artillery in the traditional sense. **They believed artillery was unsuitable and generally too valuable**, in terms of carefully trained personnel and specialist equipment, **to use tactically as anti-tank weapons**, and should only be used in this role if nothing else was available. Thus although anti-tank ammunition was produced for most light and medium artillery pieces, the *German tactical doctrine* meant that they normally only committed their artillery (including flak guns) to engage enemy armour if no other suitable or effective anti-tank weapons were available.

The Red Army adopted the idea that although dedicated anti-tank forces should be available, light, medium and even heavy artillery (field guns) should normally be issued with anti-tank ammunition and be tactically available to stop enemy armour as required. **The Soviets viewed artillery (especially light artillery) as having a dual anti-tank and artillery role.** This philosophy may have been the main reason the Red Army neglected the dedicated anti-tank arm, relative to the tank and artillery arms, in terms of anti-tank weapon development during WWII.

The result was that throughout WWII Soviet light divisional artillery, and *in particular the 76mm divisional guns, were often used in the artillery and anti-tank role*. Throughout 1941 the Soviets used their 76mm divisional guns in the anti-tank role in all types of rifle divisions. This includes divisions deployed in June 1941 and newly mobilised divisions. However, the divisions deployed in June 1941 had 54 dedicated anti-tank guns in their TOE, while those mobilised after July 1941 only had 18 dedicated anti-tank guns. All types of rifle division retained 16 **76mm guns** in their artillery regiments. Obviously the newly mobilised rifle divisions were expected to use their 76mm guns to bolster the weak divisional anti-tank forces, which was as per their tactical doctrine. This meant the newly mobilized rifle divisions only had 8 **122mm howitzers as 'dedicated' artillery** and 16 76mm guns trying to be artillery and anti-tank guns at the same time. The Soviets were effectively trying to 'have their cake and eat it'.

In addition to the large formations above, the **76mm guns also went into dedicated anti-tank brigades and regiments during 1941**. Between June and December 1941, 73 new small anti-tank regiments were mobilised; using up 288 45mm anti-tank guns and 918 85mm anti-aircraft (AA) guns as anti-tank guns.[8] These were small regiments with 16-20 'anti-tank' guns each. They initially used 45mm anti-tank guns and 85mm anti-aircraft guns. In October 1941 the anti-tank regiment TOE called for 20 76mm field guns. Only 1 new anti-tank regiment had this TOE when formed, and 9 others used replacement 76mm divisional guns to convert to this TOE. Apart from using heavy artillery in the direct fire anti-tank role, which is very expensive and not a good idea, *the main problem was that the Soviet 76mm divisional guns were all designed as a light artillery pieces, and were always better field guns than anti-tank guns. . .* For the German 50mm PaK 38 L/60 (only 986kg in action) the same test firing figures are 59mm and 48mm, using standard **Pzgr 39 AP shot.** On top of this the **50mm PaK 38 had superior optics and fire control against small moving targets, a much lower silhouette for concealment, and a considerably higher rate of fire**. On the other had the 50mm PaK 38 wasn't much use as artillery for which it was never designed.[9]

From June to December 1941 th**e Soviets lost a staggering 12,300 76mm guns, another 10,100 76mm guns during 1942**. This total reached **44,000 76mm guns lost by war's end**. In the same period the figures for 45mm and 57mm anti-tank gun losses were 12,100, 11,500 and 42,400. In other words, the Soviets lost more light divisional artillery pieces (including infantry guns) than anti-tank guns, and in all probability most were lost

[8] **Note:** Appears that the Red Army used all kinds of guns—AA guns, artillery pieces, etc.—to function as anti-tank guns.

[9] **Note:** Ironically the Germans used many captured 76mm guns as anti-tank guns later in the war. They were re-bored, modified with new optics, issued with new German designed ammunition, often given new lower splinter shields and muzzle brakes and **designated 7.62mm Pak 36(r) or 39(r).** The penetrative performance of these weapons with new ammunition was considerably improved. The more well publicized German figures using their ammunition etc has led some military simulation designers and authors to rate the Soviet 76mm divisional anti-tank guns with an anti-tank capability comparable to the German 75mm PaK 40 gun. In no sense were any of the Soviet WWII 76mm divisional guns in the same class as the PaK 40 in terms of penetration or fire control against enemy tanks.

fighting German armour. The total German fully tracked AFV losses on the East Front in WWII amounted to approximately 36,800, and around half of these were lost to Soviet anti-tank guns and artillery (including anti-aircraft guns).85 If we assume around 80% of the dedicated Soviet anti-tank guns and 60% of the 76mm guns were lost fighting German armour during WWII, it means the Soviets lost an average of 3.3 guns (and most likely a large portion of their crews) for every fully tracked AFV they destroyed. This is before we even consider the other 17,500 medium and heavy artillery pieces and 8,000 anti-aircraft guns lost on the East Front by the Red Army during WWII, (of which a significant proportion were also lost fighting German AFVs). (p. 33)

On balance the evidence suggests that the *German Army's philosophy of separating the anti-tank and artillery functions, and simultaneously developing highly effective dedicated anti-tank guns, led to a much more favorable result*. (p. 34)

Mortars

By strict definition, mortars are any piece of ordnance *restricted to firing at angles of elevation between 45 and 90 degrees to the horizontal plane*, and many countries have correctly named some of their heavy howitzers as mortars in conformity to this rule. Today the word mortar is used to refer to a light weight, *smoothbore, muzzle-loading weapon firing a fin stabilised bomb*; and it is this weapon to which we will confine our attention here. For the purposes of this discussion there are three categories of mortar: light, (45-60mm), medium (80-82mm) and heavy (107-120mm).

The first Soviet light mortar was the **50mm mortar M1938**, which was rapidly replaced by the **50mm M1939**, which in turn was replaced by the **50mm M1940**. The 50mm mortar M1940 appeared conventional in appearance but had two unusual features. It had a small recoil buffer between the barrel and bipod yoke, and *the sights were fixed at 45 and 75 degree firing angle*. The range was controlled by venting a proportion of the propellant gas to the atmosphere, thus reducing the propellant available to the bomb. The 50mm mortar M1941 dispensed with the bipod and buffer and hinged the barrel to the baseplate. **The 50mm M1941** became the standard Soviet light mortar during WWII and was comparable to the British 2in and German 50mm models. After 1941, they were gradually phased out of service and by 1944 they had been largely replaced by the 82mm mortar. By 22 June 1941 there were approximately **36,300** 50mm M1938-M1941 mortars in Soviet service, although some sources give a slightly lower figure. In the period 23 June to 31 December 1941 a further 23,200 50mm mortars were produced (or became available) and approximately **38,000** were lost. ***This loss represented almost 64% of total 1941 50mm mortar stock.***

As with the 50mm mortar, the Soviet pre-war infantry were presented with a *bewildering array of medium 82mm mortars*, although the differences between models were minor. These were the 82mm mortar M1936, M1937 and M1941. The **82mm M1941**, which became the standard medium mortar up to 1943, consisted of a circular steel stamped baseplate and an unusual bipod assembly. The 82mm M1941 was a generally good design, comparable with western counterparts and with a *greater range than the average medium mortar.* By 22 June 1941 there were approximately **14,500** 82mm M1936-M1941 mortars in Soviet service. In the period 23 June to 31 December 1941 a further 16,600 82mm mortars were produced (or became available) and approximately **18,500** were lost. This ***loss represented around 59% of total 1941 82mm mortar stock.***

In 1941 the **Soviets possessed an advantage in the heavy mortar category.** They had developed the **120mm mortar M1938**; probably the best weapon in its class in the world at that time (with the possible exception of the Finnish 120mm Tampella M1940 mortar). The *120mm mortar was considered an artillery weapon in Soviet use* and 4 mortars were issued to a single mortar company per rifle regiment in June 1941. Newly mobilised rifle divisions reduced this to 2 mortars (in a mortar platoon) per rifle regiment. As it is included in the TOE of the rifle regiment, and for the sake of completeness, it is included here as a heavy infantry weapon (and not an artillery weapon). (p. 34)

The 120mm mortar M1938 was basically a conventional design. It included a smooth bore barrel locked into a circular baseplate and supported by a bipod, with a two spring shock absorber unit connecting the barrel and bipod together. For movement a specially designed transporter was provided which enabled the mortar to be rapidly moved into and out of action, and which could be towed by any convenient vehicle. **The Soviet 120mm mortar was one of the few weapons in WWII that the Germans copied directly from their enemy.** The Germans were so impressed by this weapon they added some modifications and manufactured a copy, the **12cm Granatwerfer 42** (GrW 42), which was first issued in late 1942. By June 1941 there were approximately **5,300** 107-120mm mortars in Soviet service. In the period 23 June to 31 December 1941 a further 2,600 107-120mm mortars were produced (or became available) and approximately ***4,000 were lost. This loss represented almost 51% of total 1941 heavy mortar stock.***[10]

Infantry & Mountain Guns

Infantry guns are artillery allocated to an artillery platoon in a rifle regiment or an infantry gun company in an infantry regiment, and are usually used in the direct fire infantry support role. As such, they are classified as a heavy
infantry weapons. *As in several contemporary armies, the Red Army used a short barrelled howitzer for infantry support at the regimental level*. The standard weapon was the **76mm M1927 regimental gun**. This was a modification of the old Tsarist 3in Model 1913, which was modernised in 1936 and 1939 to permit motorised towing and designated the **76mm M1927/39**. The 76mm M1927 L/16.4 was archaic and heavy compared to most equivalent German and American weapons. It used an interrupted screw breech (which was relatively slow to reload) and weighed 780kg in action. Along with many other Soviet weapons, rather than reduce production for a better weapon (with a more modern design), it remained in production until 1944. By June 1941 there were approximately **4,708** 76mm M1927 regimental guns in service. There were also around 42 old 76mm M1923 regimental guns available; these appear to have been issued to naval rifle brigades in the autumn of 1941. In the Soviet FILARM model, the total number of 76mm infantry guns in service on 22 June is calculated as 4,750, which includes both the above types.

The Red Army also had around **1,860** 76mm mountain guns in service on 22 June 1941. These were generally issued to Red Army mountain rifle divisions, but large numbers were also used as 'infantry guns' in rifle regiments in rifle divisions. The two types in service were the 76mm Model 1909 and the 76mm Model 1938. The 76mm Model 1909 was actually a slightly modified French Schneider *Canon de 76M modele 1909*, which was used by the *Tsarist Army* and produced in France for Russia. Minor modifications in the 1930s included smaller wheels and a large over-wheels (detachable) gun shield. Although a 'mountain gun' which broke down into seven loads for pack transport, it was still heavy at 1,225kg for transport and 627kg in action. Its maximum range was around **8,550 metres**. There were still **1,121** 76mm Model 1909s in Soviet service on 22 June 1941.

The 76mm Model 1938 L/21.4 was a *Soviet licence built version of the Czech Skoda* 75mm M1936 mountain gun modified to take the Soviet 76.2mm rounds. It broke down into 10 pack loads, weighed 1,450kg in horse transport mode and 785kg in action (with long carriage). Although heavy, its maximum range is purported to be 10,100 metres (which seems optimistic). On 22 June 1941 there were at most 739 76mm Model 1938s in Red Army service; mostly with the mountain troops. (p. 35)

1D. Artillery Weapons

Light Divisional Artillery (75-105mm Guns, Howitzers, Gun-Howitzers)

[10] **Note:** Notice how with many of the Soviet wpns systems—from rifles to mortars—more than ½ their total stock was lost by 31 Dec '41. This must have seriously degraded performance in the winter battles of 1941/42.

Light divisional artillery is usually allocated to an artillery regiment in a division, and is normally used in the direct or indirect fire artillery support role. During the interwar years there was considerable debate in military circles as to the best calibre for the light divisional artillery. **The 75-77mm gun had many supporters and was the choice of the Red Army**. *This calibre enabled the gun to have a higher muzzle velocity (and hence a good range), lighter weight and a higher rate of fire.* The choice of 76mm calibre in the Red Army was probably influenced by their desire to have a gun that could more *easily fulfil the artillery and anti-tank gun role*. It is possible that the Soviets were worried about the lack of destructive effect of the 76mm round, because in the **5th April 1941 Shtat** (pre-war rifle divisions) they stiffened the light artillery regiment with 8 122mm howitzers in addition to the 16 76mm guns. The *Wehrmacht and the US Army opted for a standard 105mm howitzer instead*. They felt, based mainly on WWI experience, that the 105mm howitzer delivered a much heavier and more damaging shell despite being heavier and having less range than the guns. The British compromised between both positions with their excellent 25-pdr (87mm) field gun. (p. 36)

In June 1941 the Soviets had **4 main types of 76mm divisional gun in service**. These were as follows.

- 76mm M1902 L/30 gun.
- 76mm M1902/30 L40 gun.
- 76mm M1936 (F-22) gun.
- 76mm M1939 (F-22USV) gun.

The **76mm M1902 L/30** *were old Tsarist era divisional guns*. Around half of the total stock was modernised in the 1930s with a longer L/40 barrel and designated the 76mm M1902/30 L40. *The longer barrel resulted in a maximum range increase from 8,550 metres to 13,400 metres*. These guns weighed 1,320-1,350kg in action and had solid spoked wheels unsuited to motorised transport. Approximately **2,066** 76mm M1902 and **2,411** M1902/30 guns were still in service with the Red Army in June 1941.

The new **76mm M1936** (F-22), produced in 1936, was the first serious attempt to bring the Red Army's light artillery *up to scratch*. This gun was produced in large numbers and although a fine weapon it was still generally viewed as too expensive and heavy. . . These factors resulted in the F-22 being replaced with the **76mm M1939** (F-22 USV) gun. In the USV the barrel was shortened and the recoil system was completely redesigned. At the same time the carriage was modified and strengthened, resulting in a reduction in weight to 1,480kg. Approximately **2,844** 76mm M1936 (F-22) and **1,179** 76mm M1939 (F-22USV) guns were in service with the Red Army in June 1941. (p. 36)

In the Soviet FILARM model, the total number of 76mm divisional guns in service on 22nd June is calculated as **8,680**, which includes all the above types. The 76mm M1939 (F-22USV) gun became the standard Soviet light artillery piece until 1942-43 when the 76mm M1942 (ZiS-3) gun appeared. As such, the 76mm M1939 (F-22USV) is used in Table Sov Res Database 1 to ascertain the OCPC value of 76mm guns in the Soviet inventory during 1941. Note, however, that this ignores the fact that *around half of the 8,680 76mm guns available to the Soviets in June 1941 were old 76mm M1902 and M1902/30 guns*, and these guns had a considerably lower OCPC value than the 76mm M1936 (F-22) and 76mm M1939 (F-22USV) guns.

Medium to Heavy Divisional Artillery (122-155mm Howitzers)

Medium to heavy divisional artillery is usually allocated to an artillery regiment in a division, and is *normally used in the direct or indirect fire artillery support role*. In June 1941 the Red Army had 3 principal types of **122mm** howitzer and 3 principal types of **152mm** howitzer in service with their divisions. In the 122mm howitzer category the weapons were the:

- 122mm M1909/37 howitzer.

- 122mm M1910/30 howitzer.
- 122mm M1938 (M-30) howitzer

The 122mm M1909/37 was an *old Tsarist weapon* and **778** were still in use in June 1941. The 122mm M1910/30 was also an old weapon but was the most common 122mm howitzer in the Red Army from June to December 1941 (with **5,578** in service on 22 June 1941). ***As such, it is a very important weapon in any discussion on Operation Barbarossa.*** (p. 37)

The 122mm M1910/30 howitzer was a result of the association between the Putilov Arsenal and *Schneider et Cie of France*. The original howitzer was a Schneider export model 4.8in weapon *adopted by the Tsarist army* as the 122mm Field Howitzer Model 1910 or 10S. Large numbers were produced under licence by Putilov and it became the standard weapon of the Tsarist army from 1914 to 1917. In the 1930s the type was modernised. The original 12.8 calibre barrel was relined, the chamber was enlarged to accommodate larger propellant charges, and the box-trail carriage was strengthened to withstand the higher recoil stress (resulting from larger charges). The howitzer now weighed 1,466kg in action and had a **maximum range of 8,940 metres**. However this was still an old weapon with some serious limitations. For example, t*he traverse was restricted to only 4.7 degrees which meant even small target switches involved manhandling the entire howitzer and relaying it.* In addition, the wooden spoked wheels were retained on the vast majority of weapons so motorised traction had to be done slowly with the ends of the carriage suspended on a limber.

The last 122mm howitzer in service was the **122mm M1938 (M-30)**. This was an altogether different weapon to its predecessors and was **one of the outstanding artillery designs of WWII**. The M1938 (M-30) had a completely new 22.7 calibre barrel on a new split trail carriage with solid rubber tyres and steel disc wheels. The maximum range was increased to **11,800 metres** (it fired the same ammunition as the M1910/30), although it was a much heavier and larger weapon: its weight in action was 2,450kg. The 122mm M1938 (M-30) was first delivered in 1938, and **1,667** were available to the Red Army on 22nd June 1941. In later war years it was to become the standard Red Army weapon in this class. (p. 37)

In the Soviet FILARM model, the total number of 122mm divisional howitzers in service on 22nd June is calculated as **8,234**, which includes all the above types.[11]

In the **152mm howitzer** category the 3 principal weapon types in service were the:

- 152mm M1909/30 howitzer.
- 152mm M1910/37 howitzer.
- 152mm M1938 (M-10) howitzer.

There were also 101 152mm M1931 Mortars (L/9.28 barrel and weight in action 1,150kg), and 92 152mm **Vickers Howitzers** (L/14.6 barrel and weight in action 3,963kg) available on 22nd June 1941. **The 152mm M1909/30** howitzer (sometimes also called the M1903/30), was originally manufactured at the Putilov Arsenal and the Perm artillery plant. It appears the original design was strongly influenced by Schneider. It was a conventional design with a box trail and short barrel. *The M1909 was used in WWI and the subsequent civil war, with production continuing throughout the 1920s.* In the 1930s its scrapping was also delayed by a modernisation programme. In this case the barrel was replaced with a renovated 14 calibre barrel and there were some minor carriage changes. No provision was made for mechanised traction with the original wooden spoked wheels being retained. On 22nd June 1941 there were **2,611** 152mm M1909 howitzers available, of which at least 2,030 had been 'modernised' to be M1909/30s. This means that on 22nd June 1941, almost 66% of the entire Red Army inventory of 152mm howitzers was made up of 152mm M1909 and M1909/30 howitzers.

[11] **Note:** On 22.6.1941, the entire *Ostheer* had a total of **7164** weapons of 75mm and above!

The **152mm M1910/37** howitzer (sometimes also called the M1910/30), was originally a Schneider commercial product, unwanted by the French army but adopted by the Tsarist army. They purchased a licence to manufacture the howitzer at the Putilov Arsenal and the Perm artillery plant. As with the M1909, *the 152mm M1910s were modernised in the 1930s.* The 152mm M1910/37 was never widespread in the Red Army, and only **99** were on strength in June 1941. (p. 38)

The first 'modern' 152mm howitzer available to the Red Army was the **152mm M1938 (M-10)**. Like the 122mm M1938 (M-30), the 152mm M1938 (M-10) *was comparable with the best designs in this class in service anywhere in the world. . .* The maximum range with the standard 152mm round was **12,390** metres. On 22 June 1941 there were **1,058** 152mm M1938 (M-10) in service. However, despite being a fine weapon, the Soviets considered the 152mm M1938 (M-10) too complicated, expensive and heavy (4,150kg in action). Production was thus terminated soon after June 1941, by which time a total of **1,522** had been manufactured.

In the Soviet FILARM model, the total number of 152mm divisional howitzers in service on 22 June is calculated as **3,961**, which includes all the above types. (p. 38)

A common perception in literature on Barbarossa is that due to the presence of their modern 122-155mm howitzers, *the Soviet medium to heavy divisional artillery in 1941 was technically comparable to German artillery in this class.* The general perception is the older howitzers were relegated to second line reserve and training duties, and only sent to the front line in desperate circumstance. The result is that in virtually all current military simulations relating to the East Front in 1941, the Soviets divisions are given artillery capabilities consistent with being fully equipped with 122mm M1938 (M-30) and 152mm M1938 (M-10) howitzers.

However, in the process of researching this work **it became very clear that the average Soviet 122-155mm howitzer available in 1941 was not comparable to the German 15cm sFH 18** (the standard German Army weapon in this category). Let us examine the distribution and type of medium to heavy divisional artillery in the most important and strongest military districts facing the *Wehrmacht* on 22 June 1941; namely the five Western Military Districts, which became Fronts following the German invasion. The table below [not shown here] details the specific howitzers available to each of the Western Military Districts at the start of Barbarossa. In June 1941 the Western Military Districts were the best equipped districts in the Red Army, with the internal military districts having, at best, similar levels of modern equipment (but usually worse levels). Despite this, **approximately 75% of 122mm and 61% of 155mm howitzers in these districts were of pre-WWI Tsarist origin and archaic design by WWII standards.** It is obvious that the older howitzers were not simply being used for second line reserve and training duties in June 1941: they were still being allocated to first line combat divisions in the military districts being readied to meet any possible attack.

The reason the Red Army was forced to equip its divisions in this way was *principally due to the very rapid expansion of the army from 1939 to 1941*. As with many other equipment types, the TOE requirements of so many new divisions quickly outstripped the production of new howitzers. When this information is coupled with the deficiencies in Soviet divisions relating to their ability to conduct indirect fire operations, **it becomes apparent that the overall Red Army artillery capability during Operation Barbarossa (and during 1941-42 in general) was much weaker than is commonly perceived.** Despite the extensive use of old howitzers, it is worth noting that the number of modern 122mm M1938 (M-30) and 152mm M1938 (M-10) howitzers present in the Western Military Districts (excluding Stavka reserves with an additional 1,792 122-152mm howitzers), was still a large number of **1,806**. This compares to the total of **1,972** sFH 18s initially committed to Operation Barbarossa by the Germans. (39)

Heavy Corps Artillery (100-152mm Guns-Cannons)

Heavy corps artillery is usually allocated to a corps artillery regiment or battalion, and is **normally used in the indirect fire artillery support role.** The value of these weapons and crews is such that they should only be used for direct fire as a last resort (and by then you've probably already lost any battle). For the purposes of this discussion 'guns' and 'cannon' are the same, and is usually only a result of a particular country's use of the term. In June 1941 the Soviets employed 3 calibres of weapon in this category: **107mm, 122mm and 152mm**.

The Soviet 1**07mm M1910/30** was an old gun derived from the **Russian Schneider** 107mm Field Gun Model 1910, used to equip corps level batteries. Large numbers were manufactured from 1910 to 1917, with limited production into the 1920s. In the *1930s the M1910 was modernised*[12] with a longer 38 calibre barrel and some minor carriage changes, to become the 107mm M1910/30 gun with a weight in action of 2,535kg. By 22 June 1941 there were still around **863** 107mm M1910/30 in service. The **107mm M1940 (M-60)** gun was the modern replacement for the M1910/30, and was an *altogether superior weapon*. This gun used a modern split trail carriage, a barrel 42 calibres long, weighed around 4,000kg in action and ranged out to **18,130 metres.** Unfortunately only around **77** had been produced by the time the Germans invaded, and production ceased shortly after due to the destruction of the production line. Total production of the 107mm M1940 (M-60) gun amounted to only **127** pieces. This meant that around 17% (564 out of 3,299) of the Soviet heavy corps artillery guns assigned to artillery units in the Western Military Districts, including Stavka Reserves, were 107mm M1910/30s on 22 June 41. In the Soviet FILARM model, the total number of 107mm heavy corps artillery guns in service on 22 June is calculated as **940**, which includes both the above types.

The **122mm M1931 (A-19) and M1931/37 (A-19)** guns were *reliable new designs which entered service from 1936 to become the standard weapons of this type in the Red Army*; eventually replacing the 107mm guns. In appearance the two guns were almost identical apart from the slope of the prominent equilibrator horns sticking up on each side of the barrel. The M1931/37 (A-19) had a marginally wider traverse and an increase in elevation to 65 degrees. The ballistic performance and overall weight in action were almost identical: 7,117kg in action and a maximum range of **19,750** metres. Around 24% (**789** out of **3,299**) of the Soviet heavy corps artillery guns allocated to combat units (i.e. Deployed (D)) in the Western Military Districts, including Stavka Reserves, were 122mm (A-19) guns on 22 June 41. In the Soviet FILARM model, the total number of 122mm heavy corps artillery guns in the Soviet inventory on *Barbarossatag* 1941 is estimated to be **1,300,** which includes both the above types. (p. 40)

The most common Soviet heavy corps artillery calibre available in June 1941 was 152mm. These constituted 3 main types as follows:

- 152mm M1910/30 gun.
- 152mm M1910/34 gun.
- 152mm M1937 (ML-20) gun.

These guns were a *mixture of old guns updated to give modern performance, and some new designs*. The 152mm **M1910/30 cannon** was an old Schneider design, modernised in the 1930s with a new 31.9 calibre barrel and muzzle brake, and some carriage improvements. In its updated form it weighed 6,700kg in action and had a maximum range of around **16,800** metres. Only **137** 152mm M1910/30 guns were available in June 1941. The **152mm M1910/34 and 152mm M1937** (ML-20) guns both used the same new 32.3 calibre long barrel with an unusual slatted muzzle brake. The 152mm M1910/34 cannon was a modern hybrid design using the 152mm M1937 gun on the 122mm M1931 (A-19) carriage. These guns are sometimes called gun-howitzers because the long barrel provided something like the range of a comparable gun *while retaining the flexibility and economic bagged propellant of a howitzer.* It is unknown how many 152mm M1910/34 guns were available in June 1941, but it is known that **275** were produced up to 1938. It is therefore reasonable to assume that this number was still available on 22 June 1941.

[12] **Note:** Many Russian artillery types date back to the Tsarist period, and were then upgraded in the 1920s and 1930s.

The **152mm M1937 (ML-20)** was a new gun-howitzer which used the same carriage as the 122mm M1931/37 (A-19), and like the latter it would become *the standard weapon of this type in the Red Army during WWII*. This gun carriage was originally designed for the 152mm barrel, but with delays in the production of these barrels it was
decided to use 122mm barrels which lead to the 122mm M1931/37 (A-19). The ballistic performance of the 152mm M1910/34 and 152mm M1937 (ML-20) guns, and their weight in action, was very similar. The 152mm M1937 (ML-20) weighed 7,128kg in action, fired a 43.56kg HE shell, and had a maximum range of **17,265** metres. *Both these gun-howitzers were as good as, or better than, any comparable weapons then in service anywhere.* Approximately **2,800** 152mm M1937 (ML-20) guns were available by June 1941. In the Soviet FILARM model, the total number of 152mm heavy corps artillery gun/howitzers in the Soviet inventory on 22 June 1941 is estimated to be **3,240**. (p. 41)

Super Heavy Corps Artillery (200-305mm Guns, Howitzers and Mortars)

Super heavy corps artillery is usually allocated to a corps artillery regiment or battalion, and **is normally used in the indirect fire artillery support role.** In June 1941, most of the Soviet super heavy corps artillery pieces in service were relatively modern. In the 203mm category there were 3 types:

- 203mm M1916 howitzer.
- 203mm M1929 howitzer.
- 203mm M1931 (B-4) howitzer.

The **203mm M1916** was the *imported British 8 inch Mk VI Vickers howitzer.* This weapon weighed 8,192kg in action and had a maximum range of **9,600** metres. In November 1936, **50** of these howitzers were still in Red Army service and as far as is known they remained in service until 1943. **The 203mm M1929** was a modified **Schneider** 203mm M1913 howitzer, of which **16** were built in the USSR from 1931 to 1933. This weapon weighed 7,452kg in action and had a maximum range in the region of **14,000** metres. Again, as far as is known these old howitzers remained in Red Army service during WWII, *although probably relegated to fortification and/or coastal defence units.*

The most important Soviet super heavy corps artillery piece fielded in 1941 was (by far) the **203mm M1931 (B-4)** howitzer. This heavy howitzer rode on tractor type tracks and came in two barrel lengths: 22 calibres (designated MM) or 25 calibres (designated BM). The B-4 also employed three different types of suspension, but the most common was tractor type tracks. Getting the B-4 into action was a laborious process which involved mating the barrel with the box trail, digging in the heavy trail spades, fixing heavy tension ground cables to the rear and front, and securing the cables by using steel pickets. The 25 calibre weapon with tracked suspension seems to have been the most numerous, designated the 203mm M1931BM (B-4), and so this is the model shown in table Sov Res Database 1. This howitzer weighed 17,700kg in action and had a maximum range of **18,025** metres. Development of the B-4 began during the late 1920s but *production only commenced in 1937*. Production ceased soon after Barbarossa started to concentrate on more practical weapons meeting the Red Army's immediate needs. Approximately **849** units were available in June 1941, and another 40 were produced before production stopped in 1941. In the Soviet FILARM model, the total number of 203mm super heavy corps artillery howitzers in the Soviet inventory on 22nd June 1941 is **915**, which includes all the above types. (p. 42)

Going up the calibre scale, the next Soviet super heavy corps artillery piece fielded was the: **210mm M1939 (BR-17)** gun. In all, 9 of these guns were **purchased from the Skoda works** in Czechoslovakia in 1939, and they were one of the heaviest artillery pieces fielded by the Red Army during WWII. On paper they appear formidable: they weighed 44,000kg in action and 59,600kg in travel mode, had a 49.6 calibre barrel with a 135kg HE shell, and had a massive maximum range of **30,360** metres. It is unknown if this weapon actually saw any action in 1941

(or during WWII for that matter), but it is known that at least one gun was Deployed (D) on 22nd June 1941 in the Moscow Military District.

The next significant Soviet super heavy corps artillery calibre was **280mm** (or 279.4mm to be precise). There were 2 weapons in this category as follows:

- 280mm M1915 mortar.
- 280mm M1939 (BR-5) mortar.

These weapons were relatively short range (with short barrels) and **with high angles of trajectory (hence the mortar designation)**, in order to reduce fortifications and urban terrain to rubble with their formidable 200-213kg HE shells. The **280mm M1915** was a **tsarist** era weapon designed by Schneider and exported to Russia between 1910 and 1914. For this reason these mortars are sometimes referred to as 280mm M1912 and M1914. They weighed 16,100kg in action, had a heavy 212.9kg HE shell, and had a maximum range of **10,920** metres. By June 1941 there were **25** 280mm M1915 mortars still in service, and most were issued to selected super heavy corps artillery battalions in the Western Military Districts. (p. 43)

The **280mm M1939 (BR-5)** mortar was a more modern weapon which rode on the same tractor based carriage as the 203mm M1931 (B-4) howitzer. The BR-5's emplacement was an even more laborious process than that for the B-4, but there was no doubt about its punch when in action: it weighed 18,400kg in action, had a 200kg standard HE shell and a 246kg concrete piercing HE shell, and had a maximum range of **10,950** metres. Very few of these weapons saw any combat during 1941, with only **47** 280mm M1939 (BR-5)s on strength in June 1941. In the Soviet FILARM model, the total number of 280mm super heavy corps artillery mortars in the Soviet inventory on 22 June 1941 is **72**, which includes both the above types.

The last Soviet super heavy corps artillery calibre was **305mm** (or precisely 304.8mm). There were 2 weapons in this category:

- 305mm M1915 howitzer.
- 305mm M1939 (BR-18) gun-howitzer.

The **305mm M1915** howitzer was the **heaviest artillery piece fielded by the Red Army during WWII**. It weighed 64,783kg in action, had a **376.7kg HE shell**, and its short 20 calibre barrel enabled a maximum range of **13,486** metres. The gun was as difficult to emplace as the 210mm M1929 (BR-17) (discussed above). In this case it was normally transported disassembled by rail, and then emplaced on a triangular girder framework embedded into the ground. This enabled a **60 degree arc of traverse** once emplaced. This weapon was really designed for static siege warfare, and as such the Red Army had little use for it in the mobile battles of 1941. There were around **34** 305mm M1915 howitzers available in June 1941, although few, if any, saw combat during this period. The *extremely rare* **305mm M1939 (BR-18)** gun-howitzer was a **Skoda** design, and 3 units were purchased by the Soviets in 1939. It resembled the 305mm M1915 (above), except that it could be disassembled into 3 major parts and moved using motorised transport, and *had to be emplaced into a pre-prepared trench in the ground*. [It had a] 465kg concrete piercing shell, and its 22 calibre barrel enabled a maximum range of **16,580** metres. At least one 305mm M1939 (BR-18) gun-howitzer was deployed in the Moscow Military District on 22 June 1941, but it is unknown if these weapons saw action during WWII. In the Soviet FILARM model, the total number of 305mm super heavy corps artillery howitzers in the Soviet inventory on 22nd June 1941 is **37**, which includes both the above types. (p. 43)

Railway and Coastal Artillery

The **Soviet railway artillery** was relatively scarce but still significant. Soviet railway artillery was used primarily by the navy for coastal defence, but as it was capable of land combat it is included here (along with coastal artillery) for completeness. The Soviets placed various sized guns on different railway mounts, usually with the designation TM. The Soviet railway artillery types fielded in 1941 are shown in the following table [table not shown but there were 7 main types of guns].

At the lower end there were the **130mm to 180mm** naval guns placed on fully rotating mounts on flatbed type railcars. The **203mm** TM-8 and above were essentially large naval guns built onto specially designed and constructed rail mounts. As far as is known all these mounts were designed and constructed in the USSR, most notably at the *Leningrad Metal Works*. The TM-2-12 used 6 **305mm** guns from the (**foundered**) battleship Imperatritsa Mariya. At least 4 of these guns were Deployed (D) in Railroad Coastal Batteries 7 and 8 in the Far East Front (it is likely the remaining 2 guns were probably also in the Far East, possibly in a disassembled state). The TM-3-12 used the longer 305mm L/52 naval guns, and a single battery (Railroad Coastal Battery 9) used 3 of these guns to defend the **Hanko Naval base** in June 1941. The TM-1-14 used 6 guns planned for the Izmail (also called Borodino) class battle-cruisers, none of which were ever completed. These guns used the same mount design as the TM-3-12, and by June 1941 6 guns were in service in 2 batteries: Railroad Coastal Battery 6 was in Vladivostok and Railroad Coastal Battery 11 was deployed at the **Tallinn Naval Base**.

Soviet coastal artillery, which was mainly concentrated around key strategic ports such as Sevastopol, Leningrad and Vladivostok, came in all shapes and sizes. The coastal defence batteries were usually in fixed emplacements in fortifications. The guns they used could be categorised into 2 types: army originated weapons and naval guns. The 'army-type' weapons ranged from **45mm anti-tank guns to 305mm howitzers**: for example, a small number of 152mm M1935 (BR-2) cannons and 305mm M1915 howitzers were used in fixed and fortified coastal gun emplacements. The most common army-type weapons used were the 45mm M1932 anti-tank gun, the 76mm M1927 regimental gun, the 76mm M1914/15 anti-aircraft gun and the M1915/28 anti-aircraft gun. It is apparent that most of the army originated weapons used for coastal artillery in 1941 were *older weapons bordering on obsolescence,* and they had been replaced by more modern types in the Red Army and PVO forces. These weapons are covered in other sections, and from a ballistic perspective they (more or less) remained unchanged when used as
coastal artillery. (p. 44)

Rocket Artillery

Rocket artillery was *usually allocated to a corps rocket artillery regiment or battalion, and normally used in the direct and indirect fire bombardment role*. The first Soviet rockets were originally intended as aircraft weapons. Design work on these rockets commenced as early as 1936 by a design team led by G. Langemak. The Red Army began developing multiple rocket launchers for ground bombardment before 1941 under the secret codename 'Guards Mortars'. **The first 3 rocket artillery batteries were rushed to the front in mid-July 1941 in the Western Front, near Orsha**. The rockets were *fin stabilised, electrically fired* and initially came in 2 forms: the BM-8 (82mm rocket) and the **BM-13 (132mm rocket)**. The latter attained the well-known nickname Katyusha (Little Katy), due to the wailing sound on launch. **The range of the Soviet rockets was better than the comparable German *Nebelwerfers,* but their repeatable accuracy and payload to rocket weight ratio were not as good.**[13]

The first type in service was the BM-13-16, which consisted of a **ZiS-6 truck with 16 rail launchers for 16 132mm M-13 rockets.** The M-13 rocket had a length of 1.41 metres, weighed 42.5kg, had a maximum range of **8,470** metres and carried 4.9kg of explosive. The launch rails were 4.88 metres long on a tubular steel frame with 8 rockets on top and 8 below. The launcher had an elevation of up to 45 degrees, a traverse of 10-20 degrees

[13] **Note:** The 15cm *Nebelwerfer* 41 system could deliver 4.7 and 2.5 times more high explosive per kg of rocket, than the BM-8 and BM-13 systems, respectively, at ranges less than 6,700 metres.

and enabled a ‘muzzle velocity’ of 344 metres per second. **The M-13 went on to become the longest serving Soviet artillery rocket.** This was shortly followed by the **BM-8-36**, which consisted of a ZiS-6 truck with 36 rail launchers for 36 82mm M-8 rockets. The M-8 rocket had a length of 0.66 metres, weighed 8kg, had a maximum range of 5,030 metres and carried 0.5kg of explosive.

The advantages of rockets over conventional artillery were they were cheap and easy to produce. They could be manufactured in small plants that *did not have the large, complex and expensive tooling required to produce conventional artillery.* In addition, *because they could be fired simultaneously they could bring down a very intense barrage for a short time*. On the down side t**hey were far less accurate than conventional artillery, they were much slower to reload** and the rocket engines consumed far more propellant than an artillery round carrying a comparable amount of high explosive. *Also, rockets did not have the penetrative ability of even light artillery, relying on the blast effects of the explosive carried to do most of the damage.* Their destructive effect on dug in or fortified positions was therefore considerably less than comparable artillery. (p 46)

If there is one feature of WWII rocket artillery that is consistently overrated by many authors, and in military simulations in general, it is the accuracy of these weapons. The idea behind these early bombardment rockets was to launch them in large salvoes to saturate an area with a large quantity of high explosive in a few seconds. As such, WWII bombardment rockets are really only suited to short offensive bombardment operations. **World War II rocket artillery was not accurate enough to provide effective close artillery support.** If used in this role, a defending or attacking infantry force was as likely to be hit as the enemy. Many current military simulations allow WWII rocket artillery to be used in all respects like conventional artillery, which was simply not the case.

On 22 June 1941 there were no BM rockets in service (with any combat units), but **34 new rocket artillery regiments were mobilised and deployed in the Red Army from July to November 1941**. These used up the bulk of around 400 BM-8-36 and **600 BM-13-16 rocket launchers** received by the army to the end of December 1941. (p. 46)

1E. Anti-Aircraft Weapons

For the purpose of this analysis there are 3 categories of anti-aircraft (AA) guns considered. They are anti-aircraft machine guns (AAMGs), light to medium anti-aircraft guns (20-40mm calibre) and heavy anti-aircraft guns (75-105mm calibre). Depending on the country and source, anti-aircraft weapons from 75mm to 90mm calibre are sometimes referred to as medium anti-aircraft guns. To avoid confusion, and as it suits our purposes, these are classified as heavy anti-aircraft guns in this discussion.

The lack of light to medium anti-aircraft guns was one of the greatest weaknesses in the Red Army’s arsenal during 1941. *Protection against low flying aircraft was an area that Soviet pre-war planners appear to have neglected, and the Red Army’s tactical air defence forces were given a relatively low priority for new equipment compared to most other service arms* (such as tanks, artillery, and heavy anti-aircraft weapons). By June 1941 the problem wasn’t so much the quality of the available 20-40mm anti-aircraft guns as the quantity, which was unusual because in most other weapon categories Soviet production was on a different scale to other countries. This is particularly ironic when one considers that the pre-war Soviet Air Force (VVS) was investing heavily in the development of a whole range of ground attack and close support aircraft, such as the Sukhoi SU-2, the Arkangelski Ar-2 and the Ilyushin Il-2.

The Red Army’s inadequate protection against ground attack aircraft manifested itself most acutely through the lack of light to medium anti-aircraft weapons at the regimental and battalion levels. **The result was that most Red Army divisions were forced to use improvised means, such as rifles and light machine guns, to defend (rather ineffectively) against enemy aircraft.** For this reason a significant portion of the available Soviet MMGs and most of the HMGs were used in an anti-aircraft role during 1941. This served to exacerbate the already acute

problem of finding sufficient machine guns to equip the large numbers of newly mobilizing divisions after June 1941. (p. 47)

By the late 1930s the Soviets (especially the **PVO - National Air-Defence Forces**) had realised that their 76mm calibre anti-aircraft guns would be hard pressed to deal with the latest high level bombers. A project was therefore initiated to develop an 85mm weapon, and the development team was led by the experienced M.N. Loginov and G.D. Dorokhin at the **Kalinin Artillery Works**. The new gun was essentially an enlarged version of the 76.2mm M1938: it used the same ZU-8 two-axle carriage, and was so similar to the 76.2mm M938 that it is difficult to distinguish between the two, apart from the obvious muzzle brake on the 85mm gun. The new gun was very quickly placed into production (20 were produced in 1939) under the designation 85mm M1939 (52-K). It had a L/55.2 barrel, a muzzle velocity of 800m/sec with a 9.2kg shell, a weight in action of 4,330kg, a practical rate of fire of around 12 rounds per minute, an 82 degree angle of elevation, and a maximum effective ceiling of around **8,400** metres. (p. 51)

It is commonly perceived that the 85mm anti-aircraft gun had only just started entering service when the invasion started. However, we know that there were at least **3,402** in service in June 1941, which represented 47% of the modern (post 1931) heavy flak gun inventory in the Soviet Union. Of these, 2,616 85mm anti-aircraft guns (77% of the total in service) were in the Western Military Districts, which represented 56% of all the heavy flak guns in these districts. In addition, from June to December 1941 an additional 1,700 85mm M1939 anti-aircraft guns were received (out of a total 1941 production figure of 3,371 guns). This means that over the period June to December 1941 the most common Soviet heavy anti-aircraft gun in service, and the most common encountered by the Axis forces, was the **85mm M1939**.

Lastly, it is worth mentioning that *Soviet losses of heavy anti-aircraft guns during 1941 were still very heavy* despite the large majority of them being deployed with the strategic (PVO) air-defence forces. Total losses amounted to approximately **2,800** 76-85mm anti-aircraft guns, or over 31% of total 1941 stock. This loss represented almost two thirds of the total Soviet heavy anti-aircraft gun losses during World War II. The majority of these guns were lost when major cities like Minsk, Smolensk, Riga, Tallinn, Kiev, Kharkov, Dnepropetrovsk and Stalino fell. *The defending PVO forces in these cities were relatively immobile*, even by 1941 Red Army standards, and PVO combat-units were never designed for rapid redeployment. **It is unknown how many of the 2,800 heavy anti-aircraft guns 'lost' in 1941 were captured intact by the German Army, but the number was significant.** (p. 52)

1F. Tanks & Tankettes

In June 1941 the **Red Army possessed more tanks than the rest of the world's combined armed services put together.** This amounted to over 28,400 armoured vehicles, including over **23,300 tanks and tankettes**, and over 5,100 armoured cars. This figure excludes armoured tractors and all AFVs based on the obsolete T-27 tankette chassis (mostly now used as armoured prime-movers). The sheer size of the Red Army's tank inventory in June 1941 (as well as its tank losses in 1941) was not fully appreciated until the 1990s. This was entirely due to the veil of secrecy which surrounded almost all aspects of the Red Army prior to June 1941, and the continuation of this policy in the USSR in the post-war decades. **Although the *Wehrmacht* claimed the destruction or capture of around 20,000 Soviet tanks during 1941, most post-war historians attributed this to Axis war-time propaganda**, and until the late 1980s even the most enlightened historians (at least in the West) attributed 10 - 14,000 tanks to the Red Army in June 1941.[14] ***During the early 1990s and the opening of the Soviet (now Russian) archives, it became possible for scholars in Russia to verify the German claims*** (Soviet/Russian admitted

[14] **Note:** The only book found with a realistic assessment of Soviet pre-war tank production, and which was published prior to 1980, is the excellent: J. Milsom, *Russian Tanks 1900-1970, The Complete Illustrated History of Soviet Armored Theory and Design*, Galahad Books, New York, 1970, Appendices p. 180. How Milsom managed to get these numbers in the late 1960s unknown, but his overall production figures are surprisingly close to current information.

irrecoverable tank losses during 1941 now stand at **20,500**). In addition, Soviet pre-war tank production figures are now available, which essentially verify that the Soviet tank park was easily in excess of 23,300 fully-tracked armoured vehicles in June 1941. This was the number allocated to combat units as well as in rear areas undergoing repair or/and refurbishment. (p. 52)

Of all the Soviet weapons used in WWII, one would expect their tanks and other armoured vehicles to be the most comprehensively documented. There are indeed numerous very good works on the subject; but, surprisingly, none are comprehensive (especially in relation to pre-war tanks), current (i.e. fully up to date) and definitive.[15] They usually present information on the history of the Soviet armed forces, and then often focus on selected tank types (most commonly the T-34, KV and late war series). Early Soviet WWII tanks are often given only cursory treatment: it is as though the Soviet tanks that enabled the USSR to survive the first six month of the Axis invasion (albeit at huge cost) are somehow less worthy of detailed examination. (p. 54)

Worse than this is that the technical specifications for many important tank types (especially the less well known ones) are often entirely absent, or vary *significantly from one source to another. Frustratingly this includes basic parameters such as armour thickness and slope on each surface, operational range and top speeds.* In the following descriptions of the armoured vehicles available to the Red Army during 1941, the technical parameters used are obtained from multiple sources. However, only the most likely or/and the most successful 'cross-referenced' data is used. The following tables [not shown here] contain most of the relevant technical information (extracted from multiple sources) for our use.

Tankettes

Tankette is a name generally reserved for tanks even lighter than 'light tanks'. They weigh less than **6.3 tons**, have a crew of two and are only armed with MGs. By June 1941 the primary Soviet tankettes in service were the **T-27, T-37, T-38, and T-40.** The main idea behind the tankettes, or **tankietka**, was they were to be used as reconnaissance vehicles, scouting ahead of the main force. With this in mind the Soviets designed the T-37, T-38, and T-40 to have an amphibious capability. In theory they used agility, speed, small size and a low silhouette to compensate for minimal armour and firepower. Experience would show that these vehicles relied too heavily on manoeuvrability and low silhouettes to survive, while the reconnaissance role was increasingly filled by other vehicle types and aircraft. Tankettes were however relatively easy and cheap to produce, and did not require the full resources of heavy industry. This suited the Soviet Union in the early 1930s, *and these vehicles went a long way to enabling the training and production of the largest tank park in the world by June 1941*. (p. 59)

T-27 Tankette: The first Soviet tanks in service were essentially a Soviet copy of the **French Renault FT tank** designated the T-18 (also sometimes called the MS-1 and, later versions, the MS-3) light tank. Although over **960** of these were built up to 1931, **it was the decision to mass produce the T-27 in 1931 that marked the real start of the creation of the large armoured forces envisaged by the Red Army in the late 1920s.** The T-27 was not amphibious and was *not fitted with any communication devices*. Like many Soviet AFVs, the T-27s were *expected*

[15] **Note:** This is in contrast to German WWII tanks. Singular and definitive works include: **P. Chamberlain, H. Doyle, T.L. Jentz**, Encyclopedia of German Tanks of WWII, Arms and Armour Press, London, 1993. Also German Tanks of WWII: The complete Illustrated History of German Armoured Fighting Vehicles 1926-1945, **F.M. von Senger und Etterlin**, Galahad Books, New York, 1969. At the time of writing, the author could find no single work on Soviet WWII armour as comprehensive as these two volumes (especially the former). In addition, important German WWII AFVs are exhaustively covered in other published works such as the **Spielberger German Armor & Military Vehicles Series,** W. J. Spielberger. Again, current publications on individual Soviet tank types pale by comparison (the exception is the most recent works on the development, production and use of the T-34 by **R. Michulec**). Arguably, the best single volumes, published in English, on Soviet WWII tanks are: **T. Bean, W. Fowler**, Russian Tanks of WWII-Stalin's Armoured Might, Ian Allan Publishing, London, 2002, and **J. Milsom**, Russian Tanks 1900-1970, The Complete Illustrated History of Soviet Armored Theory and Design, Galahad Books, New York, 1970.

to use signalling flags to communicate with each other; a situation that remained unchanged until well into WWII. The T-27 was accepted for Red Army service in February 1931, and **3,297** vehicles were produced at Leningrad and Nizhni Novgorod from 1931 to 1934. Although the T-27 was never popular or really satisfactory, it did **provide the Red Army with sufficient AFVs to equip some 65 battalions by the end of 1933**. This enabled the Red Army to gain invaluable experience with tracked armoured vehicles and their practical application in mechanised warfare. By June 1941, at least 2,554 T-27s still remained in the Red Army. However, by this time the large majority of T-27s had been *converted to light artillery tractors* (mostly for towing 37-45mm anti-tank guns). The two greatest drawbacks of the T-27 proved to be its very limited cross country performance (even with the Soviet improvements), and the incredibly small crew compartment. The latter was so bad that crews with an especially small stature had to be used.[16]

T-37 Amphibious Tankette: The *evolving deep-battle and mechanised warfare tactics* being developed by the Red Army in the early 1930s led to a requirement for a 'light reconnaissance tank', which was also preferably amphibious. The T-27 had proved inadequate in this role, and the **Soviets continued to look to the British Vickers tank designers for inspiration**. In 1930/31 the Soviets purchased eight Vickers Carden-Loyd (VCL) amphibious light tanks, designated A-4E11, and these soon became the starting point for a whole generation of Soviet amphibious tankettes. There were also various sub-models of the T-37 produced. These included the OT-37 with a flamethrower (produced in very limited numbers), and the much more important T-37(V) (also sometimes called T-37TU) commander's version (around 640 produced). The latter proved to be the most useful of all the T-37 types **due to it having a radio**, and the type is recognizable by the frame antenna around the hull. In total, **2,624** T-37s of all types are known to have been produced from 1933 to 1936.

T-38 Amphibious Tankette: In the mid-1930s attempts were made to improve the T-37. This work was carried out at Zavod Nr 37 by a team led by N. A. Astrov, and resulted in such extensive changes that it was decided to designate the new vehicle the T-38. The improvements included: a new hull design which resulted in a lower profile and a slight decrease in weight, modified suspension, wider tracks, improved steering and transmission, and the turret being moved from the right side of the vehicle to the left side (the driver's position consequently also swapped sides). Attempts were also made to improve the armament . . . Production commenced in 1936, and **1,063 early-version** T-38s were produced during 1936-37. This includes a small (unknown) number of OT-38 **flamethrower tankettes.** A few of these tankettes **were modified to be carried under a TB-3 bomber**, and in 1936 a number of T-27s and T-38s were involved in military exercises in the Kiev Military District. In this exercise they were *air-landed deep behind 'enemy lines' in a radical test of the potential of the new airborne forces.* There was also an additional **165** T-38RT produced in 1937, which was *a radio fitted commander's version* of the T-38. Finally, in **1939** an improved version of the T-38 went into production as the T-38M2. This vehicle had an improved gearbox, and the more powerful GAZ M1 engine with 50hp at 2,200rpm (vz. 40hp in the T-38). It appears only 154 of these vehicles were produced, including a few T-38TU command versions. Altogether, **1,382** T-38s were produced from 1936 to 1939. Like the T-37s, these T-38s mostly served in the reconnaissance role with tank, mechanised, cavalry and airborne units. (pp. 60-61)

T-40 Amphibious Tankette: By 1938 the Red Army had realised that the T-37 and T-38 series had been developed as far as they could practically go. In addition, experience in various conflicts had shown them to be highly vulnerable to HMGs, shell splinters, anti-tank rifles, and even infantry rifles with suitable AP ammunition. However, the requirement for a light amphibious reconnaissance tank remained so an improved and heavier tankette design was required. The T-40 was accepted for production and service on 19 December 1939. The T-40 incorporated some very advanced design features, and in 1940 it was **probably the most advanced amphibious AFV design in the world.** The armour on the T-40 was increased to **13mm** maximum and the tankette now weighed 5.9 tonnes. Lastly, it was planned for all T-40s *to be fitted with a 71-TK-3 radio* (range 16km), installed to the right of the commander's position. This would have enabled the T-40 to fulfil its reconnaissance role

[16] **Note:** Again, the problem of shitty ergonomics in Soviet AFVs.

effectively as well as act as a command vehicle. However, it is unclear and uncertain how many T-40s ever actually received radios.

Although the T-40 was accepted for service in December 1939, a refit and retooling of production facilities at Zavod Nr 37 meant that **T-40 series production didn't start until October 1940**. Although the factory had planned to produce around **100** T-40 tanks that year, it only managed to produce 41. In 1941 the production rate increased, but by 22 June 1941 the factory had still only produced another **181** tanks. **Very soon after the Axis invasion the Soviets found themselves in a dilemma as to which tanks to continue producing**. The tank losses were simply massive, so the Red Army desperately needed new tanks ASAP. Unfortunately the *T-40 was one of the vehicles that had not distinguished itself in the Winter War* (mainly due to it being used in unsuitable roles) and it was soon obvious that it was very vulnerable to German anti-tank forces. On the other hand T-40 production lines were not geared or tooled to produce much heavier tanks like the T-34 the KV, and if they stopped producing the T-40 they would (in the medium term, at least) only produce more trucks or armoured cars. This situation also applied to other light tanks such as the T-60 and T-70, and was *one of the main reasons why Soviet light tank production remained so high during WWII*. ***Interestingly, it is also the main reason why Soviet motor vehicle production was so low during WWII***: the Soviets preferred to have more strength up front (i.e. tanks) and weaker strength in the rear (i.e. weaker logistical support due to fewer trucks). (p. 61)

With the T-40 it was decided to maintain production with a slight increase in armour, but remove features which were not essential and hence simplify construction. . . The new version, which we will call the T-40S, had the turret front and hull armour increased to 14mm: a very marginal and barely worthwhile armour increase. All the water propulsion and steering systems were removed, the hull shape was changed slightly around the front, a flat rear armour plate was used without a cavity for the propeller, and radios were not fitted. The armament was left unchanged on most T-40S, although starting in September 1941 a number were fitted with a 20mm ShVAK automatic tank gun (with 750 rounds of ammunition). These may have been experimental vehicles only, as this gun was in the final stages of development. In total, **487** T-40, T-30 and T-40S were produced from July to December 1941; the majority being the **T-40S** version.

Early in 1942 (or possibly late December 1941) **all T-40 production ceased** and the production facilities were retooled to produce the T-60 (see T-60 section below). On balance, the T-40 was one of those designs that was ahead of its time but never realised its potential. *In 1939/40 in Finland, and later in 1941 in the USSR, Soviet commanders tended to use T-40s like regular tanks, which inevitably led to heavy losses*. If it had been used in its intended role as a specialised reconnaissance AFV, then its weak armour and armament might have proved adequate. *It is noteworthy that the T-40s greatest moment probably came in late 1943, where a handful of surviving T-40s were used in their intended reconnaissance role during the crossing of the Dnieper River.* (p. 62)

Tanks

T-26 Light Tank: Along with the T-27, the decision to mass produce the T-26 signalled the birth of the massive armoured and mechanised formations which would equip the Red Army by 1941. The T-26 was a *much more significant tank than any previous model,* and enabled the creation of an effective Soviet armoured force. ***On 22 June 1941 there were more T-26s in service than any other tank type in the Red Army, or for that matter, any other tank type in the world***: there were around **10,000** T-26 combat vehicles on strength in the Red Army. When production had ceased in 1940, over **11,020 T-26s (in 53 different versions and armaments**, including experimental vehicles) had been manufactured, including a whole range of engineer and other ancillary vehicles.

Unlike the reconnaissance focused tankettes, the **T-26 was intended to carry out the first phase of the Red Army's concept of 'deep battle**'. This involved direct support of the infantry when breaking through an enemy defence line. The T-26 was intended from the outset to be suited to offensive operations. Although it is classified as a light tank in modern literature, especially when measured against later WWII tanks, **in its heyday the T-26 was one of the Red Army's most important 'main battle tanks**'. Progressively upgraded versions of the T-26

were produced from 1931 to 1940, and the most important versions are shown in the table on the following page [table not shown]:

T-26 Model 1931
T-26 Model 1932
T-26 Model 1933 (three 1933 models)
T-26 Model 1937
T-26 Model 1938
T-26 Model 1939
(p. 63)

(**Note:** Maximum armor went from 15mm to 25mm from 1931/40. Beginning in 1933, most models had a **45mm** main armament; several had "flame guns.")

The T-26 started life as the **British Vickers-Armstrong** 6-ton tank (or Vickers E tank), which was developed as a private venture at Vickers in 1928. The lead designers were J.V. Carden and V. Loyd. The Vickers E weighed 7.3 tonnes, had 13mm of armour, was powered by a 80hp Armstrong Siddeley Puma engine, and had two turrets each with a single water-cooled Vickers MG. At around the same time (the late 1920s) the newly created Directorate of Mechanisation and Motorisation (the UMM, led by I.A. Khalepsky) was looking to purchase suitable AFVs and other vehicles. 184 In 1929 a visiting purchasing-delegation (led by S. Ginzburg) saw potential in the Vickers E design and **an order for 15 twin-turreted T-26 Mark E Type A vehicles** was placed on 28th May 1930. The first tanks were delivered in late 1930, and were promptly issued to Soviet factories, military educational institutions and training units for study in preparation for possible series production.

Licence production of the T-26 Model 1931 (also called T-26A series, refer table above) commenced at the Bolshevik Factory in Leningrad in July 1931. The T-26 Model 1931 was a very similar to the Vickers E and incorporated only minor changes. . . Close to **1,200** MG armed T-26 Model 1931s were completed from 1931 to 1933. **The next significant T-26 version was an attempt to increase the armament**. *The twin turret configuration was maintained* because in the early 1930s the multi-turret tank was still considered the best way to engage multiple targets simultaneously. As the T-26 was considered an infantry-support or 'breakthrough' tank, its twin turrets (which operated independently, but with a safety interlock) were seen as a good way to suppress or destroy multiple enemy positions. Various prototypes and armaments were produced. These included tanks with a HMG, a 20mm cannon, a 27mm gun and three types of 37mm gun. In the end it was decided to place a Hotchkiss 37mm (PS-1) gun or a Soviet 37mm BS-3 gun (subject to availability) in the right hand turret, and keep a 7.62mm DT MG in the left hand turret.

The first single turreted T-26 was actually one of the earliest AFVs to be produced as a flame throwing vehicle. This was designated the KhT-26 (Khimicheskiy or Chemical Tank) or OT-26 (Ogniemietny or Flame-throwing Tank), and was first produced in 1933. It appears the KhT designation was the original designation, and the OT designation was used later, possibly post-war. A total of **562** OT-26 tanks were produced from 1933 to 1936. From 1934 onwards production of the twin turreted (T-26A series) was discontinued, as it was realised that the single turreted tank with a heavier armament was the way of the future. To mount a larger gun it was necessary to produce a new turret design, and the turret selected was a cylindrical turret with a large rear niche for stowage. This turret had been developed for the BT tank series by the **Bolshevik Leningrad factory and KhPZ Kharkov Works** (this turret was also used on the T-35 tank). The new tank was designated the **T-26 Model 1933** or T-26B-1. (p. 64)

In 1935 an improved model **T-26 Model 1933** appeared which had improved turret hatches, a PT periscope for the gunner, additional turret vision slits and pistol ports on the turret sides, and, most significantly, enlarged fuel tanks which increased the tank's range (to around 225km on roads). . . In 1934 and 1935 s**erious border clashes occurred between Soviet and Japanese forces in Manchuria**, and some of these involved T-26s. The Red Army f

ound that bullets hitting a T-26 could cause the rivets holding the armour to burst (especially if the bullet actually struck the rivet head), which caused the inner face of the rivet to careen around the inside of the tank with potentially lethal results.[17] *Soon after this the Soviets dispensed with rivets and, where possible, all armour was welded*.[18] The earlier T-26 Model 1933s had riveted armour, but starting in 1935 a progressively larger number were built with welded hull and turret armour. It appears some of the earlier T-26 Model 1933s were also retrofitted with welded turrets after 1936. **The T-26 Model 1933 was in production from 1933 to 1937, and with over 5,000 built it was consequently the most common version in service in June 1941.** (p. 65)

In 1937 the **T-26 Model 1937** (also called T-26B-2) appeared on the scene. This version incorporated some significant design changes and improvements over all previous versions. The hull armour was redistributed so that the *frontal and side armour were increased to 16mm, while the rear armour was reduced to 13mm (from 15mm)*. The turret was improved with a new welded 25mm thick mantlet (vs. 15mm previously) and improved hatches, and the gun itself had a newly developed electric breechblock and an improved *TOP-1 telescopic sight*. The fuel tanks were enlarged which improved the on-road range to around 346kms, and many of the Model 37 tanks had more resilient solid bogie wheels. . . By 1936 it was realised that the **flame thrower version** of the T-26 (the **OT-26**) needed to be upgraded and a further flame-throwing version was developed. The new tank was designated the KhT-130, or OT-130, and was first produced in 1938. . . Around **400** OT-26 tanks were produced from 1938 to early 1940. (p. 66)

Reports on actions in Spain and Manchuria resulted in further T-26 modifications and the production of a new version. This model was designated the **T-27 Model 1938**, but is more commonly known as the T-26S (and occasionally, in Western literature, as the T-26C). The main change was the turret. The T-26S used a more modern conical turret which provided better sloped armour protection. . . **By 1939 the T-26 was showing its age and had almost reached the end of its evolutionary life**. The engine had been maximised and the hull could not accommodate a larger engine. Also, despite the suspension and transmission being strengthened in the T-26S (to compensate for the additional weight), it was apparent the tank's basic design could not practically support further significant weight increases. Nevertheless, in 1939 the T-**26 Model 1939** appeared (still designated the T-26S) with some 'final' upgrades.

As with previous T-26 models, a **flamethrower version of the T-26S** was also produced, designated the KhT 133, or OT-133. This tank used the hull and turret of the T-26 Model 1939, and replaced the 45mm gun and ammunition with an OT-133 flame projector and 146 liters of flame-fuel (and internal compressed air tanks). Otherwise the OT-133 was very similar to the gun tank. Approximately **258** OT-133 tanks were manufactured during 1939 and 1940. Lastly, it is worth mentioning that the basic T-**26 chassis was also used to produce around 480 specialised armoured support vehicles in the pre-war period.** The majority of these vehicles were developed at the **Leningrad Factory of Experimental Mechanical Engineering** (also known as the Factory No. 185 from 1935). *Some of these vehicles were well ahead of their time*, especially the 'combat engineer vehicles' (to use a modern term).

By 1940 it had become apparent, even before the German blitzkrieg operations in the West, that the T-26 had *reached the end of its evolutionary life*. Combat experience in Spain, the Far East and Finland had shown the tank to be vulnerable to most contemporary anti-tank guns, direct artillery fire and even some anti-tank rifles. The conclusion was that by 1940 the T-26 would struggle to perform its direct assault role and the emergence of more powerful anti-tank weapons in the near future would ensure it soon became obsolete. (p. 67)

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[17] **Note:** Hmm. This is bizarre. One would think that realistic tests would have been done to see just how well the riveted armor plating held up, or didn't hold up. But such tests weren't done? Same issue apparently with the Czech Pz 35(t) and Pz 38 (t).

[18] **Note:** The Western Allies (in the North African campaign) also discontinued using **rivets in amour plate** for this reason, as well as the fact that **welded plate is much stronger**.

The T-26 and Fire Control Efficiency:

In order to fully understand the weaknesses of the T-26 at the tactical level, it is necessary to digress somewhat and discuss the T-26's apparent lack of firepower against German forces during 1941. **Most of these weaknesses were also duplicated in BT and T-34 tanks.**

For almost all of its time in service, the T-26 tank (along and its companion the BT tank) actually possessed a superior main gun to most of its opponents. **This includes the period June to December 1941 against the German Army.** This superiority existed in terms of armour penetration as well as high explosive capability. Many authors and WWII commentators have **underestimated the fact that the large majority of Soviet tanks during 1941 possessed a more powerful gun than their panzer opponents**, preferring instead to focus exclusively on the lack of modernity in the Soviet tank park. Statements such as "the Soviet tanks only had 45mm guns" or even "the pop guns on Soviet tanks" are often used to imply that German tanks somehow had bigger and technologically superior guns. This 'fact' then apparently explains the lack of effective fire power from the majority of 1941 Soviet tanks, and apparently goes a long way to explaining their relatively poor overall combat performance in the summer of 1941. **The reality was very different**. In fact, only around **39%** of all German fully tracked AFVs committed to Barbarossa between 22nd June and 4th of July 1941 were equipped with guns greater than 45mm calibre.[19] If only German tanks and StuG III assault guns are considered, then this figure drops to only 33%. The **Soviet 45mm L/46 tank gun** was also more powerful than the standard German Army anti-tank gun of the time; namely the 37mm PaK 36.[20] (p. 67)

The main reason for the poor overall firepower (at the tactical level) of the T-26 and BT tanks was the relatively poor fire control efficiency inherent in the design of these tanks. This is not the same as ROCP: i.e. even with well trained and supplied crews, they would have been at a severe disadvantage against enemy tanks or hidden anti-tank guns. **The T-26, BT and T-34 all had the same flawed two man turret configuration**. In all these cases the tank's commander, gun-aimer, gun-firer and platoon commander (if a platoon leader controlling up to three of four tanks) *were all one and the same person*. This person was easily the most important person in the tank and absolutely critical to its effectiveness, and yet they were *simply overwhelmed by an impossible work load once the shooting started.* This situation was compounded with: **inferior aiming optics, inferior overall vision devices** (such as lack of turret cupolas and periscopes), and lack of communication devices (**a great many tanks had no radios**) to communicate with supporting units. (p. 68)

T-50 Light Tank: As early as 1935 the Red Army had started looking for a replacement for the T-26. This led to two prototypes called the T-46 and the T-50, neither of which were produced in significant numbers. However, at least 77 T-50s were produced in total, including two prototypes: 60 underwent series production from July to December 1941 and another 15 were produced in 1942. These tanks were issued to combat units in 1941/42 and so are included here for completeness. . . The T-50 programme of 1939-40 was a much more important programme. Initial development was conducted by the OKMO bureau in Leningrad under the direction of S. Ginzburg and L. Troyanov, and two prototypes were produced at the S.M. Kirov Factory Number 185 (Kirovsky factory). Unfortunately, the **OKMO design team fell victim to Stalin's purges** around this time and the project was transferred to the *K.E. Voroshilov Factory Number 174* (Voroshilovsky factory) in May 1940. The prototype T-126 (from the Kirovsky factory) was selected for further development, and the **resulting T-50, produced in January 1941, was the most advanced and powerful light tank design in the world at that time.** The T-50 weighed 13.7

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[19] **Note:** A total of **4,445** fully tracked German AFVs were committed to Operation Barbarossa up to 4th July 1941. Of these, only **1,748** had a main gun greater than 45mm calibre. This includes all PzMk III (50mm), PzMk IV, 15cm sIG33 SP Gun, StuG III Assault Gun, PzJäger I (47mm), 47mm Pz kpfw 35R(f), 105mm K18 Pz Sfl IVa, Pz.Kpfw B2, and Pz.Kpfw 35-S, AFVs.

[20] **Note:** After studying the technical capabilities of the various tank guns used during Barbarossa, it quickly becomes apparent to any war-game designer that the **standard Soviet 45mm L/46 tank gun** had better penetration and HE performance than most contemporary German tank guns.

tonnes, had 6 road wheels on each side with independent torsion bar suspension, was powered by a GAZ V-4 6 cylinder diesel engine which generated 300hp at 2,000rpm, had a top road speed of 52kph, had a range on roads of 354km, and was armed with a 45mm L/46 A/Tk tank-gun (with 150 rounds) and a single 7.62mm DT MG (with 4000 rounds). *Perhaps the most impressive feature of this tank was its armour and armour distribution*. The hull superstructure front consisted of 37mm of 50 degree sloped (from vertical) armour, the side used 37mm of 40 degree sloped armour, the turret had a 37mm thick armoured and curved mantlet, and the turret side consisted of 37mm of 20 degree sloped armour. **This gave the T-50 the sort of protection attributed to much heavier medium tanks of the period.** By late 1941 the decision to abandon T-50 production had been implemented, and the last tanks were produced in December 1941/January 1942. (p. 69)

T-60 Light Tank: The T-60 light tank was *developed as a rather desperate 'war-emergency design' after the Germans invaded in June 1941*. By July 1941 it was apparent that the T-37/T-38 tankettes were completely obsolete and unacceptably vulnerable, while the T-40 was chronically under armoured and armed (although otherwise a basically sound design). *In addition it was increasingly obvious that the Red Army's massive pre-war tank park would very soon cease to exist and the Red Army's tank situation would soon be desperate*. Furthermore, the production facilities able to produce light tanks like the T-40 were generally unable to produce heavier medium tanks (or for that matter, the new but relatively complex T-50 light tank). What was needed was a cheap and easy to build light tank which could fulfil the role envisaged by the pre-war tankettes, but also with adequate armour and firepower to engage enemy infantry forces and light AFVs.

The **T-60 was reputedly designed in only 15 days in August 1941** by the highly experienced N. A. Astrov bureau at Zavod Nr 37. This was the team that had developed the T-40 and, unsurprisingly, the new tank was essentially a re-engineered T-40S. . . The armour on the T-60 was increased to 14-20mm on the superstructure front, 15mm on the turret front, and 15mm on the hull sides. This was a very minor increase in armour over the T-40S which had
14mm of base armour on the same facings. The weight of the T-60 was very close to that of the T-40S: **5.84 tonnes.** (p. 69)

Mass production of the T-60 commenced in **October 1941** at Zavod Nr 37 and 245 T-60s rolled off the production lines that month. These tanks were designated **T-60 Model 1941** and have the distinguishing feature of having spoked road wheels. However, **T-60 production in late 1941 was disrupted by the evacuation of important factories eastwards.** While Zavod Nr 37 moved east, T-60 production started at the **Gorkiy Auto Zavod** (GAZ) in Gorky and the Zavod Nr 38 at **Kirov**. These factories were *automotive factories pre-war,* and it is significant that T-60 production (and future development) was undertaken by the Soviet automotive industry rather than the tank industry. **This reflects the Soviet penchant to produce as many AFVs as possible at the expense of their automobile production**: a trend which remained in place for the duration of the war. By the end of 1941 a total of **1,388** T-60 Model 1941s had been produced.

In service the T-60 was shown to have several key problems. Firstly, it was a light tank which relied primarily on manoeuvrability and a low silhouette to remain alive. However it was considerably less manoeuvrable than the T-34 with which it was supposed to operate, and it proved to have a relatively sluggish cross-country performance (definitely not a desirable feature in any light-tank). The T-60's horse power to weight ratio was only 82% of that in the much heavier T-34. Secondly, t**he 20mm cannon proved to be completely inadequate in terms of armour penetration performance**. This was fine in T-60s being used for reconnaissance and other suited light tank duties, but was potentially disastrous if the T-60 was used as a regular battle tank against enemy armour and anti-tank defences. Unfortunately, the T-60 was increasingly used in the latter role (like the T-40) well into 1942, with the inevitable heavy losses. *Thirdly, the T-60 still utilised a crew of two* with only one man loading, aiming and firing all the turret's weapons, while simultaneously acting as the tank commander. Again, this arrangement is very disadvantageous in almost any combat situation, and especially so if your opponent is coordinated enemy armour or hidden enemy anti-tank guns. **The combat performance of the T-60 is best summed up by the Soviet soldier's nickname for this tank. They called it the BM-2 or Bratskaya Mogila na Dovoikh, quite literally**

meaning a 'brothers grave for two'. Despite the average Soviet tanker's dislike of the T-60, it was better than nothing during the dark days of 1941 and 1942. *It therefore served a strategic purpose*: primarily by allowing industry incapable of producing heavier tanks to produce large numbers of still useful AFVs. Most of *1,388* T-60s produced in 1941 were **rushed to the front in the new late 1941 tank brigades**, or as replacements to existing tank units. (70)

BT-2 & BT-5 Tanks: The BT tanks, or Bystrokhodnii tanks (l**iterally 'fast tanks' or 'high speed tanks**'), were developed by the Soviet Union in the early 1930s as a **practical solution to the 'exploitation component' of their 'Deep Battle' and 'Deep Operations' theories of modern warfare**. These advanced theories (for their day) were first formulated in the late 1920s by several far-sighted Red Army officers. The original concept behind the BT tanks was that they would be used after a gap had been punched in the enemy lines by infantry, artillery and slower moving support or 'infantry tanks'. The BT tanks would then move rapidly into the enemy's rear area. To fulfil this role effectively it was envisaged that the BT tanks would need to be fast on roads (for strategic/operational redeployment), be fast across-country, have a good operational radius of action, be able to operate independently from supporting arms if needed (as it was likely the supporting arms would temporarily be left behind in a rapid advance), and be able to hold their own against enemy mobile forces for an extended period if required. To fulfil this criteria it was thought that in the **armour, firepower and mobility balance (which all tanks have to address)**, the BT tanks would have to favour mobility and firepower over armour. The reader should bear in mind here that in the *early 1930s the technology to create a fast and heavily armoured 'general-purpose tank', with a lot of firepower, simply didn't exist*. Almost all the elements needed to successfully build such a machine were still in their infancy. The Soviets' progressive development of their T-26 and BT tank series through the 1930s is illustrative of how the technology evolved during the pre-war era to create the tanks which dominated during WWII. (p. 71)

The J.W. Christie Story:

In the 1920s most tank designs used a conventional leaf spring suspension system, but for cross-country work this proved problematic due to the limited vertical space available for movement and the rapid wearing out of the springs. **In 1928 the American inventor, J.W. Christie, produced a revolutionary tank chassis using his newly patented Christie suspension system.** In this system the road wheels were mounted attached to a bell-crank so that as the wheel moved vertically upwards the bell-crank transferred the direction of motion to the horizontal. Fixed springs on the other end of the bell crank then absorbed the force of the wheel's vertical motion. The big advantage of this system was that the springs could be positioned along the length of the hull, which enabled the road wheel to have a greater range of movement as additional vertical space was not needed for the traditional spring and strut. In addition larger and longer springs could be used which enabled a stronger and more robust suspension system. Another feature of the Christie design was the use of a **convertible-drive** which enabled the caterpillar tracks to be removed so the tank could travel on its road wheels on roads at higher speeds (and over longer distances). This also reduced wear on the tracks, which at the time were still unreliable and subject to rapid erosion. The idea was that the tracks could be quickly replaced for cross-county work.

The **Christie M1928** eventually led to a small number of test-prototypes for the US Army under the designations T-3 and T3E2, as well as an Armoured Combat Car (T-1). These vehicles had four large road wheels, were equipped with MGs and/or 37mm guns, and were powered by a Liberty V-12 engine. Unfortunately for Christie, and even more unfortunately the USA, **the prevailing US Army's Infantry Tank Board (and later the US Cavalry), were far behind the Soviet Army (and a few well known British officers) in their understanding of how a modern mechanised war would be best waged.** This was despite a handful of more fare-sighted US officers who had realised the potential in Christie's design. One of these was a US Cavalry officer, **C.C. Benson**, who wrote a series of articles titled 'The New Christie, Model 1940', because he claimed it was easily ten years ahead of its time. **These articles caught the attention of I.A. Khalepsky who was head of the Red Army's Directorate of Mechanisation and Motorisation (UMM)**. (p. 71)

In short order the **USSR's clandestine purchasing organisation in the USA**, operating under the trading name of Amtorg Trading Company, was instructed to obtain as many T-3 prototype vehicles as possible. On 29th April 1930, Christie, who was by now bitter and completely disenfranchised with the US military authorities, signed a contract with Amtorg vice president A.V. Petrov for the delivery of two improved models of his new tank. The contract included clauses preventing Christie from selling tanks with similar features (described under patent) to a third party for ten years. *Christie was also contracted to provide technical support, drawings, parts and instructions as required.* The Soviets even assigned a full time engineer to Christie's US Wheel Track Layer Corporation to monitor the tank's construction. Considering that at this time the US had no diplomatic relations with the USSR, and the USSR was barred from obtaining military equipment from US sources, **one can only assume the US intelligence and security organisations were 'asleep at the wheel**.'[21] The two Christie M1930 tanks were shipped out of New York on 24th December 1930 as '**turretless tractors**'. The fact that they had no armament or turrets was meaningless as the **USSR was probably already ahead of the rest of the world in the technology of tank armaments**. The tanks duly arrived at the **Kharkov Komintern Locomotive Plant** (KhPZ Nr 183) where they were re-designated BT-1 and immediately underwent testing. The Soviets were impressed with the tank's speed and cross-country ability, and were especially fascinated with the track-and-wheel system. (pp 71-72)

By **late 1931** the Soviet built BT-2 was ready for production. This was the start of the BT series which the Soviets *classified as 'fast-tanks'; and in this sense they were neither light nor medium tanks.* The BT tanks were considered to be independently operating fast-tanks which were intended for use by large and completely independent mechanised formations. The basic models adopted for service were the **BT-2, BT-5, BT-7 and BT-7M**. Later models became heavier and less mobile, and as the Soviet tank doctrine was modified they were thought of more as medium 'fast' tanks. It is clear that by 1938 the Red Army expected late model BT tanks to also perform as 'infantry support' tanks if the circumstances demanded. Progressively upgraded versions of the BT tank were produced from 1932 to 1940, with the most important versions shown in the table below [table not shown].

For the BT-2 the Soviets improved the BT-1 chassis only slightly, with most modifications aimed at increasing the ease of mass-production. It retained the distinctive sloped V shaped front of the BT-1 and used a small Soviet designed cylindrical turret. *One distinctive difference was actually a step backwards: while the US vehicle made extensive use of arc welding, the BT-2 was riveted throughout*. There were **too main versions of BT-2**. The first type was armed with a **37mm M1930 gun** in a small square mantlet and a 7.62mm DT MG in a ball mount to the right of the main gun. The **second type replaced the 37mm gun with two more DT MGs** mounted in parallel. Neither model BT-2 was particularly popular with tank crews. They found the small BT-2 turret very cramped (which is saying something for Soviet tanks) with barely enough room to service the 37mm gun, while the MG armed BT-2s were still cramped and obviously chronically under-armed. The BT-2 was powered by a **Soviet copy of the US Liberty Aero twelve cylinder petrol engine** which delivered 343hp at 2,000rpm. This provided plenty of power, but unfortunately the engine proved to be very unreliable and these problems were never fully worked out in the BT-2. In 1932 the BT-2 went into mass production, and when production ended in 1933 a total of **620** had been manufactured. The large majority of these machines were still in service in June 1941. (p 72)

Towards the very end of 1932 the BT-5 went into production; incorporating a number of improvements. Most important of these was a new riveted turret and gun design developed by the **Bolshevik Leningrad factory** and KhPZ (Kharkov) Works. It included the new 45mm L/46 A/Tk (20K) tank-gun (the tank-gun version of the 45mm M1932 anti-tank gun) and a coaxial 7.62mm DT MG. Unfortunately the new BT-5 turret still only had room for a

[21] **Note:** Apparently Lieutenant Colonel J.K. Crain from the US War Department and S.L. Parker from the State Department (the Division for Eastern European Affairs) attempted to halt the export, but their efforts were far too little too late. The US's token resistance to the export does tend to indicate that US authorities must have placed very little value on the Christie M1930 tanks. **As it turned out, they couldn't have been more wrong. The Christie suspension system was eventually used on all the BT tanks, the famous T-34, and numerous good British tank designs**.

two man crew so the commander had to double as the gunner; a situation which remained unchanged on all BT tanks. [It also had no radio.] (p 73)

From late 1932 to the end of 1934, a total of **1,946 BT-5** variants were completed including **325 with radios**. The large majority of these were BT-5 Model 1932/33s with a 45mm gun, and this version was therefore the most common BT-2/5 in service in June 1941.

BT-7 Fast Tank:[22] Combat experience in the Far East in 1934/35, against the Japanese Manchurian Army, revealed the *vulnerability of riveted armour* (refer to the T-26 entry). This led to a modified version of the T-26 with partially welded components and accelerated the development of the BT-7 tank series. **The BT-7 appeared in 1935 and was essentially a modified BT-5**, but the modifications were extensive enough to justify the new designation. The most important changes were in the engine and transmission systems. The engine used was the new Mikulin M-17T 12 cylinder petrol engine which delivered 450hp at 1,750rpm (this was a **licence copy of the German BMW VI engine originally developed for aircraft**). The transmission was also improved by incorporating a new gearbox and clutch/brake steering system. The whole power-train system, which had plagued the BT-5 series, was now much more reliable; although it resulted in the number of forward gears being reduced to three. The initial BT-7 continued to use the same cylindrical turret and armament as the BT-5. The BT-7 was almost immediately replaced in series production with the **BT-7-1**, which incorporated further improvements. This became a *major production variant and included fully welded hull armour,* a more rounded hull front with 22mm of armour (increased from 13mm). A commander's model was also produced designated the BT-7-1V (also called BT-7TU). This used the same radio and turret as the as the BT-5V, with a frame antenna around the turret roof. These vehicles carried 132 rounds of **45mm** ammunition in place of the usual 172 rounds. In 1937 the **BT-7-2** appeared with a new welded conical turret. All BT-7-2s were **meant to have a radio**, and in this case a modern whip antenna was used in place of the previous frame-antennas around the turret. With a radio the BT-7-2 could carry 146 rounds of 45mm ammunition. However, shortages of radios (a problem that was never fixed until late in WWII) meant that **most BT-7-2s were never fitted with radios**. In this case the BT-7-2 had sufficient internal capacity to carry 188 rounds of 45mm ammunition. The BT-7 series had the **highest power to weight ratios of any AFV series on the East Front** in WWII. Coupled with the long range of these vehicles, this gave the BT-7 a significant boost in terms of overall combat power, as shown in the above table. The BT-7-2 remained in production until very late 1939, and a total of a total of **4,613** BT-7, BT-7-1 and BT-7-2 were completed (including all those with radios). (p 75)

As with the BT-5 series, an **artillery support version** of the BT-7 was also produced; designated the **BT-7A**. This vehicle used the same turret as used in the BT-5A (refer previous entry) along with the **76.2mm KT-28 M1927/32 L/16.5 howitzer**. If a radio was fitted the BT-7A could carry 40 rounds of 76.2mm ammunition, and without a radio it could carry 50 rounds. A total of **155** BT-7A were produced in total with almost all of them (149) being produced in 1937.

From as early as 1932 the **Kharkov Locomotive Factory** (KhPZ) had had a **tank-diesel engine programme** underway under the designation BD. ***The main advantages of using a diesel engine in tanks*** *were that it reduced the risk of fire and increased the radius of action by around one third* for the same weight in fuel (compared to a conventional petrol engine). It seems the early development team was led by I. Trashutin, who had recently returned from studying diesel engine design in the USA. However, it appears that from around 1936/37 the KhPZ diesel engine programme was led by K. Chelpan (possibly in collaboration with Trashutin). By 1937 they had produced a new V-12 engine which was liquid cooled and (initially at least) employed lightweight aluminium alloys in its construction. **This was the first diesel engine to be developed specifically for tanks**, and later versions of this very important and ground breaking engine would ultimately become the main power unit used in most of the Soviet tanks produced during WWII (including **T-34s and KVs**). By 1938 the first version was ready

[22] **Note:** At least a couple of BT-5 and BT-7 designs were outfitted with a **76.2mm** main armament; several with **45mm** main armament.

for production under the designation V-2. The V-2 engine could deliver 500hp at 2,200rpm and it was decided to use it in the BT-7, which led to the **BT-7M** in 1938/39. Series production began in 1940 with **779** BT-7Ms produced in that year. *By late 1940 production was terminated in favour of the much superior T-34* which was just starting series production. Altogether, **788** BT-7Ms were produced from 1938 to 1940. (p 76)

After the T-26 tank series, the BT tank series represented the most numerous tank type in service with the Red Army in June 1941, and this made them the second most numerous tank type in service anywhere in the world at that time. A grand total of **8,122** BT-2, BT-5 and BT-7 tanks were produced from 1932 to 1940. Of these, 620 were BT-2s, 1,946 were BT-5s and **5,556** were BT-7s. On 22 June 1941 the Red Army still had approximately **2,340** BT-2/5 and **5,470** BT-7 tanks on strength and assigned to combat units.

When looking at the specifications for the BT tanks, and especially the BT-7-2 and BT-7M, *one might have expected the BT-7 to have performed well in 1941. It was fast, relatively new and mounted a good anti-tank gun for its day.* However the BT series may have been a case of having 'all the eggs in one basket'; the 'basket' in this case being speed and manoeuvrability. **Although the BT-7 was undoubtedly fast, its overall armour was actually thinner than the already thinly armoured T-26**. **All types of BT tank could be easily penetrated by the standard German anti-tank gun of the day (the 3.7cm PAK 36), even out to 1,000 metres**. The PaK 36, dubbed the 'door knocker' by the Germans due to its inability to deal with heavy Western Allied and Soviet tanks, is subsequently maligned in much post WWII literature. However, the PaK 36 never had any trouble hitting a target accurately, and with its rapid rate of fire it was invariably lethal if it could penetrate the target's armour. The **historically underestimated PaK 36 took a massive tole of tankettes, T-26 tanks and all types of BT tanks, and destroyed more Soviet tanks in 1941 than any other weapon type**.

On top of its weak armour, the entire BT series suffered from the *same flawed two-man turret configuration* as other Soviet tanks during 1941-43. The *overall fire control efficiency was similar to the T-26 (relatively poor)*, so when they came under enemy fire they were generally very slow to acquire and engage the enemy target. Against a small hidden target like a 3.7cm PAK 36, firing many rounds per minute, this usually proved fatal. To make matters worse, **very few BT tanks had radios (although they were meant to**) so BT tanks generally operated in the same inflexible and closely grouped formations as most other Soviet tanks in 1941. (p 76)

T-28 Medium Tank: The T-28 was the **Red Army's first medium tank**, and when it entered Red Army service in August **1933** it was one of the largest and most powerful tanks (in service) in the world. It was produced in very limited numbers by Soviet standards, although it remained in limited production for over seven years: a total of only **503** T-28s were produced from 1933 to 1940, and **442** were still in service in June 1941. . . Around this time the Red Army was formalising its ideas around the 'Deep Battle' concept and was looking for a medium 'break-through' tank for breaking through fortified defences. . . Around this time the Soviet designers were also influenced by plans of the **British Vickers** A1E1 medium tank and to a lesser extent by the **German Grosstraktor designs**. **The plans for the Vickers tank had been obtained covertly** (refer T-35 entry for more on this). In addition, in **1929 the Germans sent six Grosstraktor to the secret tank training/testing ground at Kama (near Kazan) in the USSR.** The Soviets had access to these machines and witnessed their testing, which in turn also influenced the T-28's development.

The T-28 was quickly approved for production (simply designated the T-28) which commenced in early **1933**. However in production tanks the **main turret armament was upgraded to a 76.2mm L/16.5 gun**[23] with a coaxial MG mounted to the right of the main gun, and the turret was fitted with an all-round vision cupola for the commander. The T-28 **weighed 28.9 tonnes**, could carry 70 rounds of 76mm ammunition, and had sufficient fuel capacity to travel **220km** on roads or 161km cross-country (which was not particularly good). Very soon after the T-28 went into series-production, it was modified slightly and designated the **T-28A** (also sometimes called the T-28 Model 1933). The T-28A remained in production until 1937/38 and the total number produced is unknown,

[23] **Note:** No German tanks at this time had a **76.2** main armament.

but it was a major production model and it is estimated that at least **222** were produced. . . In 1938 the T-28A was replaced in production by the **T-28B** (sometimes called the T-28 Model 1938). The most important change was the upgrading of the main armament to a 76.2mm L-10 L/26 gun. Other changes included: an *increase in frontal-hull armour thickness to 35mm* (from 30mm), the addition of a ball-mounted MG in the turret rear (making a total of 3 DT MGs), the addition of a driver visor in place of head covers (which improved the driver's vision) . . . T-28B production continued through 1938 and 1939, with around **200** being produced. In addition an unknown number of T-28As were retrofitted with the improved 76.2mm L-10 L/26 gun. (p 77)

The 1939/40 Winter War witnessed the combat debut of the T-28 and it became apparent that anti-tank guns had moved on since 1932. This quickly led to the **T-28C** which was in production for a short time only (the last 13 T-28s were produced in 1940). On the T-28C the frontal hull and turret armour was increased to **80mm** maximum, and the hull side armour was increased to **40mm** maximum. This was achieved by attaching armoured 'screens' onto the existing armoured plate. However the increase in weight was only around a tonne, so the 'armoured screens' appear to have given only partial coverage. Also the manner of attachment provided dubious protection; i.e. HE shells could blow them off and **welding armoured plate onto existing armoured plate provides significantly less protection than homogeneous armour**. Despite this, the armoured screens increased protection against 1940 era anti-tank guns sufficiently to enable the T-28 to perform reasonably well in breakthrough attacks against the **Mannerheim Line in 1940**.

Despite its archaic and generally obsolete appearance, the T-28 was more successful than it would at first appear. On the plus side, the armour was strong enough to provide reasonable protection from most 1940 era anti-tank guns at longer ranges. In addition the T-28 had sufficient internal volume to enable a full size crew to service all the weapons properly. *The **T-28 was the only Soviet medium tank in 1941 with a three-man main turret** and a turret basket. This enabled the T-28 to actually have a tank commander dedicated to the task, and still have its main weapon serviced with a dedicated gunner and loader.* (p 78)

T-34 Medium Tank: In June 1941 the Soviets possessed the best armed and most heavily armoured general issue tanks in the world; specifically the T-34 and KV tanks. The T-34 may have come as a surprise to the Germans but it was the *result of years of development*, and was probably the most influential tank design of WWII. The impetus for the T-34 came from *lessons learnt during the Spanish Civil War* (from July 1936 to April 1939). To a large extent the credit for this should go to **General D.G. Pavlov** who had been appointed head of the Directorate of Armoured Forces (ABTU) in 1937. Pavlov drew the wrong conclusions from the civil war in regards to the effectiveness of massed armoured attacks. However, he did recognise that the T-26 and BT tanks were too vulnerable to the latest anti-tank guns, and that that the Red Army needed a completely new type of medium tank. (p 79)

While the Spanish Civil war was still raging, there were also a number of converging technological developments in the USSR which eventually led to the T-34. Firstly, two experimental tank designs called the BT-IS (I for Ispitatelniy – Investigator) and the BT-SV were produced around 1936 under the direction of engineer M. Tarshinov at **Kharkov**. *They were modified BT-7 tanks and became the first Soviet tanks with fully sloping armour on the hull and turret, specifically designed to deflect incoming fire.* Secondly, in early 1937 a team led by A. Morozov had developed a **prototype tank** called the Izdeliye 111 or T-46-5. The T-46-5 had a greatly increased armour basis (to 60mm) which provided protection against 37mm anti-tank guns at close range, and against contemporary 75mm field-guns at over 1,200 metres. This tank had a crew of 4, weighed 32.3 tonnes, used a 300hp diesel, was armed with a 45mm gun and 2 MGs, and used the **Christie suspension system** with small diameter bogie wheels. Ultimately the T-46-5's complex suspension and light armament led to it not being developed further, but the experienced gained in producing, manipulating and attaching thicker armour plate would be invaluable later. Lastly, a new and advanced V-12 liquid cooled diesel engine had recently been developed at the **Kharkov Locomotive Factory** (KhPZ) for the BT-7 tank and Voroshilovets artillery tractor (refer to the BT-7M entry). This engine was called the V-2, provided 500hp at 2,200rpm, and was obviously an ideal power-basis for any new tank types.

The new specification in the 1940-41 Tank Programme called for a tank with sufficient armour to protect it from 37mm anti-tank guns at all ranges and 76mm anti-tank guns at ranges over 1,000 metres. The tank should also use **a diesel engine to reduce the propensity to catch fire when hit**: *a serious problem encountered with BT and T-26 tanks in Spain and during the clashes with the Japanese in the Far East*. **Pavlov's** initial idea was to replace the BT-7 with an improved version of the BT-IS. **In November 1937 he tasked a design team at the Kharkov Locomotive Factory (KhPZ) to come up with a new medium tank which retained the convertible wheel/track system and BT type Christie suspension.** This design team was led by M. Koshkin and he proceeded to assemble some of the best talent available. These included: A. Morozov deputy leader and responsible for the power train, N. Kucherenko and P. Vasihev responsible for the Christie-type suspension, and M. Tarshinov responsible for the armour and shape. The team came up with a design designated the A-20 and presented a wooden model to the Defence Council of the Soviet People's Commissars (Soviet Narodnykh Komissarov – SNAKE) in **May 1938**. Eventually, following a presentation to and *personal intervention from Stalin*, SNAKE authorised the A-20 prototype to be produced as well as an up-gunned version which was designated the A-30.

A **prototype A-20** soon followed which outwardly had the classic sloped lines of what would become the T-34. It had a crew of 4, weighed 20.1 tonnes, had a new 25mm rolled armour plate turret, had 25mm of frontal hull armour sloped at 60 degrees from vertical, used a V-12 V-2 diesel providing 450hp at 2,200rpm, and was armed with a **45mm L/46 A/Tk gun** and 2 7.62mm DT MGs.231 The A-20 employed 4 road-wheels with **Christie suspension**, and for moving on wheels the 3 rear-axles were driven and the front-axle was used for steering with a steering wheel (it had proved impractical to steer a wheeled vehicle with levers only). The **A-30** was very similar except it had a slightly thicker armour base, mounted a **76.2mm L/30.5 A/Tk (Mod 38) gun** and weighed 21.2 tonnes. However, this design was an immediate failure because the tank's turret proved far too small for the gun to be serviced and the turret ring (as constructed) could not absorb the recoil forces. In addition, Koshkin and several other lead designers had by now become adamant that the convertible wheel/track system was pointless. They pointed out that it was rarely used in transport mode because *modern track designs were very reliable*, it was almost never used in combat, and it resulted in an overly complex and unnecessarily heavy tank. This however was not apparent to many Soviet officers at the time and remained an unresolved issue. (p. 79)

Primarily on their own initiative, **Koshkin and Morozov decided to re-work the A-30 design and produce a new design without the convertible wheel/track system. This decision involved considerable courage because around this time Stalin had a habit of eliminating (purging) anyone in the USSR who exhibited this sort if initiative**. It is likely that Koshkin and Morozov survived because they were not Red Army officers. They gambled that the weight saved by not having the complex convertible wheel/track system would enable the new tank to have more armour and the larger 76.2mm gun, without violating the weight limit (around 20 tonnes). The new tank was designated the **A-32 (also called T-32)** and the design drawings were submitted to a conference on medium tank design in August 1938. The Main Military Council criticised the design because it did not have the convertible wheel/track system, but fortunately for Koshkin and Morozov (and the USSR in general) *Stalin saw the logic of Koshkin's argument. He approved the A-32 project and demanded a prototype be produced as soon as possible.* (p. 80)

The prototype A-32 featured: a crew of 4, 30-60mm of armour, a 76.2mm L30.5 (Mod 38) gun, 2 7.62mm DT MGs, a 12 cylinder V-2 diesel providing 450hp at 2,200rpm, 5 road wheels with Christie suspension (vs. 4 on the A-30), and weighed 19.3 tonnes.233 The A-32 was also able to have a simpler conventional lever-type steering system rather than a steering wheel used in the BT and A-20/30 tanks (because the A-32 was only designed to run on tracks).

The A-20 (and possibly the A-30) and A-32 prototypes were sent to the **Scientific Test Institute of Tank Technology (NIB) at Kubinka in July 1939**. Both types were found to be mechanically reliable with tracks on and were superior to any other models available. However, *further analysis of the war in Spain* (which had only recently ended) resulted in the strong recommendation that the armour be increased even further. On 1st September

1939 the A-20, A-32, KV heavy tank, T-50 light tank and T-40 amphibious tankette, appeared in a display of new Red Army vehicles held for the Main Military Council. Koshkin insisted that the A-32 was the best vehicle to replace all light, medium and fast tanks, but the Main Military Council was still not fully sold on the track only policy or the idea of a 'universal tank' to replace the T-26, T-28 and BT tanks in service. Some council members pointed to the fact that the A-32 cost around three times as much as the T-26. Notably, Pavlov supported the A-20 design as this most closely resembled the original ABTU design specification resulting from his early experiences in Spain.

The issue was finally settled at a meeting of SNAKE on 19th December 1939. **At this time the invasion of Finland was underway and initial reports verified the experiences from Spain and the fighting at Khalkin Gol: namely that the current Soviet light, medium and fast-tanks were very vulnerable to contemporary anti-tank guns.** In addition the *45mm gun's HE capability was proving unsatisfactory* against emplaced Finnish defences. In timely fashion Koshkin showed that the A-32 could be easily up-armoured without undue loss in performance, and that it was already capable of mounting a 76.2mm calibre weapon. **Stalin (who was chairing the defence council) was convinced by Koshkin's preliminary design drawings and approved the up-armoured version of the A-32**. With the onset of war in Europe the new medium tank project had suddenly become much more urgent. Now that a track-only and up-armoured A-32 design was sanctioned, *the team at Kharkov rapidly produced a new design*. This was essentially a scaled up version of the A-32 with thicker armour, a modified V-2 engine and a more robust transmission system (to handle the heavier tank). At Koshkin's suggestion this was designated the **T-34**, and the **first two prototypes were ready by January 1940**. After extensive testing, including an impressive road trip from Kharkov to Moscow, the T-34 was accepted for series-production as the **T-34/76A or T-34 Model 1940.**

The T-34/76A (Model 1940) had: a 4 man crew, weighed **26.7 tonnes, 45mm of frontal armour sloped at 60 degrees from the vertical** (providing the equivalent of around 75mm of vertical plate against a horizontally traveling round), 40-45mm of side sloped armour, and a small but well-sloped two-man turret with 16-45mm of armour. Power was provided by a **12 cylinder V-2-34 diesel** which had revised hull mounts, modified fuel and cooling connectors, and a refined clutch. The V-2-34 provided 500hp at 1,800rpm. The road range was 303km and the range across-country was 209km. The **Christie suspension** was independently sprung and attached to 5 large road-wheels on each side, with a small gap between the second and third wheel. Armament consisted of a **76.2mm L/30.5 (Mod 38) gun**, also called the 76.2mm L-11 gun, and 2 DT MGs. This 76.2mm gun remained the standard gun on the Model 1940 production run, although its anti-armour performance was not up to the standards that the T-34 designers had envisaged. This gun could penetrate 47mm of 30 degree sloped armour at 500 metres and 41mm at 1,000 metres, using its standard AP shot.

Series production of the T-34/76A (Model 1940) was planned to begin in **June 1940 at the KhPZ plant at Kharkov, and in October 1940 at the Barrikady Tractor Plant at Stalingrad**. However political problems generated by the Deputy People's Commissar for Defence, Marshal K. Kulik, who had developed a special dislike for the T-34, meant that production only got underway in September 1940.[24] By 15th September 1940 only 3 T-34/76As had actually been delivered to the Red Army. At the same time, **series production of the V-2 engine had only begun in late 1938 largely due to the fact that several lead members of the development team at KhPZ had been arrested in 193**7. By the end of 1938 only around 50 V-2 engines had been completed, and these were meant for the new BT-7M series then in production. *The result of all this was that by the end of 1940 only 115 T-34s had been produced out of an intended figure of around 600*. (p. 81)

[24] **Note:** Apparently Kulik set up a special test-range manned by his own personnel, which sent out a stream of reports insisting on various modifications for the T-34. Kulik's efforts to 'sabotage' the T-34 project were eventually curtailed by V Malyshev (head of the Medium Machinery Production Ministry, responsible for tank production) and the KhPZ management. S. Zaloga, P. Sarson, T-34/76 Medium Tank 1941-1945, Osprey Military, London, 1994, p. 18.

In the meantime efforts were being made to replace the 76.2mm L/30.5 L-11 gun with a better weapon, and several guns were considered. These included the 57mm ZiS 4, the 76.2mm L/39 F-32 and the 76.2mm L/41.5 F-34.236 A few T-34s were fitted with the 57mm gun and although it had superior armour penetration there were severe problems with the ballistics of this weapon (which were not fixed until 1943). The F-32 was already being used on early model KV tanks, and by late 1940 V. Grabin and P. Muraviev (of the **Central Artillery Design Bureau at Zavod Nr 92**) had adapted the F-32 gun-mounting for the T-34. However by late 1940 Grabin's team had also finalised the superior F-34, which was immediately the obvious choice for future T-34 and KV production. This gun was capable of penetrating 56mm of 30 degree sloped armour at 500 metres and 49mm at 1,000 metres, using its standard AP shot.

Unfortunately the Main Artillery Directorate was under the control of our old friend **Marshal K. Kulik**, and he would not authorise F-34 production without official approval (which for some reason he wouldn't actually seek). **Kulik's obstructiveness in regards to the T-34 appears so frequent and dangerous that one is left wondering if he was actually working for an enemy state!** In the event, Grabin and the director of Zavod Nr 92 (A. Elyan) *acted on their own initiative* and produced the F-34 alongside the L-11, which remained the standard gun on most T-34/76A (Model 1940s). Zavod Nr 92 then shipped the new F-34 guns to the KhPZ factory in Kharkov. The first F-34 guns appeared in January 1941 and appeared on a few T-34s in February 1941. T-34s with the F-34 gun are generally designated **T-34/76B of T-34 Model 1941.**

The T-34/76B was initially issued to platoon and company leaders, and was markedly better against German armour during Operation Barbarossa. The Red Army field commanders were soon asking for T-34/76B models and news of this version seems to have reached Stalin rather late through front-line correspondence. *This seems unusual as Stalin was normally closely involved in new tank developments in 1940/41*. Very belatedly, in the summer of 1941 the Main Defence Committee formally authorised the F-34 gun, with T-34/76A production ceasing soon after. However, the **large majority of 1,225 T-34s manufactured by 22 June 1941 remained (and ultimately perished) with the 76.2mm L-11 gun**.

On 22 June 1941 there were **917** T-34s in the Western Military Districts and Stavka Reserve. In all, the Soviets had 956 T-34s in service with the Red Army on 22 of June 1941, with an additional 269 T-34s ready for delivery or in transit. The large majority of these were T-34/76A (Model 1940)s; the exact number is unknown. From June to December 1941, an additional **1,886** T-34s were manufactured, of which at least 95% were allocated to the Red Army before the end of 1941. The large majority of the newly manufactured T-34s were **T-34/76B (Model 1941)s**. Therefore, this improved model of the T-34, with the more powerful F-34 gun and some other more minor improvements, was the most common when considered over the whole period from June to December 1941. (p. 81)

T-35 Heavy Tanks: Experience from WWI had demonstrated the value of tank support to the infantry for achieving a swift breakthrough of the enemy's tactical defences. The Red Army was no different in this regard to most armies during the interwar period; although by the early 1930s they envisaged this as merely the initial stage of their 'Deep Battle' philosophy. **This led to the creation of a series of Direct Infantry Support (NPP) tanks and Distant Infantry Support (DPP) tanks**, which were aimed at providing direct fire support at close and long range for massed infantry attacks. The DPP variety was more concerned with local mobile-artillery support, while the NPP variety needed heavy armour and led to the creation of the first Soviet heavy tanks. The first Soviet tank project tasked specifically with producing a heavy tank was started in 1930 by the Directorate of Mechanisation and Motorisation (UMM) in cooperation with the Main Artillery Directorate's General Design Bureau. . . There were 2 T-35 prototypes produced in 1932-33, designated the T-35-1 and T-35-2. The T-35-1 had the 5 turret configuration used on the T-32, but proved to have an overly complex power train which was difficult to mass produce. The T-35-2 had fewer turrets and more armour, but more importantly it had improved suspension and demonstrated the effectiveness of the M-17 V-12 petrol engine, which delivered 500hp at 2,200rpm. Further work led to the T-35 Model 1933 (sometimes called the T-35A) being approved for series production on 11th August 1933. Production was shifted (from Leningrad) to the Kharkov Locomotive Factory (KhPZ) and 20 vehicles were

initially ordered. The T-35 Model 1933 used the same **5 turret and armament configuration** as the T-35-1, and had a large c**rew of 10 men.**

A total of **51** T-35s were available in the Western Military Districts and Stavka Reserve on 22 June 1941 (out of 59 still in service). All 51 were all in the **34th Tank Division**, **8th Mechanised Corps, Kiev Special Military District**, although 4 of them were in a category four state of repair (in rear areas). **On balance the T-35 was not a successful design.** They were always difficult to mass produce and by 1940 advances in weaponry had rendered them vulnerable to most contemporary anti-tank weapons. Furthermore, they remained slow and large targets, while *the whole multi-turreted tank concept had reached its evolutionary end.* The few T-35s encountered by the *Wehrmacht* in 1941 were quickly dispatched or had already been abandoned after mechanical breakdown. (p. 83)

KV-1 Heavy Tank: In June 1941, and for some time afterwards, the Red Army had significant numbers of the **most powerful main-battle tank in the world; specifically the KV-1 heavy tank**. The development of the KV series stemmed from early experience in the Spanish Civil War and the desire to replace the T-35 which was obviously becoming rapidly obsolete. *The first year of war in Spain had clearly demonstrated that tanks with 25-35mm of armour were vulnerable at normal combat ranges to contemporary 37-40mm anti-tank guns* (and even to medium artillery). Consequently, in November 1937 the Directorate of Armoured Forces (ABTU) laid down a new specification for a new heavy tank design. The main initial requirements called for: sufficient armour to withstand fire from 37mm guns at all combat ranges and 76.2mm guns above 1,200 metres, a 400hp or better diesel or petrol engine, and 5 turrets. Unsurprisingly, given their prior experience on developing the T-32 and T-35 heavy tanks, all the research effort for the new heavy tank design soon shifted to Leningrad.

The importance of the project was such that **two separate design bureaus in Leningrad** were committed to developing the new heavy tank. These were the Bolshevik Factory's Experimental Design Mechanical Section (OKMO) headed by N. Barykov, and the **Kirov Factory's** new Special Design Bureau 2 (SKB-2) headed by Z. Kotin. . . The OKMO's design was designated the T-100, while the SKB-2's design was designated the SMK (named after the deceased Bolshevik leader S.M. Kirov). At this stage both designs incorporated a short 76.2mm gun and 2 longer 45mm guns in separate turrets. However, Kotin convinced the committee (and especially Stalin) that having even 3 turrets was impractical: he successfully argued that fewer turrets would enable thicker armour to be used over the whole tank while maintaining the same weight. The GKO agreed that 2 turrets would be acceptable along with a minimum 60mm armour base, and that both designs should proceed to a prototype stage.

The **prototype of the T-100 was completed in May 1939** while the SMK prototype was ready by early August 1939. The revised T-100 and SMK designs were similar in overall layout and in external appearance. They both had: a **6 to 7 man crew, a 76.2mm L/30.5 L-11 gun** in an elevated rear turret, **a 45mm L/46 M1938 gun** in a lower forward turret, torsion bar suspension on 8 small road wheels, 4 or 5 small return rollers, wide cast tracks, and were powered by a GAM-34-8T 12 cylinder petrol engine (a 4-500hp tank version of the Mikulin AM-34 aero engine). The 2 T-100 prototypes weighed **58 tonnes** and had 20-70mm of armour, while the SMK prototype weighed 5 tonnes and had 20-60mm of armour. Arguably the most important development in both designs was the **successful application of torsion bar suspension**. This was much lighter and more robust than the spring suspension used in the T-35, and was **much more effective at damping movements during cross country travel.** Even today, torsion bar suspension remains one of the most effective suspension mechanisms available for heavy main-battle tanks. Both prototype designs were sent to the **tank testing facility at Kubinka outside Moscow.**

However, Kotin and his assistant chief engineer, A. Yermolayev, were never happy with the idea of 2 turrets. They felt this led to excessive weight problems and cramped crew compartments. Apart from the weight of 2 separate turrets, the problem with having 2 turrets was that in order for the main armament to be able to rotate 360 degrees the main turret had to be mounted on a large and heavily armoured pedestal (above any secondary turrets). Kotin and Yermolayev became convinced that the only way to put sufficient armour on a tank to make it 'shell proof' whilst maintaining mobility, was to have a single turret and main gun. **Acting on his own initiative**, in February 1939 Kotin assigned a SKB-2 team, led by N. Dukhov, the task of designing a single-turret version of the SMK.

Kotin must have been very brave to do this, or he was convinced he could safely convince Stalin he had not exhibited too much initiative! Possibly in order to obtain wider support, **Kotin designated the new design KV after Marshal K. Voroshilov; the People's Defence Commissar (a Stalin crony who also happened to be Kotin's father in law**). In early August 1939 Kotin presented the new design to Stalin and fortunately won him over. *Stalin immediately authorized a prototype which was produced by September 1939* and designated the KV. (p. 84)

The KV prototype was immediately sent to the **Kubinka testing ground** in late September-October 1939 and quickly proved to have superior mobility (and obviously protection) to both the T-100 and SMK. It didn't hurt that the tests were attended by a special state acceptance committee headed by Marshal K. Voroshilov. **In December 1939 the Winter War (with Finland) provided the Red Army with an opportunity to test its new heavy tanks in combat conditions, and all 3 prototypes were promptly dispatched to the Soviet-Finnish border**. They were attached to a special company of the 91st Tank Battalion in the 20th Tank Brigade. **All 3 types saw limited action from 17th December 1940 onwards and it soon became apparent that the KV was the best tank in almost all respects (with the T-100 and SMK proving to be a disappointment).** The war simply confirmed the decision already made by the Defence Committee on 19th December 1939, which was to approve the KV for series production.

The initial production order was placed with the **Kirov-Zavod (Kirovskiy) Factory** for 50 tanks with the designation KV-1 (also called the KV-1 Model 1939). The KV-1 had a re-designed turret and can be distinguished by having its 76.2mm L/30.5 L-11 gun (also called the 76.2mm Model 38 gun) in a low slung gun-mantlet along with a simple pistol port (instead of a MG) in the hull front. It had a 5 man crew with 2 men in the turret, weighed around 43 tonnes unloaded, and had **frontal hull and turret armour thickness of 75mm and 90mm,** respectively. The **V-2 diesel engine** was modified slightly for the KV power-train and designated the V-2K, and it was able to deliver 500hp at 1,800rpm (or 550hp at 2,150rpm). An unknown number of KV-1 Model 1939s were built in 1940; in time for a small number to participate in the Winter War before it ended on 13 March 1940. **The experience gained assaulting fortified positions during this war also led to calls for a heavy 152mm howitzer to be mounted on the KV chassis, and this led to the KV-2 which is discussed in the next entry.**

In 1940 the KV-1 was improved with a new gun mounting and turret mantlet design, and the longer 76.2mm L/39 F-32 gun. The F-32 had been recently developed by a team led by P. Muravyev at the **Grabin Central Artillery Design Bureau at Artillery Plant Nr. 92**. This gun had been originally intended for the KV-1, but due to delays and shortages the L-11 gun was initially used. KV-1s with the F-32 were produced from mid-1940 until July 1941 and this model is usually designated the KV-1 Model 1940. It is also sometimes called the KV-1A, but it appears this terminology may have originated from a German intelligence designation for this vehicle. The Model 1940 also normally had 3 MGs: one in the hull front, one coaxial with the F-32, and one in the turret rear. Only a single KV-1 was produced in 1939 and another **141** were produced in 1940.

In the early spring of 1941 **Soviet intelligence grossly overestimated the size and power of tank-guns being fitted to German tanks**. It is unclear how this happened but it appears to have originated from a rather bizarre report generated by the **Deputy People's Commissar for Defence, Marshal K. Kulik** (the same person who had developed a special dislike for the T-34 and did his best to sabotage that project). Shortly after this, German propaganda showed destroyed French Char B1bis heavy tanks with the implication that these were readily penetrated by German tank-guns. Stalin therefore demanded the armour on KV tanks be increased (apparently without impacting the combat performance!). However the Soviet foundries and tank-factories were not easily capable of handling any thicker armour, and altering the base armour thickness significantly would have severely disrupted KV production. It was therefore decided to **weld appliqué armour to new production KV-1 Model 1940** tanks and possibly retrofit a number of tanks already in service. There followed a crash programme to fit appliqué armour to KV-1 tanks, which consisted of welding 25-35mm armour plates to the superstructure and turret front. This increased the KV-1's frontal armour to a very formidable 100-110mm. However, this increased

the **tank's weight to over 47 tonnes** which overstressed the already delicate clutch and transmission system (*which in turn led to many tank's being lost due to breakdown in 1941*). (p. 85)

In the meantime another factory had geared up to produce KV-1s. This was the Chelyabinsk Tractor Factory (ChTZ) and the first KV-1 Model 1940 rolled off its production lines on 31 December 1940. A total of **282 KV-1s were produced in the first half of 1941**, prior to the German invasion, taking total KV-1 production to **424** prior to Operation Barbarossa. The large majority of these were KV-1 Model 1940s, and around a half of these would have had the additional appliqué armour.

In **July 1941** it was decided to improve the KV-1's main armament. The gun chosen was the improved 76.2mm L/41.5 F-34 gun, which was the **same gun being fitted to the latest T-34**. When mounted in the KV-1 this gun is sometimes called the 76.2mm ZIS-5, but the only difference (to the F-34) was the turret mounting. This model KV-1 is usually designated the **KV-1 Model 1941** and it commenced production in July-August 1941. The Soviets were dissatisfied with the angularity and weakness of the Model 1940 turret, so a new up-armoured welded turret was introduced shortly after August 1941. This turret included 100-110mm of frontal armour and 90-95mm of side armour. This model is sometimes called the **KV-1 Model 1941** (welded turret). It now weighed around **48 tonnes** and accounted for most of the KV-1 production during the second half of 1941.

On 22 June 1941 there were **362 KV-1s in the Western Military Districts and Stavka Reserve**. The Soviets had **388** KV-1s in service with the Red Army on 22 June 1941, with another 36 ready for delivery or in transit. The large majority of these tanks were **KV-1 Model 1940s, while the rest were KV-1 Model 1939s**. From 23 June to 31 December 1941 an additional **844 KV-1s** were manufactured, of which at least 95% were allocated to the Red Army before the end of 1941. The majority of the newly manufactured KVs were **KV-1 Model 1941s** (or KV-1B) with a variety of turret types (refer above). Therefore the more powerful KV-1 Model 1941 was the most common type of KV in service when considered over the whole period from June to December 1941. (pp 85-86)

KV-1 Shortcomings During 1941-42: Despite its very impressive armour, the KV-1 exhibited some very serious shortcomings. The most serious problems related to poor clutch, transmission and steering systems, as well as poor fire control efficiency and crew ergonomics. The KV-1's clutch and transmission system was the most frequent cause of breakdown, often leading to loss of the vehicle in the retreats of 1941. The clutch and transmission systems seriously impeded the mobility of KV tanks. Changing gear often involved halting the tank, which prevented it from ever attaining high speed and making its top theoretical speed of 35km/h an illusion (it also greatly increased the probability of being hit). On top of this, the KV-1 had no power assisted steering which is something of a problem on a 48 tonne tank. To say this made it very difficult to steer and gave the driver a huge workload is an understatement. **A US army report** from the Aberdeen Armoured Testing ground in 1942 noted that the whole transmission system was years out of date and had been rejected by the US Army because it was too hard for the driver to work. **To make matters worse, the driver's field of vision was incredibly bad**. The design of the driver's vision port and the optical quality of the driver's armoured glass (usually full of air bubbles) prompted one German test report to ask how the driver could see at all. **The KV-1 did have a 5 man crew as on German medium tanks**. These comprised the commander-loader, gunner, driver-mechanic, second driver-mechanic and hull gunner-radio operator. Critically, the commander (positioned to the right of the gun) still had to double as the gun-loader because the third potential turret crewman worked the rear turret MG and was the assistant driver/mechanic. Unlike most contemporary tanks, this seemingly questionable role was needed because of the first driver's exceptionally heavy workload (above). . . **The Soviet designers made the conscious decision to have thicker and more sloped armour at the expense of good crew ergonomics and a larger turret crew**. The German medium tank designers effectively choose the opposite, and this is one of the reasons the **fire control efficiency on German medium tanks like the Pz III and Pz IV was markedly superior during most of WWII**. (pp. 86-87)

KV-2 Heavy Tank: During the Winter War with Finland it became apparent that existing tank armaments *lacked the necessary destructive power to deal effectively with bunkers and other fortified positional defences.* Thus the

Winter War not only confirmed the soundness of the decision to produce the KV-1, it also provided the stimulus for an artillery support version of the KV. . . The most practical solution came from a team led by N.L.Dukhov, which was also part of SKB-2. This involved keeping the KV-1 chassis essentially unchanged and mounting a **152mm M-1938/40 L/20 (M-10) howitzer** in a specially designed high box turret. The design took only two weeks to complete and a prototype was quickly ordered. This was ready by late **January 1940** and it underwent impromptu trials at the Kirov-Zavod Factory. Despite several obvious problems (which would return to haunt this vehicle later) an initial batch of 4 vehicles was ordered. . . The sheer speed with which the KV-2 was designed and produced, and the way several important problems with the prototype were ignored, indicates that the **Soviet High Command must have been very worried by their previous lack of success against the fortified Finnish Mannerheim Line**. **The first 2 KV-2s were ready by mid-February and these were immediately dispatched to the Soviet-Finnish front lin**e. They were attached to the **20th Tank Brigade** in Finland and were apparently used with success when attacking Finnish bunkers.

After the Winter War ended on 13t March 1940, the KV-2's turret was redesigned with slightly curved side panels and a smooth armoured trunnion cover. It was immediately ordered into series production with the designation KV-2 Model 1940, and this became the major production version. It is also often called the KV-2A. The KV-2A had a crew of six, weighed **53.9 tonnes**, was armed with a **152mm L/20 (M-10) howitzer** with 36 rounds and two 7.62mm DT MGs with over 3,000 rounds, and had a maximum of 110 of frontal superstructure armour and 75mm of side armour. (p. 87)

Despite its rather obvious shortcomings, KV-2 production progressed at a fairly rapid rate. A total of 102 were produced in 1940 and another 111 were produced in 1941 prior to the Axis invasion. The large majority of the 213 KV-2s manufactured up to 22 June 1941 were KV-2 Model 1940s. On 22 June 1941 there were **175** KV-2s in the Western Special Military Districts and Stavka Reserve. The Soviets had 176 KV-2s in service with the Red Army on 22 of June 1941, with at least another 37 ready for delivery or in transit. From 23 June to October 1941 an additional **121** KV-2s were manufactured **before production ceased in favour of KV-1 production.** In total, **334** KV-2s were built.

During Operation Barbarossa the KV-2 **proved to be a tactical failure which resulted in rapid manufacture termination.** The reasons were not because the concept was basically unsound, but because the KV-2 production model exhibited critical weaknesses which mostly stemmed from its very rushed development. The first was its extremely poor mobility. The already overstretched KV transmission and steering system was further exacerbated by the huge increase in weight to over 57 tonnes. This meant the KV-2's top cross country speed was at best a painful 12km/h if the transmission held out, and this was provided the terrain wasn't too rough and the driver could change gears without halting the tank.

Another major weakness was the turret itself. Apart from providing an excessively high target silhouette of 4 metres, the massive 12 tonne turret could not traverse if the tank was on an incline (the traversing mechanism was not powerful enough to turn the turret). The result was that the KV-2 could not realistically fire on the move, was slow to respond in mobile situations, and couldn't respond at all in some situations.

Despite these problems the KV-2's very thick armour ensured that it was a formidable opponent when employed in a prepared (flat) and static defensive position. This was especially true when it did not need to move and where it could not be easily outflanked. **An example of this (and probably the most famous example) took place near Rasyeinyia when a single KV-2 delayed a large portion of 6 Panzer Division for almost two days by blocking a key crossroads.** (p. 88)

1G. Armored Cars

[**Note:** The primary armored car series in Soviet Union was the BA series: **BA-3, BA-6** and **BA-10** armored cars, the latter being the most common and important armoured cars in the Red Army during 1941-42.] (p. 107)]

Soviet WWII era armoured cars are usually distinguished as either light or heavy armoured cars, depending on the armament carried. Light armoured cars are usually equipped with one or more MGs and a 2 man crew, while heavy armoured cars have **37-45mm guns** and MGs, and at least a 3 man crew. The combat weight is considered secondary in determining the armoured car type, but is sometimes used to differentiate heavy armoured cars into a 'heavy' or 'medium' category.

From a functional point of view within the Red Army in June 1941, it is much more difficult to differentiate between light and heavy armoured cars. This was mainly due to the acute shortage of wheeled armoured vehicles (and motorised transport in general) throughout the Red Army at this time. Although armoured cars were generally reserved for the tank and mechanised divisions (in the newly created mechanised corps), we find that some divisions had mostly light armoured cars while others had mostly medium/heavy armoured cars. It depended on: whether the division was well established or newly mobilised, where it was based, where it was initially mobilised and its priority for equipment allocation.

Another layer of complexity is added by the fact that the Soviets rarely scrapped old and apparently obsolete armoured cars (at least until 1943), **but used them until they literally stopped working**. *This was again due to the shortage of such vehicles coupled with the simultaneous massive expansion of the Red Army's mechanised forces*. The result was that old medium and heavy armoured cars were often pressed into the type of service normally reserved for light armoured cars (even before the war in the East started). Such roles included light reconnaissance, or forward observation and command. The table below shows the significant Soviet armoured cars developed since 1927, and which were used by the Soviet armed forces up to the end of 1941 [table not shown here]. (p. 89)

The Russians first developed a series of armoured cars during WWI and several types were used during the Russian Civil War (from 1917 to 1923). However, in the succeeding years there was little significant development of armoured cars in the USSR until the fledgling automotive industry had somewhat matured, and until the advent of Stalin's first Five-Year Plan for the Soviet economy (from 1928-1932).[25]

The Dearth of Soviet Wheeled and Semi-Tracked AFVs, and its Effect on the Success of 'Deep Battle' and 'Deep Operations:' In June 1941 the Red Army had the most formidable tank park in the world; and yet in the areas of wheeled armoured reconnaissance vehicles, armoured signal and command vehicles, armoured (artillery) observation vehicles, and armoured personnel carriers, they lagged behind the major Western armies. **In particular, the Red Army had no vehicles comparable to the formidable array of such specialised vehicles in the invading German Army.** In June 1941 this deficiency in the Red Army existed in terms of quantity as well as quality of vehicles. Furthermore, this 'deficiency' extended into how to best integrate such vehicles organisationally into a large mechanised force (and hence how they were used tactically and operationally). It should be borne in mind, of course, *that from 1939-41 the British, French and US armies also all lagged well behind the German Army in this regard*. (p. 100)

I*n the years preceding WWII the Soviets had not developed any sophisticated armoured radio and command vehicles, armoured artillery observation vehicles, or dedicated armoured personnel carriers. The only tracked vehicles which might fall into this category are the tankettes*. But these all had only a 2 man crew (a driver and commander/gunner), *almost no communication equipment (very few had a radio of any sort*), and had no room in them to expand their basic scouting/reconnaissance role. The only significant wheeled AFVs available to the Red Army, which could fulfil any of the above functions, were their armoured cars. On 22 June 1941 the entire Soviet armed forces had just over **5,120** armoured cars available, with some vehicles going back to the late **1920s**. Of these, approximately 2,015 were light-medium armoured cars and 3,109 were heavy armoured cars. **All these armoured cars were designed primarily for the tactical reconnaissance role.** However, even in this role most

[25] **Note:** I have not included the details on the various types of Soviet armored cars.

of these vehicles had **severe shortcomings**. Firstly, only around 25% of the light-medium armoured cars, and around 45% of the heavy armoured cars **had any form of radio equipment installed at all** (and even then a large proportion of this radio equipment was dated). Secondly, **almost all these vehicles were based on commercial vehicle chassis (cars and trucks) and the very large majority of vehicles had mediocre to none-existent off-road capability.** Thirdly, the Soviet armoured cars had at least as many reliability and serviceability issues as commercial cars and trucks. But, unlike commercial cars and trucks, these armoured cars were expected to perform in a harsh military environment in all terrain and in all conditions. In contrast to the Soviet armoured cars, the **majority of the German Army's wheeled and semi-tracked AFVs were specialised 'military vehicles**': they had been specified and built to meet criteria set by the army. Most of these AFVs were designed for a specific task and built as military vehicles from the ground up (including their basic chassis, transmission and suspension systems).

During 1941 the Germans captured many BA armoured cars in working order, which should not be too surprising as many simply broke down and were abandoned. The 6 wheeled heavy BA armoured cars were placed into *Wehrmacht* service with the overall designation *Panzerspähwagen* **BA-203(r).** The lighter 4 wheeled BA-20s were usually designated *Panzerspähwagen* **BA-202(r).** They found the BA's cross country performance, general layout and old fashioned design, prohibited them from fulfilling even a basic reconnaissance role for their panzer units. Almost all captured BA armoured cars (light and heavy) were relegated to anti-partisan units in the USSR and the Balkans. Needless to say, any **captured tankettes were converted for use as light artillery tractors**. In sharp contrast the Germans used large numbers of captured **French Panhard P-178** armoured cars in their panzer division reconnaissance battalions.

The failure of the Soviets to develop specialised armoured support vehicles for their mechanised forces in the 1930s (especially command and control AFVs, and armoured personnel carriers) is at odds with the theory of deep-penetration armoured tactics developed in the Soviet Union at around this time. These concepts are commonly known as '**Deep Battle' (developed in 1929-30)** and the closely associated '**Deep Operations' (developed in 1936)**. *The plans for massive armoured forces envisaged by senior Red Army officers in the 1930s seem to have made little to no provision for any such armoured support vehicles*.[26] Even if the technology for such vehicles was not forthcoming in 1929-30, it was readily available by the mid-1930s. Presumably, even as late as 1939, the Deep Battle theorists believed that masses of tanks (and a few tank types) would be able to efficiently fulfil all the different roles required for a practical implementation of Deep Operations. (p. 101)

There is much made today about the sophisticated Deep Battle and Deep Operations theories developed by some very senior Red Army officers at this time, and that they were ahead of the rest of the world in this regard. However, the complete failure of the Soviets to direct at least a portion of their massive pre-war tank production to more specialised armoured support vehicles contradicts this. It provides strong evidence that the Red Army's depth of understanding of the practical implementation of Deep Battle, and especially Deep Operations, was not as well developed as currently thought. The principles and practical implementation of Deep Battle, and the initial ideas about Deep Operations, were (apparently) extensively tested by the Red Army in numerous pre-war manoeuvres. The largest of these manoeuvres were carried out in the Kiev Military District in 1935 and the Byelorussian Military District in 1936. It is very surprising that all these manoeuvres didn't highlight the critical need of specialised support AFVs; especially as the Deep Battle and Deep Operations concepts emphasise mobile combined arms cooperation (and effective command and control in mobile forces) which requires such vehicles. **When Heinz Guderian and others conducted similar manoeuvres to test their very similar theories, development of such vehicles as the Sd Kfz 260/261, the Sd Kfz 223, the Sd Kfz 263 and, most famously, the Sd Kfz 251 (APC) rapidly followed.**

[26] **Note:** It is truly amazing how the general staffs, etc., of one country thought so differently—developed such different ideas, doctrines, wpns—about how to wage war.

The question is somewhat academic because **Stalin's purges had effectively eliminated the Red Army's ability to conduct such operations by 1941**. It is interesting to note that the Red Army in WWII never did develop any significant support AFVs to any significant degree. Soviet armoured car development and production was minimal, while the only dedicated APCs available during WWII were supplied by the Western Allies as part of the Lend Lease program. *The fact that most Soviet WWII trucks also came from Lend Lease shows that all vehicle production was secondary to tank production*. Also, the fact that **the Soviets lost over 4.4 tanks for every enemy tank destroyed in WWII,[27] was at least partially attributable to the fact that many Soviet tanks were lost fulfilling roles for which they were not well suited.**

It seems ironic (and revealing) that as soon as WWII ended the Soviets rapidly developed a whole range of specialised armoured support vehicles to fulfil almost every imaginable function on the battlefield; and they went on to lead the world in producing such vehicles until the 1980s. Yet the full Deep Battle and later Deep Operations theories had identified the need for these vehicles in the Red Army fifteen to twenty years before. Perhaps it took this long, and the bloodiest military campaign in history, for the Red Army to move from theory to practice. (p. 101)

1H. Armored Trains

The long tradition of armoured trains in the USSR dates back to pre-revolutionary times. Russia was one of the few countries that possessed armoured trains when WWI broke out. *The civil war, which followed the October revolution of 1917, saw armoured trains used widely as mobile combat units, mobile artillery or simply as rapid transport.* In combat, armoured trains usually supported attacking infantry or cavalry, or directly defended important positions. When the civil war ended there were **103** armoured trains in service with the Red Army. After the civil war the number of armoured trains was reduced because many of the trains were needed for the economy. In addition many of the more crudely fashioned armoured rail cars were converted back to civilian use. In 1926 a major reorganisation was undertaken and under **the new June 1926 regulations**, the various armoured train types were formed and designated as follows. (p. 102)

● **Light Field Armoured Train Type A.** This consisted of an armoured locomotive, 4 control platform cars and 2 armoured (4 axle) gun cars. The armoured gun cars each had **2 76mm M1902 L/30 guns in turrets and 8 MMGs.** On reduced peacetime strength, the trains usually had 2 control cars and 1 gun/artillery car. The TOE called for the total number of cars for this train to be 29 in war (23 unarmoured) and 12 in peacetime, with crews of 160 and 86 men, respectively.

● **Heavy Field Armoured Train Type B.** The type B train was available in 2 configurations. Both configurations had at least 1 armoured artillery car **with a 107mm gun**. The second armoured artillery car had a 107mm gun, and a turret with a **76mm gun** (a Model 02 or Model 14 field gun) or a single **122mm howitzer**. Otherwise the type B train was similar to the Type A train.

● **Armoured Train Type ON**. Type ON trains carried heavy railroad guns and were subordinate to the navy.

In the late 1920s the number of armoured trains declined, and by 1931 there were only about 25 Type A, 12 Type B and 3 Type ON trains in service. However older trains were usually not scrapped; they were mothballed in case they were needed. In **February 1930** the Red Army's Department of Motorisation and Mechanisation defined a **requirement for a standardised armoured train**. This resulted in the **first BP-35 train**, which consisted of an

[27] **Note:** The **Soviet-German tank loss ratio each year, from 1941 to 1944**, was **7:1**, **6:1**, **4:1** and **4:1**, respectively. The ratio in 1945 was **1.2:1** but over a third of the German tanks included in this figure were 'strategic losses', i.e., they were lost (captured) when Germany surrendered. T. Bean, W. Fowler, Russian Tanks of WWII-Stalin's Armoured Might, Ian Allan Publishing, London, 2002, appendix, p. 170. Also, S. J. Zaloga, L.S. Ness, Red Army Handbook 1939-1945, Sutton Publishing, Stroud, UK, 1998, p. 181, Table 6.3.

armoured steam locomotive and 2 armoured gun cars, each with 2 turret mounted **76mm** Model 02 L/39 guns (light version) or a single **107mm** M10 field gun (heavy version). BP-35s were built from 1933. By 1935 there were again 60 to 70 armoured trains in service and by **June 1941 this number had grown to well over 80**.[28] This included around 56 in the Red Army and Navy, and 33 in the NKVD. The most common type of new train was the type BP-35. The armoured trains used by the NKVD usually had gun cars with 2 turret-mounted 76mm Model 02 L/30 guns. On 22 June 1941 there were **9 Red Army armoured train battalions**, one separate Red Army armoured train (the 66th) and **33 NKVD security armoured trains** Deployed (D) in the USSR (a total of 61 trains).

In the months following Barbarossa most of the armoured trains initially deployed in the West, and those sent as reinforcements to the West, were lost. I**n order to replace these losses approximately 40 new armoured trains were put into service from August to November 1941.** These consisted of *reactivated trains from revolutionary times and some improvised new constructions*. The latter included the use of T-26, T-28, KV-1, KV-2 and T-34 **tank turrets.** These trains usually came in the common 2 gun car configuration with 2 45-76mm guns per car, and appear to have been designated armoured train type NKPS-42. In addition, 12.7mm HMGs were commonly used to supplement the MMGs, presumably to improve their air defence. (p. 102)

1I. Transport and Prime Movers

Horse Teams:

Both the Red Army and the German Army relied heavily on horses during WWII. It is estimated that the German Army used around **2.75 million horses and mule**s during WWII, while the Soviets used around **3.5 million**. On 22 June 1941 there were approximately **600,000** horses in service with the Soviet armed services.[29] Of these, around 60,000 were riding horses, predominantly in the cavalry divisions. The remaining 540 000 horses were incorporated into 'horse teams' with an average of 3 to 4 horses per team. **In the second half of 1941 approximately 450,000 draft horses and 150,000 riding horses were commandeered from the Soviet economy** for the Soviet armed forces. Most of the draft horses went into the many newly mobilised rifle divisions, while most of the riding horses went into the newly mobilised cavalry divisions. (p. 104)

The TOE (or Soviet Shtat) for a **5 April 1941** Soviet Rifle Division (combat, signal, transport and supply elements) called for 792 wagons, 275 carts (including all horse drawn field kitchens) and 78 artillery limbers (including limbers used for anti-tank guns), which equates to **1,145 horse teams**. The division was also authorised 9 cavalry squads (3 in each rifle regiment) and 9 light cavalry squads, which used approximately 207 riding horses. The Division was authorised a **total of 3,039 horses** in its TOE. Taking the riding horses into account, there was therefore an average of 2.47 horses per horse team in the division.

The TOE for a **29th July 1941** Soviet Rifle Division[30] (combat, signal, transport and supply elements) called for 673 wagons, 124 carts, 54 field-kitchen carts and 54 artillery limbers (including limbers used for anti-tank guns), which equates to **905 horse teams**. The division was also authorised 14 light cavalry squads which used approximately 154 riding horses. The Division had **2,468 horses** in its TOE. Taking account of the riding horses, there was therefore an average of 2.56 horses per horse team in the division.

It is noteworthy that only 18 of the April 1941 Rifle Division's 54 anti-tank guns were towed by tractors, while all of the anti-tank guns in the July 1941 Rifle Division were horse-drawn. All the limbers used to tow anti-tank guns are included as horse teams, and these are in addition to any limbers used for the 76 - 152mm artillery pieces. The

[28] **Note:** W. Sawodny, *German Armoured Trains on the Russian Front 1941-1944*, Schiffer Military History, Atglen, PA, 2003, p. 4.
[29] **Note:** And same number (600,000) with the *Ostheer.*
[30] **Note:** So the 29 Jul '41 Soviet RD was somewhat smaller than the 5 April 1941 RD.

reader should also note that the above figures all refer to authorised equipment (the TOE). **In reality it was extremely rare for a Soviet rifle division during 1941 to actually have its full complement of any type of transport.** (p. 104)

Trucks:

Pre-revolutionary Russia did not have much in the way of a motor-vehicle industry. The Russo-Baltic carriage building plant in Riga is the first known instance of a Russian company producing motor vehicles, and they produced around 450 vehicles from 1908 to 1915. Five 'companies' or entities were set up in mid-1915 to accelerate motor vehicle production; mainly to meet the demands of the Russian Army during WWI. These 'companies' were government funded, and the **construction of the new automotive plants were started at: the Moscow Automotive Society (AMO) plant in Moscow, the Russo-Balt Administration plant near Moscow, the Russian-Renault plant in Rybinsk, the V. A. Lebedev plant in Yaroslavl and the Aksai plant in Rostov-on-Don.** It was hoped these plants would produce in excess of 10,000 vehicles a year from 1916, but delays and problems meant that *few vehicles had been produced by the time of the Russian Revolution in 1917.* By October 1917 the fledgling Russian auto industry was in disarray, and none of the five plants had been completed. However the seeds for an auto-industry had been sown, particularly at the Moscow and Yaroslavl plants. (p. 105)

Mainly due to the severe upheaval resulting from the Russian Civil War, it took some time for the new Soviet regime to get organised in terms of motor vehicle production. **Consequently it wasn't until November 1924 that the first 10 Soviet trucks rolled out of the Avtomobilnoe Moskovskoe Obshchestvo (AMO - Moscow Automotive Society) plant.** These trucks were *Fiat F-15 (1.5t) trucks produced under licence* and designated AMO-F-15. At around the same time, in 1925, medium truck production also started at the Yaroslavskiy Auto Zavod (YAZ or Ya – Yaroslavl Auto Factory). Truck production continued through the 1920s at a relatively slow rate, as shown in the table below showing Soviet motor vehicle production from 1924 to the end of 1941.

Soviet Motor Vehicle Production from 1924 to December 1941:
Year
1924: 10
1925: 116
1926: 366
1927: 475
1928: 740
1929: 1471
1930: 4019
1931: 3900
1932: **23,750**
1933: 39,100
1934: 54,600
1935: 76,900
1936: **131,500**
1937: 180,300
1938: 182,400
1939: 178,800
1940: 136,000
1941: 116,169

Total: **1,130,616**

From 1924 to 1931, inclusive, total truck output amounted to only **11,097** while the total number of motor vehicles produced was only 11,749. **It wasn't until 1931-32 that something happened to radically change the Soviet**

automotive industry, and which dramatically improved Soviet motor-vehicle production. This 'something' was the i**nfluence and help received from the US automotive industry**; specifically from the **Ford Motor Company, the Hercules Motor Company, the A.J. Brandt Company, the Autocar Company and the Austin Company**.[31] With the assistance of these companies, *including the licence production of several key US vehicles*, the USSR achieved the truck production shown [above] by the end of 1941. The reader should view this table in conjunction with the table above (and the following text), to gain an insight into the overall Soviet pre-war automotive industry. (p. 105)[32]

***Gorkovsky Avtomobilny Zavod* (GAZ):** In May 1929 the USSR made an agreement with the Ford Motor Company in which the Soviets agreed to purchase $13 million worth of automobiles and parts. Ford (and Austin) agreed to give technical assistance (until 1938) to *construct an integrated automobile-manufacturing plant at Nizhny Novgorod (more commonly known in the West as Gorky*, which it was named in 1932). Production at the new plant started on 1st January 1932 under the name Nizhegorodsky Avtomobilny Zavod (NAZ). Interestingly enough, *Ford's involvement was so great that the Ford logo even appeared as part of the NAZ logo.* The vehicles produced were the **Ford Model A car** and the **Ford Model AA light truck**, which were designated the NAZ-A and NAZ-AA, respectively. . . Almost **410,000** GAZ-AA (the Soviet version of the 4x2 1.5t Ford AA) were produced from 1932 to 1938, and on 22 June 1941 the approximately **113,000** GAZ-AAs in Red Army service constituted no less than **58.5%** of the Red Army's total truck pool. (p. 107)

***Zavod Imeni Stalina* (ZIS):** n 1931 the Avtomobilnoe Moskovskoe Obshchestvo (AMO) plant, which had been producing the AMO truck series since 1924, started a major reconstruction programme with assistance from the **American A.J. Brandt Company**. The Brandt Company had finalised a contract in 1929 to redesign, expand and reconstruct the plant. During this time its name was changed to the Automotive Factory No. 2 *Zavod Imeni Stalina* (*ZIS or ZiS*). By October 1933 the ZIS plant was ready to mass-produce a medium 3t 4x2 truck designated the ZIS-5, which was a **Soviet copy of the American Autocar Model CA 3t truck.** . . In the fall of 1941 around 80% of the ZIS Factory was evacuated (from Moscow). The evacuated machinery and workers were split between the Gorkovsky Avtomobilny Zavod (GAZ, see previous entry), and factories in Ulianovsk and Miass (near Chelyabinsk). . . As mentioned previously, around 20% of the original ZIS Factory had remained in Moscow during late 1941. In November-December 1941 the remaining workforce and factory buildings (in Moscow) were used to consolidate the various small factories in the Moscow area, and **in February 1942 motor vehicle production resumed.** (p. 108)

***Yaroslavskiy Auto Zavod* (YaAZ):** The Yaroslavskiy Auto Zavod (YaAZ or YAZ) was one of the oldest automotive factories in the USSR. *It was originally one of the five Russian 'companies' set up during WWI to accelerate motor vehicle production (mainly for the army*), and before the end of 1917 it had successfully produced an unknown number of British Crossley and Wolsey trucks. . . As part of the First Five Year Plan (officially 1928-1932) an agreement was struck with the **Hercules Motor Company** (a US truck and engine manufacturer) to equip, expand, and modernise the Yaroslavl Factory. As part of this programme the factory started making the 4x2 Ya-5 5t heavy truck in 1929, which was **a Soviet copy of Hercules heavy trucks** and used the 93hp Hercules YXC-B engine. Production rapidly increased from around 200 vehicles a year to approximately 2,500 vehicles a year by 1932-33. . . Under the Second Five Year Plan (officially 1933-1937) the Yaroslavl Factory was enlarged further, with the ambitious target of producing some 25,000 vehicles annually. Construction began in 1934, and by 1938 the *Yaroslavskiy Auto Zavod* already had over 15,000 workers and was the third largest auto-motive factory in the USSR. (p. 108)

The **YaG-6** was the most successful and numerous YAZ truck produced during the war, with **8,075** produced from 1936 to 1942. It used the same 73hp ZIS-5 engine as its predecessor, the YaG-4. In addition from 1938 to 1940 a

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[31] **Note:** W. S. Dunn, Jnr., *The Soviet Economy and the Red Army, 1930-1945*, Praeger Publishers, Westport, CT, 1995, pp. 209-214. The Austin Company of Cleveland, Ohio, was usually involved alongside Ford (mainly at the **Gorki plant**).

[32] **Note:** In what follows I am only taking very sparce notes.

very small number of YaG-6M and YaG-6A were produced, which were the same as the YaG-6 except they were powered by 93hp Hercules YXC-B engines or 82hp ZIS-16 engines. Although around **6,400** YaG-6/6M/6A had been manufactured by June 1941, only approximately **1,600** were on Red Army strength on 22 June 1941. **Most of these trucks were in use in the civilian economy with a large proportion used on the collective farms. . .** The expansion of the YAZ Factory was still underway in June 1941 when the Axis forces invaded. However, unlike the GAZ or ZIS Factories, the *YAZ Factory was quickly altered and expanded to produce predominantly tanks. This was possibly due to the YAZ factory being used to make heavy trucks*, and so having more of the infrastructure needed to produce heavy vehicles such as tanks. **By 1942 even the production of the very useful YaG-6 and its dump truck version, the YaS-3, had been terminated. This meant the Red Army remained chronically short of heavy trucks until the arrival of large numbers of US heavy trucks (in 1943), and reflects the Soviet High Command's conscious decision to produce tanks to the exclusion of other types of vehicle.**

Soviet Motor Vehicle Production from 1941 to 1945, and the True Effects of Lend Lease on the Soviet War Effort.

In fact the actual Soviet wartime production was considerably lower . . . because these figures [not shown] include production from 1 January to 22 June 1941 and from 8 May to 31 December 1945. **Actual Soviet wartime production was closer to 205,000 vehicles**, while a rather high estimate of Soviet truck production states the Soviets produced **197,100** trucks from June 1941 to May 1945. The best estimate is that the Soviets produced around 33,000 new trucks from 23 June to 31 December 1941: only around 28% of the total 1941 production. The majority of these trucks were 1.5t GAZ-MMs. In addition, **by November-December 1941 Soviet motor-vehicle production had shrunk to a desperately low level.** (p. 109)

There were three reasons for this. Firstly, the Soviets had already **decided to attenuate motor vehicle production in 1939**, and especially after the start of WWII. Although the Soviets participated in the invasion of Poland they were well aware of the threat of invasion and decided to refocus their production on new weapons for their rapidly expanding army and air force. From the previous table we can see that in 1939 the Soviets produced 201,700 vehicles and this had shrunk by 28% to 145,400 in 1940. **Even before the Axis invasion the Soviets were on track to produce even fewer vehicles in 1941 than in 1940.**

Secondly, after the Germans invaded the Soviets decided to **evacuate around 80% of the ZIS Factory (from Moscow**). This plant was the second largest auto-motive factory in the USSR and effectively went 'off-line' until well into 1942. In addition, the evacuation of several smaller factories which produced critical parts meant there was a component shortage for those auto-motive plants that remained in production. (pp. 109-10)

The third, and by far most significant, reason for the Soviet shortfall in motor-vehicle production **was that the most critical plants were rapidly modified to produce tanks**. For example, over half of the GAZ factory complex (the largest auto-motive plant in the USSR pre-war) was converted to manufacture light tanks, while virtually the entire YAZ complex (the third largest auto-motive plant in the USSR pre-war) was converted to producing tanks and other AFVs.

As can be seen from the production table, the Soviets never fixed this problem during WWII: **truck production from 1942 to 1944 (inclusive) amounted to an abysmal 129,959 trucks** (and these were mostly 1.5t commercial trucks). This hardy compares to the Soviet pre-war production from 1937 to 1939 (inclusive) which comprised 612,600 vehicles, including **541,500 trucks.**

To hammer home this point, it should be noted that **Germany produced 199,605 military trucks from 1942 to 1944 (inclusive) and 345,914 trucks during WWII**.[33] These trucks were also considerably larger and heavier trucks (with 2.5-3t capacity) than the large majority of Soviet trucks, and often had **6x4 drives.** Similarly, the USA

[33] **Note:** J. Ellis, *World War II, A Statistical Survey*, New York, Facts on File 1993, Section 7, p. 278, Table 91.

produced 1,838,200 trucks from 1942 to 1944 and **2,382,311 trucks** from 1939 to 1945 (inclusive). Even the small UK completely out produced the USSR in terms of motor-vehicles: they produced no less than 256,026 trucks from 1942 to 1944 and 480,943 from 1939 to 1945 (inclusive).

So the question remains, **where did the Red Army get its transport from in 1941-42 and in 1943-45?** As we shall see below (and the Soviet FILARM Model) the **vast majority of trucks received by the Red Army from June to December 1941 were commandeered from the civilian economy**. However, this 'source' was effectively exhausted by the end of 1941. After early 1942 the majority of trucks, and the majority of total lift capacity, came from the Western Allies (mainly the USA) **via Lend Lease aid.** Exact figures vary slightly, but it is conservatively estimated that the USA, Britain and Canada **provided the Red Army with over 460,000 trucks and light transports during the war**; well over twice the Soviets' entire output. The large majority of these vehicles were trucks; and most of the Western supplied trucks were also considerably heavier and more reliable machines than Soviet domestic production. The US supplies (alone) included 77,972 light transports (including at least 51,500 Jeeps), 35,170 motorcycles (most with sidecars), **24,902 light trucks** and the huge number of **351,715 medium trucks. The latter were mostly 2.5t Studebaker trucks with 6x4 drive**: a far superior, heavier, more robust and more mobile off-road vehicle than the 4x2 ZIS-5V or 4x2 GAZ-MM.

It is even more instructive to examine these figures from the point of view of '**total lift capacity**' rather than simply truck numbers. The Soviets' **197,100 trucks** (produced during WWII) had a total lift capacity of around **354,780 tons**, while the US supplied trucks (which were also more robust and reliable) would have had a total lift capacity of around 897,964 tons. In other words, the US supplied Lend Lease trucks (alone) provided the Red Army with around **two and a half times as much lift-capacity as all the domestically produced Soviet trucks during WWII.** *This is a staggering fact, and one totally ignored (or simply unknown) by those who espouse the Soviet economy and 'remarkable' Soviet tank production figures during WWII.* (p. 110)

Lastly, just so the reader fully appreciates the **impact of Lend Lease** on the Soviet wartime transport infrastructure, consider that the Western Allies also supplied a staggering **1,981 locomotives and 11,155 railroad freight cars** during WWII. Compare this to the paltry Soviet output of these vital wartime products [e.g., Soviets only produced **411** locomotives from 1940-45!] The Germans, of course, could not rely on someone else to produce their vital rail locomotives, and accordingly had to produce several thousand locomotives during WWII.[34] I am sure they would have preferred to convert their locomotive plants in Germany (along with the raw materials needed) to produce thousands of more medium-heavy tanks instead.

As a final comment (here) on Soviet wartime motor-vehicle production, it is noteworthy that **the large bulk of the Soviet pre-war automotive industry remained in the Moscow-Gorki-Yaroslavl triangle (i.e., relatively near Moscow)** even after the autumn 1941 factory evacuations. Specifically, most of the automobile factories were never evacuated to the 'Urals'. Of the three largest pre-war auto-motive complexes in the USSR, GAZ remained in
Gorki and was expanded with part of the ZIS plant, YAZ remained in Yaroslavl, and 20% of ZIS along with several smaller factories (such as the significant KIM plant) remained in Moscow. (p. 111)

If the Germans had invaded the **Moscow-Gorki space** in August-September 1941, as requested by Army Group Centre [and, of course, by Guderian!], then around 85-90% of the Soviet pre-war automotive industry would have been either captured or wiped out. Even if the Germans had captured the Moscow-Gorki space as late as December

[34] **Note:** In 1940-1941 the German **Reichsbahn** relied heavily on commandeered locomotives from occupied Europe. They also maintained locomotive production in factories in occupied territories where possible. However, most of the newly produced locomotives used by the Reichsbahn during WWII were produced in Germany. In 1941 the Reichsbahn acquired **1,391** 'new' steam locomotives, in 1942 it was **2,127**, in 1943 it was **4,533** and in 1944 it was **3,063**. A. C. Mierzejewski, *The Most Valuable Asset of the Reich: A History of the German National Railway*; Volume 2 1933-1945, University of North Carolina Press, Chapel Hill & London, 2000, p. 113, Table 3.2.

1941 – January 1942, the **effects on the Soviet auto-motive industry would have been only slightly less catastrophic. Soviet truck production in 1942 would have been reduced to a trickle, and around 35-40% of Soviet 1942 tank production would have been lost because these plants were predominantly producing tanks by 1942.** (p. 112)

In June 1941 the Red Army had **272,600** motor vehicles available of which **193,200** were trucks. Of the trucks, approximately 113,000 or 58.5% were GAZ AA (1.5t) light trucks. **As we have seen the German invasion caused massive disruption to the automotive industry, mostly due to the diversion of truck production to tank production.** As a consequence Soviet wartime truck production fell to about one quarter of pre-war levels. This reduced wartime production focused on pre-war models, with small modifications to increase ease of manufacture (see above). From 23 June to 31 December 1941 the Red Army received around 204,900 motor vehicles: an order of magnitude greater than the number produced.

The vast majority of trucks received by the Red Army from June to December 1941 were commandeered from the civilian economy. The total Soviet truck inventory on 22 June 1941 contained approximately 700,000 trucks, predominantly the GAZ-AA and **ZIS-5** models. However, poor road conditions, shortages of spare parts, repair facilities and tyres, and the technological backwardness of drivers and mechanics took a heavy toll on these vehicles. **Consequently, about 45% of these vehicles were inoperable in June 1941, and stocks of tyres met only 25% of demand.** Therefore the removal of over 200,000 operational trucks from the civilian population had a major impact on the Soviets' internal transport infrastructure and war economy. The Soviets, however, had little choice because the **Red Army had already lost almost its entire pre-war vehicle inventory by late August 1941**. (p. 112)[35]

As an illustration of the acute truck shortage in the Red Army before and after June 1941, let us consider the examples used in the previous entry on horse teams. The **TOE for a 5th April 1941 Soviet Rifle Division** (combat, signal, transport and supply elements) called for 447 general transport trucks and 117 specialised (special purpose) trucks. This gave a total of **564** trucks in the pre-war Division's TOE. *However very few mechanised divisions in 1941, let alone rifle divisions, had anything like this number of trucks in June 1941; nor would they ever get them.* For example, **the 24 rifle divisions in the Western Special Military District on 22 June 1941 (Western Front after 22 June) had an average of only 143 trucks each, which represented only 25% of the authorised TOE strength.** (p. 113)

The **TOE for a 29th July 1941** Soviet Rifle Division (combat, signal, transport and **supply elements) called for only 169 general transport trucks and 27 specialised trucks. This gave a total of** 196 trucks; only around a third of the trucks in the pre-war rifle division. It should be borne in mind that the **new rifle division was smaller than the pre-war division: with 10,790 men compared to 14,483 in their respective TOEs.** Nevertheless it serves to illustrate that the Soviet High Command quickly realised that the available truck park would never be able to support the envisaged pre-war levels of motorisation. Even at this reduced level, most rifle divisions mobilised after June 1941 still only had around 66% of their already very low establishment strength (i.e. around 130 trucks per division). **This meant that the average Soviet rifle division in 1941 was far more dependent on horse borne supply and transport than the equivalent German infantry division was.**[36]

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[35] **Note:** A total of approximately **1,125,500** trucks were produced from **1924 to 1941**, inclusive, and the average lift capacity per truck was 2.09 tonnes.

[36] **Note:** This is something I have never seen discussed, and is rarely even mentioned, in the plethora of available literature on Operation Barbarossa. **These same qualitative 'commentators' then seem to inevitably copy each other, as though this was some sort of 'universal truth' about the German Army's weaknesses during 1941-42**, and carefully point out the German infantry division's use of horse drawn transport (**the 500+ trucks per div. are usually ignored!**). Fortunately, the SDE methodology (in the Soviet and German FILARM models) used in this series does not allow only one side's parameters to be discussed or reviewed in isolation. From a military and military-campaign outcome perspective, such an analysis is effectively meaningless, and, hence, quite useless.

Finally it should be noted that the methodology detailed in Volume I, for calculating OCPC, does not take into account the robustness and reliability of individual truck design. In other words it does not differentiate between *commercial vehicles and custom built military vehicles*. This benefits the Soviets in the respective FILARM models because the **large majority of Soviet trucks were GAZ-AA, GAZ-MM, ZIS-5 and AMO-3, which were all commercial vehicles designed for a peacetime environment.** The nature of the Soviet economy, and the development stage of their auto-motive industry, meant that the distinction between civil and military transport remained non-existent. (p. 114)

In the *Wehrmacht*, however, it was different. *Although they also made extensive use of commercial vehicles, Germany also produced a wide range of custom built military vehicles*. The Germans were also careful in their designations, with commercial and military vehicles having distinct numerical designations. Although custom built military trucks were in the minority, they represented a good proportion of the German Army's truck inventory, particularly from 1939 to 1942. *These trucks usually had a strengthened chassis and suspension, multi-axle drive, more powerful engines, and superior off-road performance* compared to the more mass-produced commercial trucks. These types of 'reliability and serviceability factors' are not built into the OCPC methodology for transport, and the *Wehrmacht's* SDE calculations do not receive the benefit having a higher proportion of military-grade vehicles.

Light Transports:

The USSR produced the following automobiles from **1927 to the end of 1941**. [**Note:** Soviet Russia produced a total of only **124,780** such vehicles during this period! Most of them were **GAZ** vehicles of one type or another.]

Cars and other forms of light personal transport did not readily fit in with the nature or culture of the Communist Party of the Soviet Union. In the pre-war era they were definitely seen as a 'luxury' to which the proletariat should neither aspire to nor ever be able to purchase. In addition, after WWI the obvious priority within the fledging Soviet auto-motive industry was to produce trucks as these were immediately beneficial to the rapidly expanding Soviet economy. With these factors in play it is therefore hardly surprising that **only 369 cars were produced in the USSR from 1924 to 1930, inclusive**. These were all NAMI-1 passenger cars produced from 1927 to 1930 at the **Spartak plant in Moscow**. NAMI was an acronym for the *Nauchnii Avto-Motornii Institut* (Scientific Automobile and Motor Institute) in Moscow, and the NAMI-1 was the first car built in the USSR of Soviet design. (p. 114)

Light Transports in the Soviet FILARM Model: In the Soviet Personnel and Equipment Resource Database, a 'light transport' is defined as any non-tracked motorised vehicle which is not defined as a truck (refer previous entry) and is not a motor cycle. **In terms of light military cross-country vehicles, the Red Army in June 1941 was unsophisticated and lagged well behind the development of such vehicles in the British and especially the German Armies.** T*he Germans in particular had developed a whole range of specialist light transports to fulfil a multitude of roles* in both their mechanised and non-mechanised divisions. These vehicles included signal (radio and telephone) cars and vans, artillery calibration and observation vehicles, light anti-aircraft gun mounts, light ambulances, light personnel carriers, etc. In the German FILARM model these vehicles, which are not trucks, are designated from Kfz 1 to Kfz 21.

It is very apparent from the preceding section that the Soviets had not devoted much effort to developing or producing light military cross-country vehicles. The only exceptions were the GAZ-61 and GAZ-64, but only around **480** of these vehicles had been produced by 22 June 1941. In addition there were **relatively few cars in the whole USSR, either in the military or in the civil economy.** The overall result of all this was that the vast majority of light transports in the Red Army during 1941 were *civilian automobiles*. Indicative of the shortage of light transports is the fact that a **pre-war Soviet rifle division only had 22 cars in its TOE**, while the rifle divisions mobilised after June 1941 only had **4 cars** in their TOE. It is revealing that the Soviets didn't even bother

to call these vehicles anything other than cars. Even the TOE for a fully motorised Soviet pre-war tank division called for only **81** light transports, while the TOE for fully motorised Soviet mechanised division called for only 70 light transports. These figures should be compared to the TOE for a 'horse-drawn' German 1st wave infantry division, which called for **237 light transports** (i.e. 2.9 times more vehicles than a Soviet tank division). For further comparison, the TOE for a 1941 panzer division called for **782** light transports. (p. 118)

Motorcycles:

On 22 June 1941 motorcycles formed a relatively minor proportion of the total motorised transport available to the Red Army. Nevertheless, **the number of motorcycles in the Soviet armed forces was significant:** numbering approximately **33,400** machines. This includes the Soviet Army, NKVD, Air Force, PVO and Navy. Of this number, around **16,600** motorcycles (49.7% of the total) were deployed with combat units in the Western Special Military Districts. (p. 119)

The majority of motorcycles in the Soviet armed forces were *used in support roles such as communications (messengers and couriers), liaison and security.* Only around a quarter of the total (approximately 8,200 motorcycles) were actually assigned to what could be described as '*motorcycle infantry*'. Most of the Red Army's motorcycle infantry were allocated to the **motorcycle infantry regiments assigned to the newly formed, or just forming, mechanised corps**. These regiments used up just over half of the available medium to heavy motorcycles (i.e. over 350cc engine capacity) produced in the USSR to June 1941, and these were the only motorcycles which could be considered 'military grade' machines in any real sense. **Over 70% of the motorcycles available in the USSR in June 1941 were light commercial motorcycles with engine capacities less than 351cc.**

***The Izhevsk Machine Building Plant (Izh)*:** The Izhevsk Machine Building Plant was also referred to as the Izhstalzavod, and motorcycles from this plant carried the IZh designation. Motorcycle production started in Izhevsk in **1928** when the talented Russian engineer Pyotr V. Mozharov started constructing what became the **Izh-1**. . . In addition various manufacturing processes were simplified and streamlined, which resulted in 4,020 **IZh-8s** being produced in 1938 and another 4,317 in 1939. By the time IZh-8 production ended on 1st June 1940, a total of **9,893** had been completed. . . By the end of June 1941 approximately 3,900 IZh-9 had been produced. Production at the Izhevsk Machine Building Plant continued until November 1941 when it was decided that motorcycles were not high enough on the list of Red Army's needs. The factory had fully converted to the production of weapons and ammunition by December 1941; by which time a total of 5,392 IZh-9s had been produced. This brought total **IZh-7 to IZh-9 production to 20,864 motorcycles.**

The Leningrad Motorcycle Factory (L, LMZ): The Leningrad Motorcycle Factory was also referred to as part of the 'Red October Factory'. Motorcycles from this plant (as well as other smaller plants in Leningrad) carried the L designation (and later models often had the LMZ designation). The history of motorcycles at this plant started in late 1929 when Pyotr V. Mozharov was transferred to Leningrad from the Izhevsk factory, because it was intended that Leningrad would now become the main development centre for future Soviet motorcycles. . . Mozharov had already gained an engineering diploma in Germany and had visited all the well-known motorcycle manufacturers there.[37] After another group mission to Germany in the spring of 1930, it was **decided to base the 'new' Soviet light utility motorcycle on the 1930 German DKW Luxus-300.** (p. 121)

By mid-1941 the Leningrad Motorcycle Factory (LMZ) was being prepared to produce the M-72 heavy motorcycle. When the German Army Group North approached Leningrad in July 1941 (and before M-72 production had commenced) the **factory complex was evacuated to Gorky**. In October 1941 it was joined in Gorky by elements of the **evacuated Kharkov Motorcycle Factory** (KhMZ), and later these formed what became the Gorky Motorcycle factory (GMZ). (Note: the existing Gorky Automobile Factory (GAZ) had already converted

[37] **Note:** He was particularly impressed with DKW, Zündapp and Neander, and was strongly influenced by the design ideas of Ernst Neumann-Neander (who also helped train him).

to producing desperately needed light tanks, and GAZ also received some additional equipment from several evacuated factories.) (p. 122)

The Kharkov Motorcycle Factory (KhMZ): Motorcycles from the Kharkov Motorcycle Factory usually had a XM3 designation in the pre-war period. In 1930 part of the Kharkov Automobile Factory was renamed the Kharkov Motorcycle Factory (KhMZ), and continued the development of a single cylinder motorcycle for Red Army use. In 1933-34 some of motorcycle design and production resources in Kharkov (including personnel) were sent to the Taganrog Machine Tool Works (TIZ) which later produced the TIZ-AM-600 motorcycle. By mid-1941 the Kharkov Motorcycle Factory was being prepared to produce the **M-72 heavy motorcycle**, and M-72 production started there in **August 1941**. Unfortunately the approach of the German Army meant the factory had to be evacuated shortly after, and it was transported by rail to **Gorky** in October 1941. In Gorky it was restabilised with the evacuated Red October Factory (LMZ) from Leningrad, and later these formed what became the **Gorky Motorcycle factory (GMZ).**

The Taganrog Machine Tool Works (TIZ): The Taganrog Machine Tool Works (in Taganrog) had the full title 'Taganrog Instrumentation Factory Number 65 in the name of Stalin', and motorcycles from this plant carried the TIZ designation. **By the early 1930s it had become apparent to the Soviet military that all the motorcycles then in production were light machines largely focused on the civilian market.** This, of course, did not stop the Red Army and NKVD using large numbers of them, but it was apparent that motorcycle infantry would need larger and more powerful machines. In 1935 a team was put together in Taganrog (including the resources from the KhMZ factory, see above), led by one J W. Kogana, with the brief to design a suitable machine and then prepare the factory for series production.

The **TIZ-AM-600** was approved for series production in May 1936 and production started immediately. The production machine had a dry weight of 185kg, was able to reach a top speed of around 95kph, and at the time of its introduction it was the *most powerful and advanced motorcycle produced in the USSR*. The TIZ-AM-600 was often produced with a sidecar (without third wheel drive) with a mounting for a 7.62mm DP (Degtyaryov) LMG. The sidecar's maximum load was around 135kg. Some standalone motorcycles had a 7.62mm DT LMG mounted on the handlebars, but these were presumably for 'ceremonial use' as such a weapon mounting was almost impossible to use in combat.

TIZ-AM-600 production at the Taganrog Machine Tool Works accelerated so that at its peak production was around 300 motorcycles per month. In 1939 further significant design improvements led to the production machine being designated the **TIZ-2.** By the end of June 1941, approximately **11,030 TIZ-AM-600** motorcycles had been produced; **making it the most important motorcycle type in the Red Army when Operation Barbarossa was launched.** (p. 123)

Although the Taganrog factory was gearing up to produce the new M-72 just before the invasion started, production of the TIZ-AM-600 continued as the German Army fought its way across the Ukraine, and in late October 1941 the **Taganrog Machine Tool Works was evacuated to Tyumen in Siberia**. Just prior to moving east, the factory managed to complete another 718 odd machines, bringing total TIZ-AM-600 production to **11,748** motorcycles by the end of 1941.

The Podolsk Mechanical Factory (PMZ): The Podolsk Mechanical Factory was *situated near Moscow,* and motorcycles from this plant carried the PMZ designation. As part of the need for more heavy motorcycles for the military in the early 1930s, the NATI (**Moscow Automotive Tractor Institute**) was asked to design a heavy 750cc motorcycle which could have a sidecar and was adapted to the road conditions of the USSR. To facilitate this project, **P.V. Mozharov** was ordered to transfer to Moscow in February 1932 and head up a NATI design team made up of selected (talented) engineers. Some in the NATI collective are known to have **visited Harley-Davidson in the US and BMW in Germany to** help with best practice design ideas, and features from both these company's products eventually appeared in what became the NATI-A-750 prototype. The NATI-A-750 featured a BMW style

duplex frame and a **Harley-Davidson engine**. The latter was a 15hp 746cc two-cylinder, v-twin 4-stroke engine. The power transmission was chain drive to the rear wheel, and there were 3 gears. By May 1933 3 (or possibly 4) prototypes had been completed and were subject to long distance testing. It was initially planned to produce the new motorcycle at the Izhevsk Machine Building Plant (in Izhevsk) and the plans had already been sent there. However, the IZh-7 was just starting series production in Izhevsk and series production of the heavy NATI-A-750 was considerably more complex and difficult. It was therefore decided to **establish a new motorcycle factory close to Moscow**, and the location chosen was the Podolsk Mechanical Factory (PMZ). This factory was originally the American Singer Company's Podolsk Machinery Factory.[38] . . . Production of the PMZ-A-750 continued until late 1938 or early 1939, by which time it had been largely superseded by the TIZ-AM-600. Total PMZ-A-750 production amounted to 4,640 motorcycles, with the **large majority going into the Red Army and NKVD security forces**. (p. 123)

The Moscow Motorcycle Factory (MMZ): By 1940 it had become apparent to the Red Army that they did not have a motorcycle in production with the same capabilities as their most likely enemy: the Wehrmacht. It is worth digressing for a moment to examine why this was considered the case. **Since 1935 the Germans had been producing the excellent 745cc BMW-R12 in large numbers.** In late 1937 the German Army had requested a replacement for the R12 to meet a very demanding specification, and had approached BMW and Zündapp. BMW quickly came up with the 22hp 746cc BMW-R71, and later **Zündapp** came up with the outstanding 751cc Zündapp KS750. A total of around 2,000 BMW-R71s were produced from 1938, but **army acceptance testing** showed the KS750 to be a markedly superior machine. Consequently, mass production of the Zündapp KS750 had started in early 1940. In the meantime the *Wehrmacht* had been so impressed with the KS750 that they even asked BMW if they would build it under licence. BMW declined, but was so 'appalled and embarrassed' at this idea that they rapidly developed the excellent BMW-R75, which employed the more advanced OHV engine arrangement. Series production of the BMW-R75 commenced in the autumn of 1940. **Both the KS750 and R75 were powerful motorcycles and came with sidecars with a driven side wheel and a locking differential. They were more akin to light all-terrain weapon carriers than motorcycles, and in 1940 they were easily the best heavy military motorcycles in series production anywhere in the world: a title they retained until the end of WWII.** (p. 124)

With this background one has to consider the Soviets' position. It was *clear that the German Army considered motorcycle infantry battalions to be an important component of their expanding mechanised forces.* The Red Army was also rapidly expanding its mechanised forces (already the largest in the world in term of numbers of divisions and tanks). However, it did not have the motorcycles it needed for the motorcycle regiments and reconnaissance units within the newly forming mechanised corps, and it was obviously going to take too long to develop comparable machines to the latest German ones. **Therefore, as part of the trade cooperation stemming from the Molotov-Ribbentrop Pact (signed on 23rd August 1939), the Soviets approached BMW to licence produce one of their latest designs.** This was not unusual: as we have seen this had already been done with DKW, BMW, Harley-Davidson and BSA in the past, and long before the Molotov-Ribbentrop Pact provided even more legitimacy.

It so happened that the BMW-R71 commercial sales were not going well and it *had already been rejected by the Wehrmacht.* In addition, motorcycles were pretty low on the **list of strategically important technology and resources already being exchanged. This list included everything from aero-engine designs, rocket technology and tank testing, to oil and rare metals**. Accordingly, in 1940 the Soviets negotiated a licence to produce the R71, and BMW supplied the construction drawings, casting moulds, example motorcycles and even

[38] **Note:** The **American Singer Co**. was engaged in sewing machine manufacture. In 1900 it had purchased 30 acres of land in Podolsk to build its first factory in Russia. Under Soviet rule the factory was renamed the Podolsk Mechanical Factory (PMZ). *It was felt the high standards of precision involved in sewing machine manufacture would be applicable to motorcycle manufacturing.*

some engineering support personnel. It should be pointed out that this sequence of events is disputed, and *some believe the Soviets simply acquired several BMW-R71s covertly and then copied them*.[39]

The licence built BMW-R71 was given the Soviet designation M-72. The importance attached to the M-72 project can be gauged by the fact that 1941 production was planned at no less than 3 factories. These were a new factory in Moscow designated the **Moscow Motorcycle Factory** (MMZ), the **Leningrad Motorcycle Factory** (LMZ) and the **Kharkov Motorcycle Factory** (KhMZ). By the end of June 1941 approximately **850** M-72s had been produced. After June 1941, the Moscow Motorcycle Factory continued production, and a small number may have been completed by the Kharkov Motorcycle Factory before the factory was **evacuated to Gorky.** By October 1941 the German Army was threatening Moscow and the Moscow Motorcycle Factory was evacuated (using a very tortuous route) to the **town of Irbit, located on the fringe of Siberia in the Ural Mountains**. Before the evacuation, the factory had completed approximately 900 more motorcycles from July to October 1941, bringing total M-72 production to **1,753** machines. (p. 125)

The first elements of the Moscow Motorcycle Factory arrived by rail at Irbit on 17 November 1941. Unfortunately Irbit had very little infrastructure to support a new factory (including buildings) and it was a long time before the new factory, now designated the Irbit Motorcycle Factory (IMZ), started producing M-72s again. The first IMZ-M-72s were **sent to the front on 25 October 1942**. Another 9,799 M-72s were produced at various plants in the USSR from 1942 to May 1945 (including at GAZ). This brought total M-72 wartime production to **11,552** motorcycles.[40]

As a final comment on Soviet wartime motorcycle production, it is worth pointing out that *Soviet achievements in this regard were not great*. If we add up all IZh-9, TIZ-AM-600 and M-72 production, we come to only **13,768 motorcycles produced from July 1941 to the war's end. By comparison, BMW and Zündapp, alone, produced approximately 35,200 R75s and KS750s from 1940 to war's end.** This was despite the *BMW and Zündapp factories sustaining severe Allied bombing damage in 1944 from which they never recovered.* The bombing was so intense that BMW was forced to stop R75 production completely in late 1944. It turns out the *Soviet WWII motorcycle story is much the same as the light transport and truck story; namely the large majority of machines were supplied by the Western Allies.* From 1941 to May 1945, the USA supplied no less than **35,170** motorcycles to the USSR: over two and a half times the Soviets' output. Over 30,000 of the motorcycles sent to the USSR were heavy 23hp 740cc **Harley-Davidson WLAs**, of which over 90,000 were produced in the USA. Although not as good as the M-72 overall, the WLA was almost as powerful and just as reliable.[41] (p. 125)

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[39] **Note:** This view is held by the minority of sources, and seems to stem from the IMZ-Ural factory's museum. It claims the Soviets acquired several BMW-R71s through a Scandinavian intermediary, and then evaluated the designs. The Soviets then reverse engineered the designs, and copied the R71 construction details and components to an extreme level. Unfortunately, **BMW's records were largely destroyed by Allied bombing in WWII, and BMW makes no claim either way.** However, there are many reasons why *this claim seems very dubious*, which we cannot examine in detail here. Briefly, some of these reasons include: the modern Russian organisation's desire to distance itself from any benefits obtained due to any pact with Nazi Germany, the speed with which the Soviets were able to move from a physical example to series production (reverse engineering a complex machine is generally a slow and laborious process), the precise detail of the 'copied' components without any apparent manufacturing improvements (unlikely if each component were copied separately), the copying of a 'second rate' machine when even better ones were available to be reverse engineered, and the ease with which a legitimate licence agreement could have been obtained. The last point is very difficult to dispute: in the overall scheme of things, and given the political situation in Europe in 1940, it would have been far easier and more cost effective for the USSR to get a licence agreement to produce a 'second rate' motorcycle than to attempt to reverse engineer a complex piece of engineering with hundreds of components.

[40] **Note:** This story just one example of how disruptive it was (or certainly could be) to Soviet industry when it had to evacuate and relocate factories hundreds of kilometers to the east.

[41] **Note:** ***Twenty First Report to Congress on Lend Lease Operations***, p.25, 'Deliveries from the USA to the USSR from the beginning of the Lend-Lease Pact to 30 September 1945.

Tractors (Prime Movers):

In the late 1920s the USSR was somewhat desperate to obtain tractors for its expanding agricultural industry and (as with the automotive industry) it looked to the USA for assistance. If the degree to which the American automotive-industry assisted the USSR's automotive-industry is not widely known, t**hen the degree to which the American tractor manufacturers assisted the USSR is a positive secret!** *In fact, all the large tractor plants constructed in the USSR in the early 1930s received major assistance from one or more US companies.* This took the form of engineering expertise in plant design and construction, production machinery, tractor components, and the drawings and manufacturing rights to produce US tractor designs. The three principal companies involved were the **Ford Motor Company**, the **Caterpillar Tractor Company** and the **International Harvester Company**. There were also several well-known individual experts involved, such as **Albert Kahn** who was hired by the Soviets in 1928. Kahn was a US industrial architect from Detroit who had designed the Ford River Rouge Plant; then the largest automotive factory complex in the world. He had also designed many of Ford's competitor plants, including factories for Chevrolet, Packard, Hudson, Oldsmobile and Chrysler. (p. 126)

The contribution of the Ford Motor Company to the USSR's overall automotive industry has already been demonstrated in the trucks and light transport entries (above). **In the 1920s Ford was marketing its famous Fordson tractor in the US and abroad.** The Fordson tractor (or the Fordson Model F) was the first lightweight, mass-produced and affordable general purpose tractor in the world; made by Henry Ford & Son from 1917. In 1920 Ford & Son Inc was merged into the Ford Motor Company and the Fordson tractor continued to be a 'best-seller' through the early to mid-1920s. **In 1929 the Putilov Factory (Kirov) in Leningrad was rebuilt and expanded with assistance from the Ford Motor Company,** and in 1931 it started producing copies of the Fordson tractor. The Putilov Factory continued to produce the Fordson tractor until 1934 when it switched to producing the superior **International Harvester McCormick Deering 15-30 tractor** (the SKhTZ 15-30, see below). From 1931 to 1934 a total of **36,100** Fordson tractors were built.

The **Caterpillar Tractor Company** was formed in 1925 through a merger between the well-known Holt Manufacturing Company and the C. L. Best Tractor Company. The Holt Manufacturing Company had been producing industrial and then agricultural tractors since 1909, and were well known in military circles because **Holt tractors saw widespread use as artillery tractors during WWI**. The C. L. Best Tractor Company was founded in 1910 and was soon Holt's primary competitor. It became well known for a series of agricultural tractors which became popular with US farmers during and post-WWI. The transition to a post-WWI economy and the US depression of 1920–21 threatened both company's survival, and they merged in May 1925. The new Caterpillar Tractor Company offered only five track-type tractors: the 2 Ton, 5 Ton, and 10 Ton (from the Holt Manufacturing Company), and the Caterpillar 30 and Caterpillar 60 (from the C. L. Best Tractor Company). By 1928 the Holt originated tractors had been discontinued, while the excellent Caterpillar 60 went to be Caterpillar's bestselling product from 1925 to 1932. **The Caterpillar 60 was also very important for the USSR because it was produced in large numbers at the Chelyabinsk Tractor Factory as the ChTZ S-60, and later as the ChTZ S-65 (refer Chelyabinskiy Traktornyy Zavod** (ChTZ), entry below).

The International Harvester Company was formed in 1902 by the merger of McCormick Harvesting Machine Company, the Deering Harvester Company and three smaller agricultural equipment firms. The International Harvester Company soon became famous for its general purpose row-crop tractors, and it produced the only serious competitors to the Fordson tractor in the 1920s. In 1921 the International Harvester Company introduced what was then the best row-crop tractor in the world: the revolutionary International 15-30 Gear Drive. Very soon it became the only tractor model produced by International Harvester, and in 1923 it was rebadged as the International Harvester McCormick Deering 15-30. It remained in production in the USA from 1921 to 1934 (although steadily upgraded); a remarkably long time during a period when tractors were evolving so rapidly. The **McCormick Deering 15-30 was also vital to the USSR because it was licence produced in massive numbers as the SKhTZ 15-30 at the Stalingrad Tractor Factory and the Kharkov Tractor Factory** (refer Stalingradsky Traktorny Zavod (STZ) and Kharkovskiy Traktorny Zavod (KhTZ) entry below). **Although not officially a Red**

Army vehicle, these commandeered agricultural tractors were the most numerous 'artillery tractors' in the Red Army during 1941-42.

It is unclear why the US government allowed so many major US companies and individuals a free hand in providing technology to what was obviously a rigidly communist regime. The most feasible explanation is that after the October 1929 crash on Wall Street and the ensuing Great Depression, **the US Government and the US companies involved saw the Soviet First Five Year Plan (1928-1932) as an economic lifeline**. While the rest of the world was suffering the effects of the Great Depression, the USSR, with (paid for) American assistance, was building automotive and tractor plants across the USSR. **It is estimated that in 1932, 64% of US metal working machinery exports went to the USSR.** Americans were initially in charge of the factories and were responsible for training the Soviets in operation. **Over 1,000 Soviet citizens went to the US to learn industrial techniques and many more trained on the job in America**. **Overall, it is estimated that the US contribution enabled the USSR to achieve around 30 years of technical development in only 3 years!** (pp 126-27)

Layered on all this was the **decision (in the mid-1930s) by the Red Army's high command to have as much of its artillery equipment towed by tracked vehicles as possible,** with particular emphasis on its heavy artillery regiments. In this regard the Red Army's thinking was possibly ahead of the rest of the world at this time (with the probable exception of the British Army with its much smaller artillery force). Similarly to the Soviet truck and light transport park, however, the limitation on available tractors was imposed by the industrial capacity of the Soviet Union, the demands of the Soviet economy, and the huge size of the Red Army. **The result of all this was that by June 1941 the Red Army's tractor park contained a curious mixture of machines designed for military use, and (mostly) machines designed for agricultural and industrial use.** The Soviet tractors or prime-movers in service with the Red Army in June 1941 are shown in table Sov Tractors June 1941 [table not shown here].

Different types of Soviet tractors (ranging from light, to medium, to heavy tractors):

T-27 Tankette, Light Tractor: At the bottom end of the Soviet 'military specification' tractor park were the obsolete T-27 tankette chassis' converted to artillery tractors with their armaments removed. Refer to the Tanks, T-27 entry for detail on the history, production and availability of this vehicle in June 1941.389 As the T-27 had a 22-40hp GAZ (Ford)-AA 4-cylinder petrol engine (depending on model), it was only suitable for towing light loads such as 37-45mm anti-tank guns. (p. 127)

T-20 Komsomolets, Light Armoured Tractor: The factories assigned to produce the Komsomolets were the Ordzhonikidze Moscow Plant No.37, the Stalingradsky Traktorny Zavod (Stalingrad Tractor Factory - STZ), and the GAZ (automobile) plant in **Gorky.** The result was that a total of **7,780 T-20 Komsomolets of all types were produced from 1937 to 1941**, inclusive. **Production ended in July 1941 when production switched to light tanks.** From the start the Komsomolets had several problems. Most critically, it was underpowered. The 50hp GAZ engine was never designed for a tracked vehicle or one of this weight, so the Komsomolets had to rely on gearing to enable it to move a loaded vehicle and trailer in the region of 5.5 tonnes (i.e. 3,460kg plus a c 2,000kg trailer). **This of course meant it was slow on roads and even slower across-country (if it could go across the terrain at all).**

***Chelyabinskiy Traktornyy Zavod* (ChTZ):** The *Chelyabinskiy Traktornyy Zavod* (Chelyabinsk Tractor Factory, abbreviated ChTZ or sometimes CTZ) was a major tractor plant in the Soviet city of Chelyabinsk. It was the third large tractor plant built in the USSR in the late 1920s and early 1930s (after the Stalingrad and Kharkov plants), as part of the First Five Year Plan (1928-1932). The Chelyabinsk Tractor Factory was initially started without US assistance, but by early 1931 construction was in chaos. **In March 1931 John Calder, a US industrial architect from Detroit, and several American experts from the Caterpillar Tractor Company arrived**. The plant was redesigned using the Caterpillar Tractor Company's Factory at Peoria in Illinois as the model, and the Caterpillar Company engineers remained during initial production. It is interesting to note that when complete, the

Chelyabinsk Tractor Factory had almost triple the capacity of its US model. On 1 June 1933 the Chelyabinsk Tractor Factory was ready to start production. (p. 129)

ChTZ S-60 Medium-Heavy Tractor Stalinets: The Chelyabinsk Tractor Factory's first significant product was the ChTZ S-60 Tractor Stalinets (or Stalinetz S-60), which was a **copy of the Caterpillar Tractor Company's Caterpillar 60 Model 1924.** The 'Stalinets' (Stalinetz) designation was a political label meaning '**son of Stalin**', and presumably stemmed from the full factory title which was *Chelyabinskiy Traktornyy Zavod imeni Stalina*. . . It is also unknown exactly how many **S-60s** were in Red Army service on 22 June 1941; probably around **2000.** However, following *the massive losses of artillery tractors from June to December 1941*, and the conversion of most existing tractor industry to tank production, the S-60 was one of the most commandeered civilian/agricultural tractors pressed into military service (to make good the losses). This did not really solve the Red Army's tractor shortage problem from 1941-43 because many of these vehicles had been exhaustively used on collective farms and other industry for many years, and with minimal maintenance. Nonetheless, several thousand more S-60s found their way into the Red Army and were used until war's end.

ChTZ S-65 Heavy Tractor Stalinets: n June 1937 the Chelyabinsk Tractor Factory started producing the ChTZ S-65 Heavy Tractor Stalinets. The main difference was that the S-65 used a Soviet made, water-cooled, 4-stroke, M-17 diesel engine, rated at 65hp during normal operation and 75hp maximum. The **S-65 was the first tractor produced in the USSR to use diesel**. . . On balance, however, the S-65 was still a significantly better machine than the S-60 because of the reliability of the M-17 diesel engine when operating under load and for long periods. In addition the **diesel engine was more fuel efficient** which enabled a (marginally) improved range. The S-65 was produced from June 1937 to July 1941, during which time **37,626** vehicles were produced. It appears this figure includes approximately 7,370 SG-65 tractors with a **gas producer engine, which could burn wood, peat, coal and straw**. [42] (p. 130)

Pictures of SG-65s pulling artillery are very rare. It is unknown exactly how many S-65s were in Red Army service on 22 June 1941, but the figure was probably around **1,600.** However, immediately after the German invasion the **S-65 was the 'agricultural tractor' most in demand by the Red Army. Consequently it was probably the most commandeered (from the civilian economy) tractor** in the USSR pro rata to the total number produced. It is unknown how many of the 37,626 S-65s manufactured ended up in the Red Army during WWII, but estimates place the figure as high as 10,000 (27% of total production). This was because they were considered very reliable, could pull the heaviest guns and tanks, and most were still relatively new. **Unfortunately the very slow speed (only 7km/h) and limited range (only 75km) of the S-65 doomed many Soviet artillery units to the same fate as those using the S-60 (refer above)**. Thus, during 1941 and 1942 several thousand S-65s were captured intact by the Germans, and most were *pressed into Wehrmacht service* as the **Raupenschlepper St (r) Typ 'Stalinez 65**'. (p 131)

S-2 High Speed Heavy Tractor Stalinets: In 1939 the Chelyabinsk Tractor Factory **started producing a tractor specifically for the military**, designated the **S-2** High Speed Tractor Stalinets (Skorostnoy Stalinetz). The ancestry of this machine can be traced back to 1935 when attempts were started to produce a militarised and faster version of the ChTZ S-60. The resulting S-1 prototype was produced with a larger petrol engine and incorporated modified suspension and transmission, and a platform for cargo. However, it appears further development was not pursued until the advent of the ChTZ S-65 with its diesel engine and internal fuel tank. The demand for a 'high speed' (or what is really normal speed for a military tractor) tractor remained, so in 1937-38 the ChTZ continued their development work which led to the S-2 Stalinets.

In mid-1939 two prototype S-2s were used on a **road test from Chelyabinsk to Moscow,** which took twelve days. The vehicles were then subject to tests at the **Kubinka tank proving ground**. Although the S-2 had a significantly

[42] **Note:** J. Vollert, *Tyagatshi: Soviet Full-Tracked Artillery Tractors of WW2 in Red Army and Wehrmacht Service*, **Tankograd Publishing-Verlag** Jochern Vollert; Erlangen, Germany, 2006, p. 131

higher power to weight ratio than the S-60 and S-65, it was significantly lower than the power to weight ratio on the contemporary *Komintern* tractor. **The S-2 struggled to tow the heaviest Soviet corps and army level artillery pieces (200mm calibre plus). It did however demonstrate reliability, a respectable stop speed of 23kph and a good range on roads of 183km.** In addition the S-2 was able to carry around 1.5 tonnes of cargo on its flatbed if required (in place of the 8 man gun-crew), although its speed was reduced to around 16kph if it was loaded and pulling a 6 plus tonne trailer load (even on roads).

Despite the misgivings, the S-2 was **placed in series production in 1939 largely due to the chronic shortage of heavy artillery tractors**. However, around this time the war clouds in Europe were gathering and the Red Army wanted to increase production of its newest tank models. **In 1940 the Chelyabinsk Tractor Factory was ordered to start production of the new KV tank series which naturally meant tractor production fell away**. Therefore, although in production for over a year and a half, only approximately **930** S-2s had been produced by June 1941. The S-2 was one of the few artillery tractors kept in limited production after the German invasion, and production only ended completely in early January 1942.402 By this time a total of only 1,275 of these useful prime-movers had been built: a small number by Soviet standards. (pp 131-32)

The Stalingradskiy Traktornyy Zavod: (Stalingrad Tractor Factory, abbreviated STZ) was a major tractor plant in the Soviet city of Stalingrad. **The Stalingrad Tractor Factory was the first tractor plant to be designed and equipped by the Americans.** The Soviets selected the site in 1926, but little was accomplished until US architects and engineers arrived in 1929. **The plant was designed by Albert Kahn** (hired by the Soviets in 1928) and built under the supervision of John Calder (the industrial architect from Detroit). In many ways it was **modelled on the International Harvester Company's Plant at Milwaukee, Wisconsin.** Many other US companies also supplied construction and production equipment, including Rockwell, Niagara, Bliss, Seper, Westinghouse and Chain Belt. The plant buildings were complete by June 1930 and soon after this the production equipment arrived from the US (and some from Germany). **When complete the Stalingrad Tractor Factory was the largest tractor factory in Europe and grew to have some 20,000 workers just prior to WWII**. Its first significant product was the Soviet copy of the International Harvester McCormick Deering 15-30 agricultural tractor (designated the SKhTZ 15-30 - the 'Kh' comes from the Kharkov Tractor Factory which also mass produced this vehicle from 1931 to 1937). Approximately **207,000** SkhTZ 15-30, also sometimes called the STZ-1, were produced by the Stalingrad Tractor Factory from 1930 to 1937. (p. 132)

***Kharkovskiy Traktornyy Zavod (KhTZ)*:** The *Kharkovskiy Traktornyy Zavod* (Kharkov Tractor Factory, abbreviated KhTZ) was a major tractor plant in the Soviet city of Kharkov (today the Ukrainian city if Kharkiv). Note, this plant should not be confused with the Kharkov Locomotive Factory (*Kharkovskiy Parovoznyi Zavod*, abbreviated KhPZ); a much older factory complex which also produced tractors (refer to the entry below). The **Kharkov Tractor Factory was the second major tractor plant to be built with assistance from US companies, and was essentially a copy of the slightly earlier Stalingrad Tractor Factory**. It was built using the American plans developed for the Stalingrad Plant, and under the 'consulting' supervision of Leon Swajian. He was an engineer who had worked for the Ford Motor Company for seven years at their Ford River Rouge Plant (then the largest automotive factory complex in the world). The plant used structural steel from Czechoslovakia, while the usual US companies (and some German) provided most of the production machinery. On 1st October 1931 the Kharkov Tractor Factory produced its first tractor: a **SKhTZ 15-30** (the same vehicle being produced by the Stalingrad Tractor Factory). When complete the Stalingrad and Kharkov Tractor Factories had twice the production capacity as the US factory they were modelled on: the International Harvester Company's Factory at Milwaukee.403 Approximately 183,500 SKhTZ 15-30 tractors were produced by the Kharkov Tractor Factory from 1931 to 1937, bringing total Soviet production of this vehicle to around **390,500**. It is interesting to note that US engineers were still present in 1933, helping with plant operations.

STZ-3 Medium Tractor: The STZ-3 was the **first indigenously designed fully-tracked tractor to be produced in the USSR**, and it replaced the SKhTZ 15-30 on the STZ production lines in 1937. The design was completed by the Scientific Automotive-Tractor Institute (Nauchnyi Avto-Traktornyi Institut – NATI) in Moscow in the

mid-1930s, and for this reason it is often called the STZ-NATI or the STZ-3 NATI. To confuse matters further, these vehicles were also produced at the Kharkov Tractor Factory from 1937 to 1941, and so they are also sometimes called the SKhTZ-NATI, the SKhTZ-3 NATI or simply the SkhTZ-3. *The STZ-3 was designed as an agricultural tractor and was another such Soviet tractor used (or misused, depending on your perspective) by the Red Army for towing all types of miscellaneous items, including artillery pieces.*

It is unclear how many STZ-3s were manufactured from 1937 to 1941/42, but best estimates are that around 16,000 were produced, of which around 4,000 were eventually delivered to the Red Army. STZ-3 production was maintained (albeit at a much reduced rate) for some time after the invasion. **The Kharkov Tractor Factory only stopped production when it was overrun in October 1941, while the Stalingrad Tractor Factory didn't completely stop until early 1942** (when it switched to tank production only). STZ-3 production was restated at Stalingrad and Kharkov in 1944 and continued until 1949. In addition, a third factory, the Altaisky Traktornyy Zavod (Altaiy Tractor Factory -ATZ) started STZ-3 production in 1944 and continued until 1952. A total of **210,744** STZ-3s were built from 1937 to 1952 (including pre-war, war and post-war production). Despite the STZ-3's relatively widespread use in the military (which was the result of prime-mover shortages in general), the STZ-3 was not particularly well suited to military work. **It was still a slow and relatively cheap agricultural tractor with limited reliability and with a very short range**. This was probably why there were not much more than **2,000 in Red Army service** on 22 June 1941. It is known that there were **5,646 agricultural S-60, S-65 and STZ-3 tractors in the Red Army on 1 January 1941**, and most of these were the heavier Stalinets type tractors. **After Operation Barbarossa commenced and the Soviet military became desperate for more prime-movers, the Soviets had no choice but to commandeer several thousand STZ-3s from the civilian economy.**[43] (p. 133)

Being a medium tractor, STZ-3s were usually used to tow regimental and divisional artillery up to 152mm calibre. They were also used to tow anti-tank guns, and 76-85mm anti-aircraft guns in Army and PVO (National Air Defence) units. They were ideally suited to the latter because their slow speed and very limited range were not a severe handicap when redeploying strategic air-defence units in rear areas. STZ-3s were also used by the VVS and PVO for moving aircraft (damaged or otherwise) and other items around airfields. In this role the STZ-3's limitations were, again, not critical. **As with many Soviet tractor types of this period, the German Army captured several thousand intact machines. They also captured over 800 complete and almost complete STZ-3s when they overran the Kharkov Tractor Factory in October 1941.** Needless to say, most of these machines were soon in use against their former owners under the designation **Artillerie Schlepper ST-3-601 (r).**

One interesting variant of the STZ-3 was the **KhTZ-16 Armoured Tractor.** It came about when the Kharkov Tractor Factory decided to produce an **improvised AFV** based on the STZ-3, hence the 'Kh' designation. Essentially, 10 to 25mm of armour plate was riveted and welded around the engine, and the cab was replaced with a similarly armoured and fixed turret. Within the turret was placed a **45mm tank gun** (mostly scrounged from damaged tanks) and a **coaxial DT MG**. . . The Kharkov Tractor Factory planned to produce 700 to 800 of these vehicles, but in the event **only 50-60 were completed** before the factory was captured in October 1941. **They were used in the defence of Kharkov**, and as far as is known none of these slow and overloaded 'death traps' survived this battle. There is also evidence that the Stalingrad Tractor Factory produced a few similar 'tractor tanks' in 1941-42, but almost nothing is known of these vehicles.

STZ-5 High Speed Medium Tractor: The STZ-5 was one of the few gun-tractors and personnel carriers developed specifically for the Red Army. In this sense it was not first designed as an agricultural tractor and then used by the Army. However, it used the same basic tractor design as used for the STZ-3 tractor, so one could still argue about its 'agricultural heritage'. The STZ-5 is also sometimes called the STZ-NATI-2TB because its design was also finalised by the Scientific Automotive-Tractor Institute (Nauchnyi Avto-Traktornyi Institut – NATI). . . In tests during 1937 the STZ-5 proved to be reliable and to have reasonable cross-country performance. In addition its normal 'cruising' speed was now around 21kph. However, there were also problems. The three main ones were

[43] **Note:** This is a common theme!

its mediocre power to weight ratio, its relatively narrow tracks and its relatively short range. Despite its drawbacks the STZ-5 met the Red Army's basic need for a faster medium tractor to pull its regimental and divisional artillery (up to 152mm calibre) whilst also transporting the gun's crew. In 1937 it was placed into series production at the Stalingrad Tractor Factory. It was mainly issued to the Red Army's tank and mechanised divisions to tow their 76mm guns, 122 - 152mm howitzers and 76mm anti-aircraft guns. By 22 June 1941 there were **3,438 STZ-5s** in Red Army service, although the total number produced was significantly higher. Production of the STZ-5 continued through 1941 and for almost the whole of 1942, which makes the STZ-5 the only fully tracked artillery tractor in the USSR which was manufactured through 1942. A total of 9,944 STZ-5s were produced from 1937 to late 1942, and **production apparently only ended when the Germans literally reached the gates of the Stalingrad Tractor Factory.** *The numbers produced mean the STZ-5 was the most widespread Soviet artillery tractor used during WWII, which was specifically designed for the Red Army.*

The Germans pressed captured STZ-5s into service under the designation ***Artillerie Schlepper CT-3-601 (r)*** 'STZ-5'. In addition, the STZ-5 probably did more than any other vehicle to inspire the Germans to produce their own ***Raupenschlepper Ost*** (Tracked tractor East). (p. 134)

Kharkovskiy Parovoznyi Zavod (KhPZ): The Kharkovskiy Parovoznyi Zavod (Kharkov Locomotive Factory, abbreviated KhPZ) is the last factory to be included in this chapter, and is included here because it was responsible for **producing most of the Red Army's heavy artillery tractors.** (Note: this plant should not be confused with the Kharkov Tractor Factory (abbreviated KhTZ, refer to the entry above)). The Kharkov Locomotive Factory can trace its beginnings way back to 1895 when it was established to build steam locomotives. Over the next 20 odd years the factory produced around 20% of the Russian Empire's steam locomotives. After the Russian Civil War ended in 1922 and the establishment of the Soviet government in the Ukraine, the country became desperate for large tractors to start rebuilding the economy and especially agriculture. The Kharkov Locomotive Factory was quickly altered to include tractors in its production, and from 1**924 it produced the fully-tracked Kommunar tractor.** This remained in production until 1931.

In the meantime, in 1928 a tank design bureau was established at the factory which would later become the well known **Morozov Design Bureau**, and the name was altered to include the name Komintern, i.e. the Kharkov Komintern Locomotive Factory (KhPZ Nr 183). This is mentioned here because this led to the name of the Komintern medium-heavy tractor in 1934. **In 1929-30 the factory was expanded and modernised with German assistance under the conditions of 1922 Treaty of Rapallo** and the First Five Year Plan (1928-1932). By this time the factory was primarily focused on designing and **building tanks, and this is what the Kharkov Locomotive Factory is most famous for during WWII.** Nevertheless, it continued to produce the very valuable Komintern tractor until 1940, and found time to develop and produce the even better Voroshilovets heavy tractor from 1939.

***Kommunar* Medium Tractor:** The Kommunar (Commune) Tractor was the first tracked vehicle to enter production at the Kharkov Locomotive Factory. It was largely based on the 25hp Hanomag WD Z 25, which entered production in 1920 and was Hanomag's first foray into tracked tractors (apart from the prototype WD Z 20 in 1919). Possibly as part of the 1922 Treaty of Rapallo between Germany and the USSR, the engineers in Kharkov were given access to **Hanomag's design.** The Soviet engineers took some key features from the WD Z 25 design, and produced the larger and more powerful Kommunar tractor. The *Kommunar* tractor entered production in 1924 and continued in production until 1931, by which time around **3,700** had been produced. All versions of the Kommunar tractor **were slow**; the model 9G had a top speed of only 7km/h while the model 9EU had a top speed of 15km/h. This is because the Kommunar (Commune) Tractor was designed for agricultural use and a higher speed was unnecessary. **The majority of Kommunar tractors went into agriculture, but around a third of those produced eventually found their way into the Red Army**. The Model 9EU (90hp) version was able to tow a 6 tonne trailer, and was therefore capable of towing any of the Soviets' medium to heavy divisional artillery pieces (122-155mm howitzers) and many of the heavy corps artillery pieces (100-152mm guns-cannons). However, as an artillery tractor the Kommunar tractor was a long way from ideal. It was slow, had no space for

ammunition storage or crew transport, was not particularly reliable, and its non-independent and old fashioned suspension meant it had mediocre cross-country performance. In addition, by June 1941 the Kommunar tractors had been in service for over a decade, and the Red Army of the 1930s is not renowned for its equipment maintenance procedures. By June 1941 it is likely most of the Kommunar tractors were either non-operational or in dire need of a major overhaul. (p. 135)

***Komintern* Medium-Heavy Tractor:** The Kommunar tractor was always intended to be a heavy agricultural machine, and was designed and produced relatively quickly to meet this need. It is therefore not surprising that it never met the Red Army's specifications for an artillery tractor, even in the late 1920s. In 1930-31 the technical bureau of the Main Defence Industry Directorate (GUVP), along with the Head Design Bureau OAT, initiated a series of projects to develop suitable light, medium and heavy artillery tractors for the military. Naturally the 'tractor team' at KhPZ was ordered to produce a design for a heavy tractor, as they already had experience with the Kommunar Tractor. In the meantime the t**ank design bureau at KhPZ (established in 1928)** had been focusing on tank designs, and by 1929-30 they had produced the **T-12** medium tank (of which 31 were completed including a single prototype). The T-12 proved disappointing and this led to the improved 18.5 tonne **T-24** medium tank, of which 24 were produced in 1931. Unfortunately the T-24 was found to be unreliable and unsuitable, and the KhPZ tank bureau started looking closely at the alternative Christie suspension on the recently arrived Christie M1930 tanks from the USA. This ultimately led to the successful BT and later T-34 tank series.

In parallel with the tank developments at KhPZ, the GUVP/OAT demand for a new artillery tractor still had to be met. A design team headed by B.N. Voronkov was selected from the KhPZ's technical office (presumably with suitable experience on the *Kommunar* tractor) and assigned the task. They looked around for a suitable suspension and drive system, and, lo and behold, the T-24 tank system just happened to fit the bill. The initial design was called the *Komintern* (Communistic International) tractor after the Kharkov Komintern Locomotive Factory. Two prototypes were produced in November 1931 (designated BNV-1 and BNV-2, after the lead designer) but tests showed little improvement over the Kommunar tractor. Further development was undertaken (with a new and more powerful engine) by a team led by N. Zubarev, and i**n 1934 the definitive Komintern medium-heavy tractor emerged.** (p. 136)

When the ***Komintern* tractor** entered service in **1935 it was at one of the best medium-heavy artillery tractors in the world.** It was reliable, **quite fast**, able to transport cargo and/or personnel, had a good operational range, and had a reasonable cross country performance (even with a heavy load). Unfortunately, in June 1941 there were **only 1,017 of these invaluable machines in Red Army service**. They were mainly issued to the Red Army's RVGK heavy artillery regiments (corps and army artillery units), but numbers were also issued to selected tank divisions as tank recovery vehicles. Regrettably the *Komintern* tractor was only ever available in relatively small numbers which only dwindled after June 1941: there were never anywhere near enough Komintern tractors available to service more than a tiny fraction of the Red Army's needs. As one would expect, the *Wehrmacht* pressed any captured tractors into service, and gave them the designation **Artillerie Schlepper Kom-604 (r) 'Komintern'**. (p. 137)

***Voroshilovets* Heavy Tractor:** The most powerful and best all-round artillery tractor to enter service with the Red Army before, and during, WWII was the Voroshilovets (Voroshilovetz) Heavy Tractor. In the mid-1930s it was **recognised that the Komintern tractor could not effectively tow the heaviest artillery pieces in the Red Army; namely those in the category of 'super heavy corps artillery**' (200-305mm guns, howitzers and mortars). In addition it was apparent that tanks were getting heavier, and a singular vehicle capable of recovering tanks weighing more than 20 tonnes was needed. The design of the new vehicle fell to the tractor team at KhPZ in 1935, which was an obvious choice considering their now successful track record in this area. The first 2 prototypes of a new design were apparently completed as early as **1936**, and their overall layout was very similar to the *Komintern* tractor. Very early on these vehicles were named Voroshilovets in honour of K. Voroshilov, recently appointed People's Commissar for Defence and Marshal of the Soviet Union. **No one can say the KhPZ design teams didn't know what was needed to survive in Stalin's USSR!**

However it wasn't until 1938 and the advent of a suitable power source that the Voroshilovets tractor showed real promise. This power source came in the form of the V-2 diesel engine, which had just completed development at KhPZ. This was a V-12 engine and was the first successful diesel engine to be developed specifically for tanks. Later versions of this engine would become the main power unit used in most Soviet tanks produced during WWII (including T-34s). *By 1939 the Red Army had become desperate for speedy military-tractors which were able to tow 18-20 tonne loads, so the Voroshilovets tractor was ordered into series production at KhPZ in that year.* By 22 June 1941 there were **228 Voroshilovets tractors in service with the Red Army**, although it appears a considerably larger number (possibly as many as **800**) had actually been produced. If this is the case it is something of a mystery why these valuable vehicles were effectively being kept in reserve. Voroshilovets tractor production stopped at the KhPZ shortly after the German invasion, **and soon after that the KhPZ (by then concentrating on T-34 production) was evacuated to the Urals.** Limited Voroshilovets tractor production was restarted at the **Stalingrad Tractor Factory,** but ended for good in August 1942 after around 230 had been produced. Total *Voroshilovets* tractor production amounted to **1,123** vehicles, of which **528** were still in the Red Army on 1st September 1942. As with the Komintern tractors, the Voroshilovets tractors were mainly issued to the Red Army's RVGK heavy artillery regiments (corps and army artillery units), as well as to a few lucky tank divisions as tank recovery vehicles. Voroshilovets tractors were only ever available in small numbers, but their steadily dwindling numbers provided sterling service to the Red Army until 1945. The Germans captured relatively small number of these tractors and immediately pressed them into *Wehrmacht* service under the designation **Artillerie Schlepper Stalin-607 (r) 'Vorosilovec'.** (p. 138)

Soviet Halftrack Vehicles:

Most of the Soviet tractor types considered thus far were fully tracked, but the Soviets also dabbled in developing a series of light halftrack vehicles. The Soviets never committed wholeheartedly to the halftrack concept as the Germans did; by designing and building a whole series of military halftrack prime movers from the ground up. All the Soviet halftracks were much lighter vehicles adapted from existing truck designs. The structure of these vehicles was so light that they barely qualify as 'prime-movers' at all: it would be more accurate to describe them as light-cargo semi-tracked trucks. However, these vehicles usually had a **basic pin-hitch** on the rear, and were commonly used for towing light anti-tank guns, light anti-aircraft guns and other similar loads. **By June 1941 there were three types in service with the Red Army: the ZIS-22, the ZIS-33 and the GAZ-60.** Note, the production ZIS-42 (an improved version of the ZIS-22) first appeared in 1942, while the ZIS-42M first appeared in 1944. (p. 139)

Tractors in the Soviet FILARM Model:

In the Soviet Personnel and Equipment Resource Database a 't**ractor' is defined as a fully or semi-tracked prime-mover, or a wheeled agricultural tractor, with at least a 1 tonne (1,000kg) towing capacity**. With this definition all the 'tractors' discussed in the previous entries qualify, including the light wheeled agricultural tractors and the light truck based halftracks. **The Soviet war mobilisation plan called for most tractors on collective farms and in the civilian economy to be removed for military use after mobilisation started.** The Red Army required around **92,000** tractors in its mobilisation plan, while **42,000** were available in the Red Army on 22 June 1941. Unfortunately, after June 1941 many of the vehicles never had time to show up due to the speed of the initial German advances and the general repair state of the overall tractor park. Also, many of the tractors that did appear were just in time to be overrun by enemy forces. (p. 142)

Nevertheless, the Red Army still possessed more tractors or prime movers than any of the world's armies in June 1941, and considerably more than the invading German Army. Approximately **23,470 tractors were allocated to combat units and immediately available in the Western Military Districts and Stavka Reserves in June 1941** (i.e. Deployed (D) in the Soviet FILARM model). In all, the Red Army had **26,040** tractors in the Western Military Districts and Stavka Reserves at this time, compared to approximately 10,750 light, medium and heavy German

halftrack prime-movers in the invading force. However, all the *Wehrmacht* halftracks considered were military grade vehicles (produced for specifically the military as prime-movers since the 1930s), **while the Soviet tractor park was much more varied and mostly made up of commercial and/or agricultural vehicles.**

If we analyse the data shown in table Sov Tractors June 1941, we find the following in relation to the Red Army's tractor inventory in June 1941:

● **32%** (approximately 13,280 tractors) could be considered 'military grade' prime-movers and were produced specifically for the military. This includes obsolete tank/tankette chassis' used as tractors. These were the T-26, T-27, T-20, S-2, STZ-5, *Komintern* and *Voroshilovets* tractors. Of these, 84% (approximately 11,110 tractors) were light tractors suitable for pulling only light artillery, such light anti-tank guns or similar loads.

● **16%** (approximately 6,850 tractors) **were fully-tracked commercial/agricultural tractors**, produced primarily for agriculture and industry. These were the STZ-3, S-60. S-65 and *Kommunar* tractors. These tractors were all slow (7-15kph) and with very limited range (60-80km). They were not designed for harsh operational conditions (eg, continuous use, low maintenance, bad weather, and other combat conditions). They could however pull medium to heavy loads.

● **43%** (approximately 18,000 tractors) **were small wheeled commercial/agricultural tractors**, produced primarily for agriculture (i.e. farm tractors). These were mostly SKhTZ 15-30 and a few Fordson tractors. These tractors were slow (c. 7kph), and with very limited range (c. 80km). They were only suitable for pulling light artillery or similar loads, and were not designed for harsh operational conditions.

● **9%** (ca. 3,880 vehicles) **were light truck-based halftracks**. They were designed for industrial and limited military use, and were suitable for pulling only light artillery or similar loads. They were reasonably effective in mud and snow, but were still not designed for long use in harsh operational conditions. (p. 142)

As with trucks and light-transports, it is again instructive to examine how the number of authorised tractors (i.e. in TOEs) changed for the various division types mobilised during 1941. The **TOE for a 5th April 1941** Soviet Rifle Division called for **99** tractors, while the new **TOE for a 29th July 1941** Soviet Rifle Division called for **only 5 tractors!** The Soviets therefore effectively eliminated tractors from their newly mobilised rifle divisions. In the pre-war rifle division the medium artillery regiment, the anti-tank battalion and the anti-aircraft battalion were all meant to be fully motorised; while in the post-invasion rifle division only the anti-aircraft battalion remained motorised. All other battalions switched to being horse drawn. *Significantly, **many pre-war rifle divisions** in the Western Military Districts in June 1941 appear to have actually had most of their required tractors.* For example, the Special Western Military District (Western Front) had 5,706 tractors, and the Kiev Special Military District (Southwestern Front) had 8,144 tractors on 22 June 1941. However, *their state of repair was dubious and the bulk of these tractors were not the superior military designs discussed above*. (p. 143)

The **TOE for a pre-war Soviet tank division called for 84 tractors**, while the TOE for the newly mobilised Soviet tank division (10th July 1941) called for **72** tractors. Obviously the Soviet high command had to keep the new tank divisions as mechanised as possible. Interestingly, the strength reports for the mechanised corps in the Western Military Districts on 22 June 1941 **indicate that many tank and mechanised divisions were worse off for tractors than some rifle divisions**. For example, the entire 14th Mechanized Corps (two tank divisions and a mechanized division with a TOE of 328 tractors) had only 99 tractors on strength. The 17th and 20th Mechanized Corps had only 40 and 25 tractors on strength, respectively. All these mechanized corps were in the Special Western Military District on 22 June 1941, **where the rifle divisions had an average of around 61 tractors each.**

At first glance this is somewhat surprising, as one would imagine tank and mechanised divisions would have had priority for all types of prime movers. There are two likely explanations. Firstly, it is probable that many of the newly mobilised tank and mechanised divisions were so new that the powers that be hadn't yet had time to

redistribute the existing tractors from established divisions (the rifle divisions were generally much older formations, with several dating back to 1918). Secondly, it is likely that the tractors in the rifle divisions were obsolescent and/or unsuitable agricultural types, and the newly forming mechanised corps preferred to wait for new production. **Whatever the reason, these still forming mechanized corps were caught in a relatively immobile state due to the lack of tractors (and trucks) when Army Group Centre struck.**

* * *

2. Soviet Aircraft in 1941

2A. Fighter Aircraft

For the purposes of the FILARM model, fighter aircraft are defined as **aircraft that only carry MGs and or cannon**, with the primary mission of intercepting enemy aircraft.

a. Polikarpov I-16:

On 1st June 1941 there were no less than **4,262** Polikarpov I-16s fighters in service with first line units in the Soviet VVS (*Voyenno-Vozdushnye Sily* - Military Air Force). *The I-16 was by far the most numerous combat aircraft type in service with the VVS*, and by far the most numerous combat aircraft in service with any air force in the world (Note: the VVS was easily the largest air force in the world at that time). From a strategic and operational viewpoint, the sheer numerical predominance of the I-16 made it the most important fighter fielded by the VVS during Operation Barbarossa. Although the Soviets were in the process of replacing the I-16 and I-15 fighters with more modern MiG-3s, Yak-1s and LaGG-3s, these fighters were not fielded in sufficient numbers during 1941 to alter this balance.[44] (p. 150)

The I-16 has several other more well-known claims to fame. **It was the world's first cantilever low wing monoplane fighter with retractable undercarriage to achieve active service**, and was one of the first with an enclosed cockpit.440 As such, the I-16 was an extremely advanced design for its time and it remains somewhat a mystery why its designer, Nikolai Polikarpov, insisted on continued development of biplane fighters (the I5bis and I-153, refer entries on these subjects below). There is strong evidence that this was a mistake: **if the Polikarpov OKB had worked solely on a monoplane fighter replacement for the I-16 (instead of the I-153 series), then it is possible the Soviet lead in monoplane fighter design would not have been lost by the time WWII started.**

I-16 Type 5s were sent to Spain in October 1936 with the first recorded combat occurring on 13 November 1936. It soon showed itself to be faster and capable of out climbing any other fighter in Spain at that time. However, the I-16 also proved to be less manoeuvrable than the I-15 and the opposing Fiat CR.32s, **which likely contributed to the Soviets persisting with biplane development**. In hindsight it is hardly surprising that the first monoplane fighters were less manoeuvrable than the highly developed and robust biplane fighter designs of the time. Nevertheless, the age of the biplane fighter was rapidly coming to an end. (p. 152)

In the spring of 1937 **I-16 Type 6s began arriving in Spain** to reinforce the Republican forces. Unfortunately the Type 6 weighed around 200kg more than the Type 5 due to the need to strengthen the airframe (because of weaknesses found in service, especially in the wings), which was not compensated for by the marginal increase in power from the uprated M-25A engine. The I-16 Type 6 ended up with an inferior climb rate, and was only able to achieve 440kph (273mph) at 3,000 metres and 390kph (242mph) at sea level. This was not good because around this time (March 1937) **the faster Messerschmitt Bf 109B was beginning to appear in the skies over Spain.** In all, **278 I-16s were delivered to Spain from 1936 to 1938**, inclusive; including 129 I-16 Type 10s (refer below) (p. 152)

Although the ShKAS MG possessed a very high rate of fire, **the two MG armament on the I-16 Type 1 to Type 6 was always considered too light.** This view was also strongly supported by **combat experience in Spain**. Some Type 4s were retrofitted with the new 20mm ShVAK cannon still being developed and two nose mounted ShKAS MGs, but this remained at the experimental stage. In late 1937 the I-16 Type 6 was withdrawn from production and replaced with the more heavily armed I-16 Type 10. The Type 10 retained the two wing mounted MGs, while 2 synchronised 7.62mm ShKAS MGs (each with 650 rounds) were added to the nose. . . Around 30 I-16 Type 10s

[44] **Note:** The total number of MiG-1, MiG-3, Yak-1 and LaGG-3 deployed with the VVS on 1st June 1941 was **1,385.**

were sent to Spain in March-April 1938, followed by 99 more later that year. However, it was soon apparent that the only real improvement over the Type 5/6 was in armament. (p. 153)

Since 1936 the Polikarpov OKB had been experimenting with **placing a heavier cannon armament on the I-16**. In 1936 production of the 20mm ShVAK (Shpital'nyy-Vladimirov Aviatsionnaya Krupnokalibernaya – Large-calibre Aircraft Cannon) cannon started. This immediately led to the semi-experimental **I-16 Type 12**, which incorporated 2 20mm ShVAK in the wing centre section and synchronised to fire through the propeller arc. The Type 12 is also known as the I-16P (Pushechnyy – Cannon). Further development of the I-16 Type 12 led to the **I-16 Type 17**, *which was intended primarily for the ground support role*. The I-16 Type 17 was essentially a Type 10 armed with two wing mounted 20mm ShVAK cannon with 150 rounds per gun, 2 nose mounted ShKAS MGs, and provision for a fuselage mounted 200kg bomb. . . A total of **341 I-16-Type 17s** were built from 1938 to 1939, with the first delivers to the VVS in late 1938; in time to participate in the **Soviet-Japanese Battle of Khalkhin Gol on the Manchurian-Mongolian border (May to September 1939). . .**

The **Type 18 and the Type 27** were always seen as interim types; until the M-63 engine became available. This led to the **I-16 Type 24**, which was initially fitted with the M-63 engine. The M-63 Type 24 underwent State trials during August and September 1939, and was able to attain **440kph** (273mph) at sea level and **489kph** (304mph) at 4,800m. . . **By 1941** the **Type 24, 28, and 29 could also be fitted to carry 2 100kg bombs or up to 6 RS-82 rockets**, in place of the 2 100 litre underwing fuel tanks. The rockets were a later development. The Type 18 and Type 27 were also able to carry these weapons (possibly retrofitted later, especially the rockets) as they had the underwing mountings. (Note, the earlier Type 17 did not have the 'wet points' for the underwing fuel tanks, and could not carry wing mounted bombs or the RS-82 rockets. It was fitted to carry a fuselage mounted bomb). (pp. 154-55)

When I-16 productions stopped in 1940 (or possibly early 1941), a total of **6,555** I-16s and **1,895** I-16 UTI trainers had been built. Of these, only **734** were equipped with 20mm ShVAK cannon. Rather surprisingly, production of the I-16 was reinstated after Barbarossa started and a further 450 were produced in 1941; bringing total I-16 production to **7,005** aircraft. This was due to delays in retooling for a more modern aircraft, and possibly the availability of M-62 and M-63 engines and other I-16 parts. The Red Army's desperate need for ground attack aircraft, and the **I-16's now very limited capability as a fighter**, meant that most of the 1941 production focused on more heavily armed assault aircraft. The I-16s produced after June 1941 were mostly I-16 Type 27 and Type 29, and only around half of the 450 I-16s produced in 1941 had 20mm cannon. Some sources refer to the I-16s produced after June 1941 as I-16 Type 30s.

In conclusion, despite the increases in I-16 engine power and armament, many VVS pilots believed all variants of the I-16 subsequent to the Type 10 were retrogressive, and adversely affected the I-16's powers of manoeuvre. Consequently, later models of the I-16 may have had increased effectiveness as a 'bomber destroyers' and ground attack aircraft, but their potency in fighter vs. fighter combat was reduced. The airframe had effectively reached its development potential and even extensive modifications did little to improve its performance as a fighter. Only **734 (11%)** of pre-war I-16 production had 20mm cannon and fewer than 14% (954) of the total I-16s ever produced had 20mm cannon. By far the most common I-16 fighter type in service during 1941 was the Type 10. The second most common I-16 type to see service was the **Type 5** with only 2 7.62mm ShKAS MGs. Note, the I-16 Type 24 is also included in these tables under this classification of fighter-bombers. (p. 156)

On 1 June 1941 there were **4,262 I-16** fighters in VVS service. Of these, 3,643 were assigned to the VMF-KA (Army) forces and 619 were assigned to the VVS-VMF (Naval) forces. Of this total, **2,153 (51%)** I-16s were assigned to the Western Military Districts, with 1,771 assigned to VVS-KA combat units deployed in the Western Military Districts, and 382 assigned to VVS-VMF combat units deployed in the Western Military Districts. I-16s therefore represented **39% of all the fighters deployed in the Western Military Districts** (including naval forces). On average, just over 1 in every 2 fighter regiments (IAPs) in composite air divisions (SADs) and fighter air divisions (IADs) were equipped with I-16s. (p 157)

When the *Luftwaffe* attacked the Western Military District airfields on 22 June 1941, most of these fighter regiments suffered extreme losses on the ground. Of the 1,043 fighters available to the Western Special Military District, at least 387 (37%) were completely destroyed on airfields on 22 June 1941, and around the same number suffered various degrees of damage. The fighter units in the Baltic and Kiev Special Military Districts did not fare much better. The *Luftwaffe* bomber units repeated these airfield attacks during the following week; destroying any damaged aircraft and facilities they could find, and any they had missed in the initial attacks. As a result, within a week the large majority of VVS fighter regiments (IAPs) deployed in the West in June were either inoperable (decimated and/or with no aircraft) or were fighting a rear guard action with only a handful of serviceable fighters.

For example, the 122 IAP / 11 SAD in the Western Military District managed to escape 22 June 1941 relatively unscathed and even claimed 4 German aircraft shot down. The entire regiment then moved further east away from the border to an airfield at Lida in Belorussia. Shortly thereafter, German Ju 88 bombers found them there and the entire aircraft complement of the regiment was wiped out: they lost 69 I-16s as well as suffering heavy casualties to the pilots, ground crews and the loss of their commanding officer. **Within two days of the invasion, the Western Military Districts had only 937 I-16s left (representing a loss of 1,216 I-16s or over 56% of the initial force)**. By 30 June 1941 the number of I-16s in the Western Military Districts had shrunk to 873 including at least 99 damaged aircraft. This was despite numerous fresh IAP regiments arriving as reinforcements from the Internal Military Districts and being assigned to one of the (newly formed) Western Fronts. (pp 157-58)

When air to air combat did occur in the summer of 1941, there were **occasions where I-16 pilots managed to exploit the manoeuvrability of their aircraft and inflicted significant losses on Luftwaffe units**. It has to be said that Russian authors generally go to great lengths to highlight these instances, even though they seem to invariably involve individual pilots, and most often those with exceptional piloting skill.[45] However, when considered at a more macroscopic level, it is very apparent that all versions of the I-16 were outclassed by their main fighter opponent: the Bf 109F and E. **First and foremost was the problem of relative speed, climb rate and dive rate.** The less common Bf 109E-3/4 (with 2 20mm cannon) had a top speed of **560kph**, while the Bf 109F-2 (with a **15mm cannon**) could reach **600kph** and the Bf 109F-4 (with a 20mm cannon) could achieve **624kph**. The BF-109F-2 was the most common *Luftwaffe* fighter initially fielded, and we can see that this was **111kph faster** than the I-16 Type 24's best (clean) test speed and some 138kph faster than the Type 24 production aircraft. . . **In addition the Bf 109 could climb faster and dive much faster, and generally operated at higher altitudes.** Thus the *Luftwaffe* pilots usually enjoyed the height advantage (and therefore the initiative), which is critical in air to air fighter combat. . .

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[45] **Note:** Unfortunately, it seems that **most Russian focused authors, even today, make the most ludicrous statements regarding *Luftwaffe* losses during Operation Barbarossa**. Their statements are based entirely on apparent VVS unit claims without any attempt at verification of actual *Luftwaffe* losses. Even worse, the Russian sources for the (unverified) VVS claims are almost never referenced: they seem to be loosely based on second hand accounts of the VVS pilots involved (even these 'memoirs' are suspect as they are almost never referenced). For example; M. Maslov, Polikarpov I-15, I-16 and I-153 Aces, Osprey Publishing, Oxford, UK, 2010. In only one page (p.70) Maslov states 33, 21, 15, 10, 55, 67, 122, 127 and 123 IAP shot down no less than 87 German aircraft on 22 June 1941. Maslov states the number shot down by each IAP (no references supplied). The figure of 87 is based on the claims by only 9 IAP units in the Western Military Districts out of 68 IAP and 15 IAP PVO regiments deployed in these districts. The most thoroughly researched source of German *Luftwaffe* losses on 22 June 1941 is from: *Germany and the Second World War, Volume IV: The Attack on the Soviet Union*, Boog, H., et al. (German Research Institute for Military History at Potsdam), Oxford University Press, New York, 1996, p. 764. The actual individual OKL archival documents on daily reports are quoted. They reveal the *Luftwaffe* lost only 35 aircraft written off as total losses by 23 June 1941 (across the whole East Front). Thus according to Maslov, these 9 IAPs (alone, out of 83 fighter-regiments deployed) shot down 2.5 times more aircraft than the *Luftwaffe* actually lost across the whole front! Unfortunately, this is only one of literally hundreds of such examples that litter works by respected aviation authors like Y. Gordon, A. Mikhailov and M. Maslov. **It appears such authors make no serious effort to verify (apparent) VVS pilot and unit claims against existing *Luftwaffe* archival documents on actual losses.**

On top of all this were the **I-16's capabilities against German bombers and reconnaissance aircraft** during 1941-42. As examples, consider that the German Ju 88A-4 could reach 470kph, the He 111H-6 could reach 405kph, and the Ju 88D-1 reconnaissance aircraft could reach 484kph. This means none of the production I-16s could catch the Ju 88D-1 from behind, and almost all types would struggle to catch the Ju 88A-4. Generally, an I-16 would need to approach these aircraft from a favourable angle or/and by diving down from above. This was often difficult as **these bombers cruised at 5,500-7,000m altitude even when loaded**. Ironically, the Ju 88s (and to a less extent the Dornier 17Zs) were doing to the Soviet air defences what the Soviet pre-war planners had hoped the Tupolev SB bombers would do to the German air-defences: namely operate deep behind the enemy lines without fighter protection and using speed as the primary defence. **The I-16 could catch the considerably slower He 111H**, but even then they didn't have that much air speed to waste. Even the lighter I-16 Type 10 was only 38kph faster, which meant the relative approach speed was low (unless diving down at a steep angle). This gave any defensive gunners a much better chance of hitting any approaching fighter. It should be noted that **by June 1941 the He 111H had considerably more defensive firepower than the He 111P had over Britain in 1940**. Over the East Front a year later it was packing a **20mm MG FF cannon** (protecting the frontal arc), a **13mm MG131** heavy machine gun in the dorsal position, and **6 other 7.92 MGs**. In addition, we have seen that only around 11% of the I-16s produced in the per-war period had any 20mm cannon, and these I-16s were slower than the lighter MG armed versions. *Thus the vast majority of I-16s had to engage German bombers with MGs only, and MG ammunition is notorious for needing a great many hits to bring down a well-designed bomber. This is especially true for bombers with **self-sealing fuel tanks** and similar protection systems.* (p 159)

These facts are not presented here simply to denigrate the I-16 as obsolete. It is to ensure the reader understands that in 1941-42 the **VVS pilots were labouring under the weight of superior enemy technology (as well as training and experience).** It is also to explain why the German twin engine bombers were able to operate for so long over the Eastern Front in daylight and with minimal (usually none) fighter escort, and whilst suffering what can only be described as an acceptable loss rate.

By the end of 1941, the **VVS had lost or totally written off approximately 21,200 aircraft including 9,600 fighters (with 5,100 of the fighter losses classified as 'combat losses' and the rest as 'operational losses'**). In the same period the *Luftwaffe* lost around **3,767** aircraft as lost or totally written off on the East Front (including combat and operational losses), and of these around a third (1,240) were fighters. This equates to an overall **Luftwaffe fighter kill/loss ratio in the region of 7.7 to 1** across the whole East Front from June to December 1941. If we estimate that three quarters of the *Luftwaffe* fighter losses were due to VVS fighters, around half the VVS fighter losses were due to Luftwaffe fighters, and that both sides suffered the same proportion of operational losses, then the ***Luftwaffe* fighter kill/loss ratio drops to around 5.2 to 1** for the period June to December 1941. This kill/loss ratio is what we would expect given the respective aircraft's OCPC values, and given the average *Luftwaffe* fighter pilot's more extensive training and combat experience in 1941.

Of the 9,600 Soviet fighters lost, at least **35% would likely have been I-16s** which equates to around **3,360** aircraft (or around **48%** of total production). Thus around **71%** of the I-16s in VVS first line units in June 1941 (i.e. 4,262 aircraft), and the 1941 new production (i.e. 450 aircraft), had been lost or written off by the end of 1941. As the VVS is known to have had around 1,300 I-16s still in service in early 1942 (excluding training I-16s), then this correlates correctly with the I-16 loss figures (above). The I-16 was rapidly replaced during 1941 and 1942 by more modern fighters such as the Yak-1, LaGG-3 and MiG-3, but it remained operational in many IAP regiments throughout the 1942 Soviet winter offensive and even into 1943. As with the I-153, many surviving I-16s were fitted to carry bombs and/or rockets and were used as low-level fighter bombers. By 1943 the last I-16s had been withdrawn from front-line service. (p 159)

b. Curtiss P-40

The Curtiss P-40 is included here because on **12 October 1941 the first British convoy to the USSR (PQ 1)** arrived at Archangelsk with **195 P-40/Tomahawk fighters**. Of these, 146 were Tomahawk IIA from Britain and

49 were P-40B from the USA. Despite a considerable number of quality control and readiness issues, *these aircraft were almost immediately put into VVS service to see action in the last few months of 1941*. A total of 315 western supplied fighters were accepted by the VVS in 1941 and used in combat units, and as many as 247 were P-40Bs or Tomahawk IIAs.

2B. Fighter-Bomber Aircraft

a. Polikarpov I-15

A group of designers led by **Nikolai Polikarpov** designed the Polikarpov I-15 biplane fighter in 1933, under the project designation TsKB-3 (*Tsentralnoye Konstruktorskoye Byuro* or Central Design Bureau - 3). It is interesting to note that around this time this remarkable designer was also working on the very advanced Polikarpov I-16 monoplane fighter. In many ways the TsKB-3 was a development of the successful Polikarpov I-5 biplane which was still in series production (803 produced to 1934). (p. 161)

Upon completion of its State trials the TsKB-3 was still ordered into production at Zavod 39 and 1 (both in Moscow) with the designation **I-15**, and the first pre-production aircraft were **delivered in November 1934**. Some production I-15s were powered by SR-1820-F3 Cyclone engines, but due to lack of engines a locally built 480hp Shvetsov M-22 radial engine was used. This was a step backwards because the M-22 was the engine used in the late model I-5s (which the I-15 was meant to replace). This was also the engine used to power the I-16 Type 1. **The M-22 I-15 had a reduced top speed of 347kph (215mph) and it now took 11 minutes to reach 5,000m versus 6.1 minutes in the Cyclone powered I-15**. These production I-15s were armed with 2 7.62mm PV-1 MGs, and provision was made for up to 4 10kg bombs. A total of 59 Cyclone powered I-15s and 404 M-22 powered I-15s were built from 1934 to late 1935.

Unfortunately some senior VVS officials had never been happy with the I-15, and they continued to complain about its instability at speed and its poor pilot vision. The NII-VVS even claimed that the I-15's poor longitudinal stability ensured an unstable gun platform and made accurate shooting difficult. 507 Polikarpov defended the design, but the ongoing discontent resulted in no I-15 production during 1936. In the meantime, manufacture of the Shvetsov M-25 radial engine (a licensed production version of the SR-1820-F-3 Cyclone) had commenced in the USSR. This engine was able to deliver 700hp at 2,300 metres, and was also used in the I-16 Type 5. In early 1937, 2 I-15 prototypes were produced with the M-25 engine (even though the very first M-25 prototype had been tested in an I-15 as early as November 1935).

Development of the I-15 continued, **mainly at Zavod 1 in Moscow**, and (apart from the engine upgrade) a number of changes were soon incorporated. These included: an increase in armament to 2 wing mounted MGs and 2 nose mounted (synchronised) PV-1 MGs, the facility to have up to 6 rockets under the wings (experimental and only on some aircraft) and the addition of a 9mm armour plate to the cockpit seat for pilot protection. Unfortunately the increase in weight meant the M-25 I-15 had only a marginally better performance than the M-22 powered machine. Nevertheless, I-15 production recommenced in 1937 and the last 270 I-15s produced in the USSR had M-25 engines. This brought total I-15 production in the USSR to 733 aircraft from 1934 to 1937 (excluding prototypes).[46] (pp 161-62)

Starting in October 1936, a total of **155 I-15s were delivered to the Republican forces in Spain**, and an additional 237 machines were licence produced in Spain by CASA. The Spanish machines were mostly powered by Soviet built 700hp M-25 engines, but a few had the improved 750hp M-25V engine (also used in the I-16 Type 10). Other sources state that only 116 I-15s were delivered to Spain, and 287 machines were produced in Spain. **In June 1941 there were still several hundred I-15s present in VVS fighter regiments, but most of these were**

[46] **Note:** Purnell's Illustrated Encyclopedia of Modern Weapons and Warfare: Part 69, Phoebus Publishing Co, London 1979, p. 1361. Also W. Green, G. Swanborough, The Complete Book of Fighters, Greenwich Editions, London, 2004, p. 473.

deployed in the Internal Military Districts and not the Western Military Districts. One primary source states there were 707 I-15s in the VVS, of which 633 were in the VVS KA (Army) and 74 were in the VVS-VMF (Naval), but only **105** were deployed in the Western Military Districts.[47] Whatever the exact numbers, by June 1941 the I-15 was obsolete as a fighter, and was generally easy prey for any of the Luftwaffe fighters entering the USSR. (p 162)

b. Polikarpov I-15bis (I-152)

As already mentioned, since 1934 the NII-VVS had never been happy with the I-15, and I-15 pilots continued to complain that the gulled upper wing obstructed the pilot's view on take-off and landing. After some debate the Polikarpov design bureau was ordered to produce a version of the I-15 with a straight (conventional) upper wing centre-section. (p. 163)

The new design was initially designated the TsKB-3bis, and led to a prototype being produced at **Zavod 39** in the spring of 1935. This was almost immediately designated the I-15bis. **The bis designation, meaning 'improved' (or second**), was used because it was envisaged this was merely an improved I-15. The I-152 designation was reserved for what was meant to be the next major redesign. However, the first I-15bis prototype very quickly demonstrated that the increase in the aircraft's weight, speed, climb rate and wing loading were unacceptable, and that in order to change the upper wing on the I-15 a major redesign would be required. **For this reason the resulting aircraft is often called the I-152 in modern literature, but its official designation remained the I-15bis.**

However the I-15bis must have been more popular with pilots, because, despite its limitations, it was soon *approved for series production* with the M-25V engine and an armament of 4 7.62mm PV-1 MGs. Production commenced at **Zavod 1 (in Moscow)** in mid-1937, although initial production aircraft were forced to use the slightly inferior M-25 engine. By late 1937 the production rates had ramped up, and by now the M-25V engine was being installed as standard. In addition, (in 1938) I-15bis production aircraft had their fuel capacity increased from 260 to 310 litres, and were f**itted to carry up to 2 50kg of bombs on wing mounted bomb racks**. Alternatively, 2 80 litre external fuel tanks could be carried in place of the bombs.

One of the first recipients of the I-15bis was the **Chinese government which received 272 aircraft from late 1937 to 1938. An additional 31 I-15bis arrived in Spain in January 1939** and a further 62 were sent too late to be received by the Republican forces (20 of them were released by the French to the victorious Nationalist forces). Prior to WWII the main area of conflict involving the I-15bis was **along the Mongolian-Manchurian border areas.** During various border clashes with Japanese in late 1938, it was found that the I-15bis was inferior to the new Nakajima Ki-27 in air to air combat. The Ki-27 monoplane, which entered service in 1938, proved to be considerably faster at all levels and almost as agile: **the whole future of biplane fighters was now seriously in doubt. . .** but all production was terminated in early 1939 in order to concentrate on the superior I-153. By this time, **2,408** I-15bis/I-152 aircraft had been produced, including all variants. (p. 163)

On 1 June 1941 there were **1,231** I-15 and I-15bis fighters in VVS service. Of these, 939 were assigned to the VMF-KA (Army), 292 were assigned to the VVS-VMF (Naval), and **399 (32%) were assigned to VVS-KA combat units deployed in the Western Military Districts**. Most I-15/I-15bis were assigned to IAP units alongside I-153s and I-16s, and those that survived the initial *Luftwaffe* onslaught on the VVS airfields in the west were immediately thrown into the fray. It was quickly apparent these aircraft were unable to face the *Luftwaffe* fighters on anything like even terms, and consequently most surviving I-15bis were soon relegated to light ground attack roles (if they remained with front-line units at all). This however did not prevent most of these aircraft from

[47] **Note:** *Boyevoi i chislennyi sostav Sovetskoy Armii* (Combat and numerical strength of the Soviet Army), Volume. 1., (A. Kiyan, (**www.rkka.ru)**). **Translation by AMVAS (www.rkkaww2.com).**

being rapidly annihilated, **so that by the end of 1941 the I-15bis (and I-15) had all but disappeared from front line service.** (p. 164)

c. Polikarpov I-153

In the early stages of the Spanish Civil War, pilots flying the I-16 had encountered some difficulty in combating the **nimble Fiat CR.32 biplane**. The CR.32 pilots would employ classic high-g manoeuvring dog fight tactics in which the monoplane was at a distinct disadvantage. The I-16 pilots often allowed themselves to be drawn into this type of aerial combat (possibly because most of them had trained on biplane fighters), and failed to take advantage of the superior speed and diving capabilities of the monoplane fighter. Strong factions in the VVS had always opposed the radical changes in fighter design policy brought on by the introduction of the I-16, and early experience in Spain appeared to vindicate their position.

In July 1937 the question of the direction of future fighter development was made the subject of a special meeting of the Central Committee of the Party, the UV-VS (*Upravlenie Voenno-vozdushnikh Sily* – Administration of the Air Force), and several senior aircraft industry figures; **with Stalin himself presiding**. *The result of this meeting was that the development of biplane fighters should be reinstated, and Polikarpov, then the most respected fighter designer in the USSR, was assigned the task of producing a potent new biplane fighter.* This was just as well because it appears Polikarpov himself had major doubts about the future of monoplane fighters. This is quite extraordinary when one realises that the Polikarpov bureau had just produced the world's first cantilever low-wing monoplane fighter with retractable undercarriage to achieve active service. **In addition, by mid-1937 the German Bf 109B was already starting to demonstrate its superiority in Spain** (largely because of the way the Condor Legion pilots used their aircraft), *but these happenings were seemingly ignored by the Soviet hierarchy*. **The Soviets were about to 'shoot themselves in the foot' and waste the potential technological lead they had built up in the monoplane fighter field.** (p. 164)

Shcherbakov choose to revert to the gulled upper wing configuration used on the original I-15, because the aerodynamic, wing loading and weight saving benefits were overwhelming (the I-15bis never did 'recover' from having a straight upper wing). . . The basic I-15bis fuselage structure was kept, but the frame was made of several types of light steel alloy, and the whole structure was extensively restressed. **The only real concessions to modernity** were a manually driven retractable undercarriage (raised and lowered by the pilot with a hand crank), and an 8mm armour plate on the bulkhead behind the cockpit. Early aircraft were powered with a Shvetsov M-25V radial engine, which could produce 775hp at sea level and 750hp at 2,900 metres. *This was the same engine used in the later production I-15bis, the I-16 Type 10 and the I-16 Type 17*. The I-153's armament consisted of 4 7.62mm ShKAS MGs in the nose with 650 rounds per gun, and 2 50kg bombs or 6 82mm RS-82 rockets. Provision was also made to carry 2 100 litres underwing fuel tanks in place of the bombs. (p. 165)

Two prototypes were produced at **Zavod 1** (in Moscow). . . The first prototype flew in May 1938 and the second one first flew in mid-June 1938. State trials of the M-25V I-153 were conducted during late September and October 1938, and showed the new fighter was capable of 360kph (224mph) at sea level, 425kph (264mph) at altitude, and could reach 5,000m in 6.1 minutes. This outperformed the I-15bis, and the new fighter also proved easy to fly with exceptional manoeuvrability. Both I-153 prototypes completed their testing in the autumn of 1938, and the VVS pilots soon resorted to the old Chaika (Seagull) name. It should be pointed out, however, that the M-25V powered I-16 Type 10 had a top speed of 448kph (278mph) and it had been in series production since late 1937, while the **German 730hp Bf 109C-1 (a handful of which had been shooting everything down in Spain since the spring of 1938)** had a top speed of 470kph (292mph).

Despite the I-153's 'modest' speed performance and other warning signs that the **era of the biplane fighter was coming to an end**, the I-153 was quickly placed into series production at 2 large factories: Zavod 156 and Zavod 1 (**both near Moscow**). In 1938-39 the VVS had initiated a rapid expansion of its fighter arm, and the new fighters were urgently needed for the many newly forming IAPs (*Istrebitel'nyy Aviatsionyy Polk* – Fighter Aviation

Regiments). . . Production M-25V I-153s were only able to achieve a top speed of 415kph (258mph) at 3,000m, which was much slower than most monoplane fighters then entering service. The first deliveries of the I-153 to operational VVS units began in early **May 1939**.

May 1939 was also the month that **things really heated up on the Manchurian-Mongolian border**, with an undeclared war breaking out between Soviet and Japanese forces. Soviet VVS forces and Japanese Army Air Forces became involved in prolonged aerial battles, **and as in Spain the I-16 fighters had trouble with a more nimble enemy** aircraft: in this case it was the Nakajima Ki-27 monoplane fighter. The I-16 had a slight advantage in top speed and diving capability, but the Ki-27 was more agile, and the I-16 pilots continued to attempt to fight the Ki-27 using close-in high-g manoeuvring dogfights. It was thought that the solution would be the new and even more manoeuvrable I-153, **so 20 I-153s (fresh from Zavod 156) were sent to join 70 IAP in June 1939.** The first combat with Nakajima Ki-27s took place on 25th July, and the Soviets claimed 4 Ki-27s shot down without loss. However, as time went on the I-153 showed no significant manoeuvring advantage over the Ki-27 monoplane, and the latter had the additional benefit of greater speed and climb rate. *Very soon the Japanese Army Air Forces was consistently achieving a higher kill to loss ratio than the VVS, including against the relatively few I-153s on this front.* (Interestingly enough, the Japanese Army wasn't doing anywhere near as well on the ground!). Tactically it was found that the I-153 was most effective when operating with the I-16, which of course defeated the whole purpose of the I-153 as a fighter (**i.e., any fighter should never have to work in concert with another aircraft type to be effective as an air-superiority fighter**). The 'writing was clearly on the wall', even for the most avid biplane protagonists in the VVS.[48] (pp 165-66)

Although it was now obvious that the reasoning behind the continued development of biplane fighters was fundamentally incorrect, the I-153 was soon in full production with around 48 aircraft rolling off the production lines each week. The VVS's expansion momentum could not be reversed, and the I-153's mostly tractable aerodynamic qualities made it ideal for inexperienced pilots to continue their training in the many newly forming IAPs. **As it would take some time to develop new fighters and gear up the factories to produce them, the Soviets had no recourse but to continue the I-153 manufacturing program.** In the meantime efforts were made to improve the I-153 by using the more powerful Shvetsov M-62 nine-cylinder radial engine. . . Following the incorporation of the M-63 engine, there were no additional major subvariants of the I-153 produced, and production proceeded at a remarkable rate until around December 1940.

During its 19-20 month production run a total of **3,437 I-153s** of all types were produced. Of these, approximately 88% (3,018 aircraft) were fitted with the M-62 engine, and **93 were delivered to China in 1940 to fight the invading Japanese**. This meant that, **despite manifest obsolescence, the I-153 was numerically the second most important fighter in the VVS inventory in June 1941**. (p. 167)[49]

On 1 June 1941 there were **2,893** I-153 fighters in VVS service. Of these, 2,630 were assigned to the VMF-KA (Army), 263 were assigned to the VVS-VMF (Naval), and **1,513** (52%) were assigned to VVS-KA combat units deployed in the Western Military Districts. Close to 1 in every 2 fighter regiments (IAPs) in composite air divisions (SADs) and fighter air divisions (IADs) were equipped with I-153s. Consequently, when the *Luftwaffe* struck on 22 June 1941, these units suffered very heavy losses on the ground. Some I-153 units deployed near the border were virtually wiped out on the first day. For example, the 74th Attack Air Regiment (74 ShAP) in the Western Special Military District lost its entire complement of aircraft, including all of its 47 I-153 and I-15bis. Of the **1,043** fighters available to the **Western Special Military District**, at least 387 (**37%**) were completely destroyed on the ground on 22 June 1941, and around the same number suffered various degrees of damage. The fighter units in the Baltic and Kiev Special Military Districts fared only a little better. (p. 167)

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[48] **Note:** So, the Soviets stuck with **biplane** types through the end of the 1930s—even their great aircraft designer **Polikarpov** was a proponent of the biplane. This helped the VVS to lose the shortlived advantage it had had in development of **monoplane** combat acft.

[49] **Note:** The I-153 (1939/40) had a top speed at altitute of only **443kph** (I believe that was well below the Bf 109).

When air to air combat did occur in the summer of 1941, *there were instances where I-153 pilots could exploit the manoeuvrability of their aircraft to the full. Several Luftwaffe Bf 109 pilots reported that the I-153 was difficult to follow in turning combat,* and many actually preferred to engage more 'modern' **monoplane fighters like I-16 and LaGG-3.** Although the I-153 posed the *Luftwaffe* some problems owing to its high manoeuvrability, especially in the hands of an experienced pilot, it was no match for the Bf 109 under normal circumstances. **The problem was really the difference in speed at all levels and climb rate**: the Bf 109 could choose to engage when the circumstances suited (i.e. when attacking from behind and/or above or below), and choose to disengage when the circumstances did not suit (i.e. when being attacked from behind). In addition the Bf 109 could climb and dive much faster, and generally operated at higher altitudes, so the ***Luftwaffe*** **pilots usually enjoyed the height advantage (and therefore the initiative). This is critical in air to air fighter combat.** On top of all this, the **I-153 was too slow to effectively intercept many of the German twin engine bombers such as the Ju 88 and Do 215**. For example, the Ju 88A4 had a top speed of 470kph (293mph) at 5,300m, which was well beyond the top speed of any I-153. (p. 168)

By the autumn of 1941 the number of biplane fighter-bombers had dropped to around 19% of the VVS's first line strength, and most of these where **I-153s** and a few **I-15bis**. Late in 1941, I-153s also started to be used as a night interdiction/harassment bomber, a sure sign that the aircraft was being relegated to secondary duties and was no longer considered a first line combat aircraft. Nevertheless, a considerable number of I-153s soldiered on in the fighter-bomber and night bombing roles **until 1943**.

d. Yakovlev Yak-1

As part of a VVS programme to modernise its aircraft inventory, in 1938 the UVVS (*Upravlenie Voenno-vozdushnikh Sily* – Administration of the Air Force) issued requirements for a single seat 'frontal' fighter and a high
altitude 'air-defence' fighter. The former was to be a single-seat general purpose tactical fighter optimised for combat between 3,000 and 4,000 metres, while the latter was an interceptor optimised for combat between 8,500 and 12,000 metres. One of the several design bureaus 'tendering' for this work was OKB-115 (*Opytnoye Konstructorskoe Byuro* 115 - Experimental Construction Bureau 115) on the **outskirts of Moscow at Zavod 39.** This design bureau was headed by **Aleksandr S. Yakovlev,** and the design bureau was mostly known for developing a range of light civilian aircraft. In the military field, its only real experience was in developing a twin-engine high-speed multi role aircraft (the Ya-22, or I-29). OKB-115 actually submitted 4 designs: the Ya-26 for the frontal fighter, the Ya-28 for the high altitude fighter, the UTI-26 fighter-trainer and the I-30 fighter. Yakovlev did not submit preliminary design documentation or mock-ups, but relied instead on his influential political connections.

In January 1939 a conference was held in the Kremlin, **with Stalin presiding**,[50] to review the whole spectrum of Soviet combat aircraft design, development and manufacture. Presumably this was a similar event to the July 1937 gathering where the decision had been made to continue biplane fighter development! Fortunately, in this meeting more foresight was shown, and one of the designs chosen to be vigorously pursued was the Ya-26 design for the 'frontal' fighter. . . The I-26 was a **low-wing cantilever monoplane** with an inward retracting undercarriage and enclosed pilot's cockpit with a rearward sliding canopy. It had been designed around the 1,350hp M-106 engine, then being developed by V.Y. Klimov's engine bureau. However technical delays, mainly due to cooling problems, resulted in the I-26 having to use the Klimov M-105P engine. *This engine was a Klimov designed derivative of the French Hispano-Suiza 12Y engine.* . . The planned armament was a single 20mm ShVAK cannon firing through the propeller hub with 120 rounds, 2 7.62mm ShKAS MGs in the upper fuselage nose and another 2 7.62mm ShKAS MGs in the lower fuselage nose. *The only pilot protection afforded was an 8mm armour plate behind the*

[50] **Note:** I see a theme here: Stalin obviously took a great interest in Soviet wpns development, thus he seemed to often take part in these key decision-making events.

pilot's head and shoulder, while the windscreen and the canopy had no armour glass. Provision was also made to carry 2 100kg bombs, **giving the aircraft a fighter-bomber capability**. (p. 169)

The first prototype, the I-26-1, took its first flight on **13 January 1940**. The I-26-1 was heavy at 2,600kg (2,300kg being the design prediction), and early flights were made with a low fuel load and no extra equipment (such as a radio). In these tests the I-26-1 r**eached 580kph at 5,000m** and took 5.2 minutes to reach that altitude. *This was not particularly fast for a 'clean' prototype, but, more importantly, the aircraft exhibited very good handling characteristics and was relatively forgiving of pilot mistakes*. Unfortunately the I-26-1 exhibited a problem (starting on its very first flight) which would plague the Yak-1 for some time; namely engine oil overheating problems. This problem apparently resulted in no less than 15 emergency landings during early testing, and, despite the engine being changed 5 times and various propeller types being tried, the problem persisted. On 27th April 1940 Yakovlev's chief test pilot ran out of luck: the I-26-1 crashed and he was killed when it 'spun in' during a low level roll.

Despite obvious problems, the I-26 design appeared promising enough to warrant authorisation for **Zavod 301** to prepare for pre-production. Zavod 301 (or Plant No. 301) was not far from OKB 115 and was a relatively small plant which also provided the workshops for producing experimental aircraft by OKB 115. Amazingly, the I-26 was **ordered into pre-series production under the designation Yak-1 in February 1940**, just over a month after the I-26 had made its maiden flight. Even though this production was at a very limited rate, **it was quite extraordinary and indicative of just how desperate the Soviets were becoming in their attempts to produce modern fighters for the VVS.** The idea was to reduce the time lag between the various acceptance trials and the tooling up of factories to start full scale production. In project management terms, it was, however, a case of putting the 'cart before the horse'. In late **May 1940**, plants in Moscow, Saratov and Leningrad were ordered to prepare for large scale Yak-1 production. **This was a huge gamble**: this decision was made for an aircraft type with one crashed prototype and before the second prototype had undergone state testing.

The second prototype (I-26-2) incorporated a number of important changes; most notably a new and enlarged oil-cooler and air-intake under the nose. . . The I-26-2 was transferred to the NII VVS on 1st June 1940 for preliminary state acceptance trials. The aircraft achieved **490kph** (304mph) at sea level, 585kph (364mph) at 4,800m, and took 6 minutes to reach 5,000m altitude. The aircraft also took 24 seconds to make a full turn at 1,000m because of strict g-load restrictions on any aerobatics! The NII VVS test pilots concluded that the I-26-2 had very good flying qualities for a fighter, but its power to weight ratio was too low and its planned armament was too light. In addition, engine cooling problems remained and it failed to meet the original frontal fighter specifications on speed and climb rate, especially above 4,000 metres. (pp. 169-70)

By this time it was appreciated that these defects could only be completely eradicated if major delays in completion and delivery of production aircraft were acceptable. True to form, the UV-VS and the Soviet hierarchy would allow no such delays. OKB-115 was instructed to work on the problems, but restrict changes to those that could be phased onto the assembly lines without resulting in delivery delays. In effect, the Soviets were serially producing an aircraft which had failed its preliminary State acceptance trials (in **June 1940**) and for which the VVS (Air Force) acceptance testing had not even commenced.[51] . . . The most charitable thing that could be said of the pre-series Yak-1 was that at this early stage it was immature and had been committed to production long before it was ready. In addition Yakovlev and his team now had to content themselves with progressive (and often palliative) modifications on the production lines, rather than being allowed to fix the root cause of a problem with any significant redesigns. On the bright side, on **9 December 1940** the third prototype, the I-26-3, finally passed the State acceptance trial (although its performance barely matched the original specifications).

[51] **Note:** The **Yak-1** is a prime example of risks Soviets were willing to take in their desperation to get more combat planes into the VVS force structure.

In the autumn of 1940 **Zavod 292** in Saratov also started Yak-1 series production, and by the end of 1940 a total of 64 pre-series and production Yak-1s had been produced. It has to be said, however, that these aircraft were virtually useless as operational combat aircraft, and as far as is known they all went to service test units and research establishments. Given all the above, one cannot help but wonder why Yakovlev and his bureau were treated so equably when so many in the USSR had been 'purged'. By December 1940 around 1 Yak-1 was being produced per day, by April 1941 this had increased to around 2 per day, **and by June 1941 around 3 were being produced per day**. In the first six months of 1941, **335 Yak-1s** with the M-105P engine had been completed. Including the 64 produced in 1940, this meant a total of almost **400 Yak-1s** had been completed by 22 June 1941 (p. 170)

The 'standard' 1941 production Yak-1 weighed 2,844kg loaded, could achieve **473kph** (294mph) at sea level and **573kph** (356mph) at 4,860m, took 5.7minutes to reach 5,000m, and could perform a 360 degrees turn at 1,000m in 20-21 seconds. **Even without the many teething problems, it was still an inferior all-round combat aircraft to the Messerschmitt Bf 109E-3 which had been in *Luftwaffe* service since late 1939. . .** The M-105PA Yak-1 also had improved landing gear, improved armament reliability (**the Yak-1's guns commonly jammed in 1941**), a trim tab added to the rudder, a landing light, a new oil drain tank, and **a radio for the first time**. *The first 1,000 or so Yak-1s produced up to that time had no radios at all (not even receivers)*, although later 1 in 10 may have been retrofitted in the field. These Yak-1s were slightly heavier than the earlier 1941 machines, and their performance suffered accordingly. Later in 1941, these aircraft were also fitted to carry 2 100kg bombs or 6 **82mm RS-82 rockets.** However, only 195 Yak-1s were equipped with rocket launchers at a factory by the end of 1941. It is possible some earlier production Yak-1s were retrofitted to carry bombs or rockets. This is because even **though the Yak-1 was designed as a fighter, it was used increasingly for ground strike missions during the 1941-42 winter battles around Moscow**.

Exactly when production of the M-105PA Yak-1 started is unclear, but it was first tested in June 1941 and **production appears to have started at Zavod 301 sometime in late September 1941**, **just before the whole factory was evacuated to Zavod 153 in Novosibirsk (Siberia)**. This obviously disrupted Yak-1 production, but it was back in full swing by December 1941. Despite this interruption to production, a further 853 Yak-1s (excluding 166 Yak7UTI or Yak 7V trainers) were completed by the end of 1941. Of the total of **1,252** Yak-1 produced by 31 December 1941, it is unclear exactly how many of these were powered by M-105P or M-105PA engines. (p. 170)

On 1 June 1941 there were **235** Yak-1 fighters in VVS service with first line units (including PVO units). Of these, 234 were assigned to the VMF-KA (Army) and only 1 was assigned to the VVS-KBF (Red Banner Baltic Fleet) forces for evaluation purposes. *However most of these Yak-1s were deployed well away from the front lines; mostly in newly forming units getting familiar with the new fighter*, or in units in the rear still trying to iron out the various problems with production aircraft. Thus only **102** were deployed in VVS-KA units in the Western Military Districts: namely **20 in the Western**, 20 in the Leningrad, and 62 in the Kiev Special Military Districts. When looked at in the cold light of day, this is not a very impressive record for a single-engine combat aircraft that had entered 'production' over a year and a half earlier, and for which considerable resources had been committed by all the involved parties (including those of two factories). (p. 171)

The most experienced unit on the Yak-1 was the 11 IAP PVO which was over full strength with 69 Yak-1s on 1st June 1941. This unit was deployed at Kubinka airfield near Zavod 301 in Moscow, and became a sort of Yak-1 conversion training centre. Pilots from this unit went to join the 20, 45, 91, 123 and 158 IAP which were issued with Yak-1s in the immediate pre-war period. The Yak-1s initially Deployed (D) in the west were largely caught in the initial Luftwaffe airstrikes, and didn't figure much in the frontier air battles. However, the superiority of the Bf 109 over the I-153 and I-16 was obvious, **and most of the remaining 950 odd Yak-1s that became available during the second half of 1941 were rushed into newly mobilised fighter regiments.** From August these units (many with pilots barely trained on the Yak-1) **were mostly concentrated around Moscow as part of the USSR's**

strategic air defences (PVO forces). In this role they proved effective and several Yak-1 pilots achieved significant success against German bombers operating over Moscow. (p. 172)

By late 1941 the Yak-1 was widely recognised by the *Luftwaffe* and VVS pilots as the best all round fighter available to the VVS. *It seems that this is the reason why the 1941 Yak-1 seems to be credited as a much better air-superiority fighter than it actually was*, and its contribution to the ultimate German failure to take Moscow is often exaggerated. This is reinforced by some authors claiming the 1941 Yak-1 was as good as the Bf 109E and not far behind the Bf 109F series (as long as nothing broke, leaked or fell off the Yak-1). The fact is that out of the **1,252** Yak-1s produced by 31 December 1941, the large majority had been lost in combat, were written off in accidents as operational losses, or were constructively unfit for combat duty (at least a 100 or more). **By mid-December 1941 there were barely a hundred operational Yak-1s defending Moscow.**

In reality, during 1941 and into 1942 the Yak-1s in operational units had many problems. The M-105P engine caused a lot of trouble (not least with the old oil overheating problem) even though it proved more reliable than the MiG-3's AM-35A engine. Other problems included: an undercarriage prone to failing, **the guns often jamming (an old problem never really fixed**), poor construction (production quality control) **and shortages of quality materials. The latter two problems caused the plywood to sometimes be torn off the wings during flight**. Other factors [include the fact] that the **first 1,000 or so Yak-1s had no radio transmitters or receivers.** In addition many Yak-1s **had no navigation instruments**, no radio navigation aids and no landing lights. Somehow these were considered unnecessary accessories! In the RAF and USAF these aircraft would have been classified as not airworthy.[52]

Even excluding quality issues and the lack of basic flight accessories, the fact is the **1941 Yak-1 was inferior to both the Bf 109E-3/4** as an all-round combat aircraft, and was essentially outclassed by the BF-109F-2/4. Comparing the data for the 1941 Yak-1 from the table above [not shown]: we find that the Bf109E-3 (in service since late 1939) could fly at **560km/h** at 4,440 metres, but had at least as good a turn rate and a higher climb rate. The Bf 109E-3 had considerably more firepower with 2 20mm cannon and 2 7.92mm MGs, and provision for a 250kg bomb load. Some later Bf 109E-3/4s had an additional 20mm cannon firing through the propeller hub (spinner). It employed the more powerful 1,175hp DB601Aa engine, but its empty weight was only 1,900kg and its loaded weight was 2,665kg (almost the same as the original I-26-1 prototype). Furthermore **the DB601 engine was fuel injected so it did not stall in negative g turns**. In contrast the M-105P engine was equipped with a carburettor and so did not tolerate high negative g turns without starving the engine off fuel. In addition, the Bf 109 was a very refined design with advanced features such as automatic leading edge flaps. These enabled a lower stall speed and enabled the aircraft to be more stable during sharp turns and other dogfighting manoeuvres (which also results in a superior gun platform).

It was not until 1942-43 when versions of the Yak-1 arrived with more powerful and reliable engines, and lighter and better constructed airframes, that the **Yak-1, 3, 7 and 9 types** achieved their full potential. **In much aviation literature the Soviet LaGG-3 and MiG-3 are maligned as not as good as the Yak-1 during 1941 (which is generally true**), and that somehow this reduced their contribution during this critical time. This view is supported by both these types also having major problems, and the fact that the MiG-3 design was definitely a 'dead end' for further development. However, based on the numbers produced and deployed into service from June to December 1941, and the many problems faced by Yak-1s in service during 1941, **both the LaGG-3 and MiG-3 did at least as much to prevent the USSR's defeat in 1941 as the Yak-1 ever did.** (p. 173)

e. Lavochkin LaGG-1 and LaGG-3

[52] **Note:** Example of combat aircraft production realities in USSR and how much they differed from Germany, U.K. or the U.S.

In early 1939, Vladimir P. Gorbunov, then head of the NKAP's technical department, forwarded **an aircraft concept for an all wooden aircraft**. It took account of the need to increase the output of modern fighters and the limitations that might be imposed by the strategic shortage of aluminium. The main designer of this new aircraft was Semyon A. Lavochkin. During preparations of the conceptual studies, they were joined by Mikhail I. Gudkov, and in the spring of 1939 this triumvirate reported the results of their work to Mikhail L. Kaganovich (the People's Commissar of the Aircraft Industry). Kaganovich quickly realised the advantages of such an aircraft, and the three designers were appointed head of a **new OKB** to develop the type in May 1939. Shortly after formation, the OKB was based at **Zavod 301** and the design bureau was given the designation OKB-301 (*Opytnoe Konstructorskoe Byuro* - Experimental Construction Bureau 301). Initially the three designers had equal rank. However after some technical development disagreements, it was realised the project would operate better with one senior director, and Lavochkin was officially made head of OKB-301 while the prototype was still under development.

The aim of OKB-301 was to produce a fighter to meet the UV-VS (*Upravlenie Voenno-vozdushnikh Sily* – Administration of the Air Force) requirement for a single-seat 'frontal fighter' optimised for combat between 3,000 and 4,000 metres. Although it was not as fast on paper as the Ya-26 (Yak-1), **it was a modern and clean design which took account of the shortages of strategic materials (alloys)**, and took advantage of a new wood based construct-ion material then being developed in the USSR. The final design was approved by the NII-VVS in January 1940, and the design and authorised prototype were soon given the designation I-22 (or possibly I-301). (pp. 173-74)

The I-22 prototype was completed at **Zavod 301**, and first flew on 30 March 1940 piloted by one of the most proficient test pilot/engineers in the NII-VVS: namely A.I. Nikashin. Initial flight tests and State testing lasted until June 1940 and included several minor modifications such as enlarging the inlet pipe and exhaust. The prototype was able to travel **515kph** (320mph) at sea level and **585kph** (364mph) at 4,700m, and to climb to 5,000m in 5.9 minutes. These parameters were not exceptional, while the climb rate, ceiling and range were actually inferior to the latest I-16 Type 24 which it was meant to replace. Most seriously, however, was that the I-22 had poor manoeuvrability for a fighter of the time . . . However this didn't stop the designers installing an ambitious armament (for a Soviet single-engine fighter of this era): it was a 23mm VYa-23V cannon firing through the propeller hub, and 2 synchronised 12.7mm Berezin (UBS) MGs in the forward upper decking. Provision was also made to carry up to 200kg of bombs. (p. 174)

It is probable that if the USSR and VVS hadn't been so desperate to find a new state of the art fighter, especially one made of cheap and readily available material, then the whole project would have died there and then. In the event, the UV-VS did the exact opposite. Before the initial flight testing was even completed, Zavod 301 was ordered to prepare for the production of 100 pre-production aircraft (for factory testing and operational trials) with the designation LaGG-1 (LaGG - *Lavochkin-Gorbunov-Gudkov*). *The intent was to accelerate the development programme by performing both factory and state testing simultaneously*, and hence minimise any delay between acceptance testing and commencing production. However, as any modern project manager will tell you, this is a very high risk strategy and one very likely to lead to ongoing production problems and quality control issues. (p. 175)

Work continued on the next prototype and the first thing go on the I-22 / LaGG-1 was the heavy armament: the 23mm VYa-23V cannon was replaced with a 20mm ShVAK cannon (with 120 rounds) and the 12.7mm UBS MGs were replaced with 7.62mm ShKAS MGs (each with 325 rounds). Other changes included: weight saving measures on the fuselage by paring it down wherever possible, the fitting of fixed wing slats to the leading edge of the outer wing panels (to increase stability at lower speeds), external rudder and elevator mass-balances, a ViSh-61P constant-speed propeller, and several other aerodynamic refinements. **Unfortunately there was no alternative power plant to the M-105P.**

The improved aircraft first flew on 1**4 June 1940** with the designation I-301 (named after the bureau and factory number). The I-301 was still severely underpowered and was not particularly manoeuvrable, but at least it had

stopped trying to kill its pilot. Just to make things harder, i**n October 1941**[53] **a high level edict was issued stating that all new fighters should have a range of 1,000km**! In response to this, initial production aircraft had additional 65 litre fuel tanks placed in the outer wings with detachable outer wing panels. It was too late to fit and test these on the second prototype, which had to make do with an additional 15 litre tank behind the pilot. The additional fuel tanks did increase the range, but they also increased the overall weight so that most of the weight saving measures in the I-301 were already negated.

The exigencies of the time demanded large scale production of the I-301 proceed as soon as possible, and the production aircraft were now designated **LaGG-3**. Zavod 301 reworked the initial batch of 100 LaGG-1s as LaGG-3s, **so the LaGG-1 never actually entered series production**. Lavochkin (along with most of the OKB personnel) was sent to **Gorkiy** to assist with setting up mass production at **Zavod 21 which became the main LaGG-3 production centre**. Gorbunov went to **Zavod 31 in Taganrog**, while Gudkov stayed at Zavod 301. Limited production was also undertaken at **Zavod 153 at Novosibirsk and at Zavod 23 in Leningrad**, which actually produced the first production LaGG-3 to fly. This occurred in December 1940 with Nikashin at the controls. As an aside, it is interesting to note that the LaGG-3 never seemed to undergo the same level of exhaustive testing apparent with the Yak-1 design. . . Whatever the reason, the barely ready LaGG-3 entered VVS service in the spring of 1941. (p. 175)

Of all the Soviet fighters produced in the immediate pre-war period, as well as those produced during 1941, the **LaGG-3 was the type most adversely affected by poor production standards and quality control.** The two IAP units tasked with operational trials and familiarisation programmes reported a litany of problems too long to describe in detail here. . . A well-built (production) LaGG-3 was capable of achieving **575kph** (357mph) at 5,000 metres, **498kph** at sea level, and it took 6.8 minuted to reach 5,000m (its maximum climb rate was 900 metres per minute). **This overall performance can be described as mediocre at best for a fighter of this era**. However, the LaGG-3's biggest problem was lack of agility: it was still very heavy (with a normal loaded weight of 3,346kg). With its existing control surfaces and controls, this made it sluggish to react to stick forces as well as relatively hard to control. Even worse, the type still exhibited some very dangerous handling characteristics, especially for an inexperienced pilot. Many LaGG-3 pilots were killed in flick-stall-spin accidents while performing tight turns, and the accident attrition rate for the LaGG-3 in service remained alarmingly high. **The LaGG-3 quickly became very unpopular with Soviet pilots** who gave it the cynical nickname *Lakirovanny garantirovanny grob* (**varnished guaranteed coffin**). Any but a highly experienced pilot found it difficult to fly, with one senior pilot calling it 'overweight, underpowered and unforgiving'. (p. 176)

By the end of June 1941 a total of **322** LaGG-3 aircraft had been manufactured. **After Operation Barbarossa started the production rate of the LaGG-3 accelerated sharply**. This actually made a bad production-quality situation even worse (at least for deliveries during July-October 1941). Attempts were made to improve the LaGG-3's performance without disrupting production, which included: adding automatic leading edge slats, replacing the external rudder and elevator mass-balances with an internal system in the fuselage behind the cockpit, and adding a retractable tail wheel. However, the performance of later 1941 LaGG-3s was hardly improved. From 1 July to the end of December 1941 an additional **2,141** LaGG-3s were produced, making it the most produced Soviet aircraft in the second half of 1941. However, these mass-produced aircraft did nothing to enhance the **average Soviet pilot's disdain for this aircraft.**

It wasn't until the more reliable M-105PA engine became available in early 1942, and later the more powerful M-105PF engine, that the LaGG-3 really started to improve. However, even with these engines the overall improvements were small (largely because these aircraft had *additional drag due to the fitting of external hard points for bombs and rockets*). The biggest improvement from 1941 was that by 1942 most of the production quality issues had been sorted out so production aircraft at least performed close to the test data. When production ended in June 1942, a total of **6,527** LaGG-3 had been produced. (p. 177)

[53] **Note:** October 1940?

One point about the LaGG-3 is that it employed a **bewildering array of different armaments**. This may have been partly due to the continuing weight saving measures and attempts to fix the early armament reliability issues. Pre 22 June 1941 aircraft usually had a 20mm cannon or a 12.7mm MG firing through the propeller hub, and 2 7.62mm MGs or 2 12.7mm MGs in the upper cowling. . . The most common armament on aircraft produced after October 1941, and for those produced in 1942 (i.e. almost two thirds of total production), was a 20mm cannon firing through the propeller hub and only a single 12.7mm MG in the upper cowling. These aircraft were fitted as standard with racks for up to 200kg of bombs or 6 **RS-82 82mm rockets.**

On 1 June 1941 there were **only 38 LaGG-3 fighters in VVS-KA service**, and of these only 2 were in The Western Military Districts while 36 were in the (internal) Moscow Military District. It turns out that around 87% of LaGG-3 production was still in the factories, or had been returned to factories to have some of the defects remedied. The **only fighter regiment in the entire VVS with any operational LaGG-3s on 1 June 1941 was the 24 IAP in the Moscow Military District with 36 aircraft** (the 2 aircraft in 19 IAP in Leningrad were both not operational). Considering that over 300 had been produced, and that most of these had been delivered to the VVS, the low number in service is a shocking indictment on the quality of those produced and the problems still inherent in the design. (pp. 177-78)

From July 1941, the available LaGG-3s were rapidly formed into new fighter regiments (IAPs) or issued as replacements to existing fighter regiments retreating eastwards. However, as one might expect, when first committed to combat in 1941 it was **quickly evident that the LaGG-3 was outclassed by the most common Luftwaffe fighter** operating in the East: the Messerschmitt Bf 109F-1/2. There are even reports that some German fighter pilots preferred to engage the LaGG-3 rather than the more manoeuvrable I-16. The greatest attribute of the LaGG-3 continued to be its **rugged wooden laminate airframe**, which provided good resistance to battle damage and was relatively easy to repair. With its heavier armament and higher top speed, the LaGG-3 was also considerably better than any I-16 type at shooting down *Luftwaffe* bombers. All models of the LaGG-3 were completely outclassed by the Bf 109F-4 in 1942. (p. 178)

Notably, **for ground-strike missions the LaGG-3 was probably better than the Bf 109E-4/B** (the fighter bomber version of the E-4). The speeds at low level were similar (excluding production-quality issues), but the LaGG-3 had a more durable airframe against ground fire: a very desirable feature for this type of mission. In this case manoeuvrability, speed of climb and ceiling were much less important. . . It is known that the VVS had lost or totally written off approximately **9,600** fighters from 22 June to 31 December 1941, with at least 4,500 (47%) being classified as 'operational losses'. This number of 'operational losses' seems extraordinarily high for a WWII era air force; even one operating in wartime. However, in the case of the LaGG-3 it is quite possible these proportions are close to the truth. By the VVS's own analysis, as a fighter the LaGG-3 loss / kill rate during 1941 was similar to that achieved by the I-16 (the aircraft type it was meant to replace).

f. Mikoyan-Gurevich MiG-1 and MiG-3

As we have seen in the previous entries, one of the UV-VS (*Upravlenie Voenno-vozdushnikh Sily* – Administration of the Air Force) **requirements issued in 1938 was for a high altitude fighter**. The specification called for a fast interceptor which was optimised for combat between 8,000 and 12,000 metres. Work on this project was initiated in June 1939 at the Polikarpov design bureau at **Zavod 1 (in Moscow)**, under the direction of N. Polikarpov, and assisted by M. Tetivikin, A. Mikoyan and M. Gurevich. The preliminary design which eventuated was given the OKB designation Samolyot 'Kh' (Aircraft 'Kh').604 At this stage it is known that Polikarpov was responsible for the initial specification and preliminary sketches. In November 1939, while **Polikarpov** was on a tour of the aviation works in Western Europe, his bureau was broken up:[54] a new OKO (*Opytno-konstruktorskoye* -

[54] **Note:** On 15 December 1938, the famous flyer, **Valery P. Chkalov**, was killed flying a prototype of the Polikarpov I-180 fighter. Chkalov was a Soviet and Stalin favourite, and from this point on **Polikarpov's star began to wane** (somewhat

experimental design section) was created under the leadership of Mikoyan and Gurevich (hence MiG), while control of at least part of the bureau's production facilities were handed over to the recently formed Sukhoi design bureau (OKB-51). (p. 179)

Around this time the new high altitude fighter was given the NKAP designation I-200. . . The basic idea behind the I-200 design was to build the **smallest possible airframe around the most powerful engine available, whilst minimising weight and drag**. The engine chosen was the newest and most powerful available: A.A. Mikulin's AM-35A liquid-cooled inverted V-12 engine, rated at 1,350hp driving a 3 bladed 3 metre VISh-22Ye controllable pitch propeller. **The engine was highly supercharged to produce up to 1,200hp at 6,000m in order to boost high altitude intercept performance**, which was one of the key objectives of the design.

Three I-200 prototypes were authorised and the first one flew on **5 April 1940**. As expected, the I-200 was fast at high altitude; achieving a speed of **648kph** (403mph) at 6,900 metres on 24 May. However the speed dropped off rapidly with altitude, and at medium and low altitude it was not exceptional (the top speed at sea level was only **508kph**). Equally serious was that during manufacturing tests (up to 25 August) the I-200 had also exhibited several poor and dangerous handling characteristics. . . **The most dangerous flying characteristic was a propensity to flick from a simple stall into a spin from which it was almost impossible to recover**. All these characteristics immediately resulted in the recommendation that **only the most experienced pilots should fly this aircraft.**

Incredibly, orders to prepare for **I-200** series production had been issue as far back as 31 May 1940; less than two months after the first prototype had flown (and well before completion of any factory or State Acceptance trials). Apart from the pressure to get more modern fighters in to VVS service as soon as possible, there were two other factors which appear to have influenced this decision. Firstly, the authorities were reassured that any ongoing problems with production aircraft could be resolved by **Zavod 1: then easily the most prestigious and modern aviation factory in the USSR.** The second reason appears to have been political, and followed the I-200's appearance at the May Day military parade. **The test pilot (Ekatov) swept over Red Square at high speed, which stunned the top Soviet leaders.** This was followed by the 24th May top speed reports (**648kph** at 6,900 metres), and the response by the Soviet leadership was immediate and predictable. The NKAP (*Narodniy Kommissariat Aviatsionnoy Promishlennosti*—People's Commissariat of the Aviation Industry) immediately ordered the I-200 into production with plans to complete an **initial batch of 100 aircraft.** It is unclear when exactly the I-200 was designated the MiG-1, but this definitely became official no later than 9 December 1940 **following a decision by Stalin.**

In the meantime the **third prototype was the first to be armed**. It was fitted with a single 12.7mm UBS MG and 2 7.62mm ShKAS MGs, all synchronised to fire through the propeller. This was a very light armament even for a Soviet fighter of this era, and was especially light if the MiG-1 was meant to intercept high-altitude bombers. The **relative ineffectiveness of MGs (vs. cannon) against bombers was still not understood by many air forces at this time (including the RAF).** Unlike the Yak-1 and LaGG-1 prototypes, the I-200 passed its preliminary State acceptance trials, which were completed on 12 September 1940. This was despite the **aircraft failing to meet the very ambitious 670kph top speed** asked for in the original high altitude fighter specification, and the ongoing (dangerous) handling issues. (p. 180)

The NKAP did order a number of quite radical improvements to the design following testing, but only a few of the easier ones were implemented. . . **The armament remained as on the third prototype**, with a PBP-1 gun

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unjustifiably). **Polikarpov had already been imprisoned and once sentenced to death between October 1929 and July 1931, and it was probably only his reputation as the USSR's leading fighter designer that prevented him from being killed as part of Stalin's numerous purges.** The Polikarpov bureau continued to exist and it would continue development of aircraft such as the I-180 (until late 1940) and the I-185. However, Polikarpov was only ever given figurehead leadership roles, and the bureau's designs were never again given equitable treatment.

sight and 300 rounds for the UBS MG and 375 rounds for each ShKAS MG. In addition, two underwing hardpoints were incorporated to enable 2 50kg or 2 100kg bombs to be carried. Later (in 1941) these were modified to facilitate the carriage of up to 6 **RS-82 82mm rockets.** The initial idea behind these rockets (especially for the MIG) was as anti-aircraft weapons against heavy bomber formations, and not as ground attack weapons. The production MiG-1 had a loaded weight of 3,099kg, could attain a speed of **628kph** (390mph) at 7,200 metres and **486kph** (302mph) at sea level, and could climb to 5,000 metres in 5.9 minutes. (pp. 180-81).

The initial batch of 100 MiG-1s were completed at Zavod 1 by mid-December 1940. Most sources indicate that operational VVS regiments first received the MiG-1 in March-April 1941, but this appears to be incorrect. In fact the first MiGs were delivered to VVS IAP units for conversion training as early as January 1941. It is known that on **21 January 1941, 35 MiG-1s were transported by rail to the 41st IAP at Belostok**, and this was the designated operational trials unit for the VVS. On 25 January 1941 an additional 31 MiG-1s were sent to 31 IAP at **Kaunas.** By 22 February 1941 these two IAPs had received a total of 89 MiG-1s.

As it turned out, the *decision to initiate series production of an untested aircraft was premature because it meant that further improvements now had to be incorporated into the production aircraft without major factory retooling and without seriously disrupting production* (a project management phenomenon the Soviets did seem fond of in 1940-41). There is also strong evidence that the basic MiG-1 design made only rudimentary improvements possible without a complete airframe redesign. The overall result was that further development incorporated mainly superficial changes, and **led to the MiG-3 (which was a rather unnecessary numerical redesignation as something the MiG-1A would have sufficed).** . . Around 20 MiG-3s were delivered by the end of 1940, and NII VVS State acceptance testing of 2 production aircraft was continued between 27 January and 26 February 1941. **Although the MiG-3 was an improved aircraft overall, the changes had also come at a cost in weight.** . . On the plus side was that the loaded weight increase was mainly due to the additional fuel load, which increased the operational range (i.e. with a combat ready load) of the aircraft from 580km to a **very useful 820km**. (pp. 181-82)

When the MiG-3 was first delivered to VVS fighter regiments in March-April 1941, **the Soviets claimed to have the fastest operational fighter in the world**. To a large extent this was true because the MiG-3 was capable of **640kph** (398mph) at 7800m. However, the MiG-3's top speed dropped off rapidly with altitude so that it was only able to achieve **505kph (314mph) at sea level**. For comparison: the Bf 109F-2 had a top speed of 615kph at altitude
and 515kph at sea level, the Bf 109F-4 had a top speed of 624kph at altitude and 537kph at sea level, and the Spitfire V had a top speed of 603kph at altitude and around 508kph at sea level. **Thus at medium to low altitude the MiG-3 actually had no speed advantage at all, and it was at these altitudes that the large majority of air-combat would occur on the East Front for the whole of WWII.** (p. 182)

There is no doubt that the MiG-3 was a very fast fighter for its day, but the real problems with this aircraft still lay in its general flight characteristics. **The Yak-1, LaGG-3, Bf 109 and Spitfire were all designed as 'general purpose' air-superiority fighters**, while the MiG-3 was designed for the high altitude interception of enemy bombers (in this regard it was actually ahead of its time for this specialised role). Consequently its airframe was small for such a large engine, the **wings had high loading factors** which only grew worse at lower altitudes and when attempting tight turns, and the **(dangerous) longitudinal stability issues** with the original MiG-1 had never been resolved.

An incident on 10 April 1941 graphically demonstrated these problems and how difficult this aircraft could be to fly, especially in the hands of less experienced pilots. On this date a German reconnaissance aircraft was detected over Kaunas, Lithuania, and a standby flight of 3 MiG-3s from the 31st IAP were scrambled to intercept. **In the ensuing chase and interception, all 3 MiG-3s went into highly dangerous and almost uncontrollable spins, and only a single aircraft managed to recover and return to base**. The other MiG-3s crashed with one pilot being killed and another managing to bail out. The pilot who returned to base (Jr Lt Akimov) stated he had gone into a spin after intercepting the intruder at 11,000m (35,750ft). He had attempted a shallow zoom past the slower

intruder which resulted in the plane going into a stall and then a spin. Having recovered from the spin into a dive, Akimov then pulled back too sharply on the stick and promptly blacked out from the high g-load. He was lucky, however, because he came around and still had sufficient altitude to recover and bring his plane home. The other 2 pilots were not so lucky. (pp. 182-83)

The ensuing enquiry found that the pilots had insufficient hours on the MiG-3, and had all made the same error in taking their fighters beyond critical angles of attack while performing sudden low-speed manoeuvres at high altitude. However, t**his was really a whitewash: in truth the MiG-3 had a much narrower safe flight-envelope compared to most contemporary fighters**, and it needed a lot of training and skill to fly effectively. Soon the more experienced German Bf 109 pilots were going to exploit such weaknesses to the full. The MiG-1/3 remains an excellent example of why 'top speed' should be only one of many parameters used in measuring an aircraft's overall combat power. (p. 183)

By the end of June 1941 a total of **1,309 MiG-1s and MiG-3s** had already been manufactured. On 1 June 1941 there were **83** MiG-1 and **1,029** MiG-3 fighters in VVS service with first line units (including PVO units). Of this total of 1,112 MiG fighters, **1,079** were assigned to the VMF-KA (Army) and 33 were assigned to the VVS-VMF (Naval) forces. **This meant that by June 1941 the MiG-3 was the third most numerous fighter type in the Western Military Districts, with 955 deployed** (including those in naval air units).

Unfortunately, occasional MiG aerial victories (usually in the hands of exceptional pilots) could not disguise the fact that the **MiG-3 was at its best at high altitude but fared badly against *Luftwaffe* Messerschmitt fighters at low and medium altitudes (below 6,000m), and this was where almost all air combat was taking place**. Essentially the MiG-3 had no speed advantage at these altitudes, proved a lot less manoeuvrable than its opponents and was less heavily armed. **The MiG-3 also continued to be a difficult aircraft to master and the operational loss rate remained unreasonably high.** This situation only grew worse as less experienced replacement pilots replaced the better trained pre-war pilots in the newly mobilising IAP regiments. Interestingly, by August 1941 several *Luftwaffe* units had reported that in general **VVS units operating MiG-3s showed a singular lack of aggressiveness** (not something that came naturally to VVS fighter units!). MiG-3 pilots often avoided combat with enemy single seaters and concentrated on the interception of bombers and reconnaissance aircraft. Considering the shortcomings of the MiG-3 below 6,000m, this was only prudent on the part of the VVS pilots.

By late 1941 most MiGs were allocated to PVO regiments defending key strategic centres against bombers, so (fortunately) relatively few MiG-3s were wasted undertaking ground attack missions. MiG-3 mass production continued after the Axis invasion **with up to 15 aircraft per day leaving the plants at peak production**. By the end of 1941, 103 MiG-1s (including 3 prototypes) and 3,142 MiG-3s had been manufactured in total. 30 more cannon armed MiG-3s were completed in 1942 from spare component parts, bringing total MiG-3 production to 3,172. This means **1,833** MiG-3s were produced from 1 July to 31 December 1941, **making the MiG-3 the second most produced Soviet aircraft during this period.** (p. 184)

g. Petlyakov Pe-3

On 21 July 1941 the *Luftwaffe* conducted a night-raid on Moscow with 195 bombers, and the Soviets suddenly realised that a heavy fighter interceptor, which could be quickly adapted for the night-fighter role, would be a good idea. **The new 'night-fighter'** would also need to be a twin-engine design in order to enable the airborne radar sets then under development to be carried, as well as sufficient armament to be effective. **At that time the Pe-2 was the only twin-engine airframe combination in series production with sufficient speed to intercept current German bombers.** Thus, on 2 August 1941 Zavod 39 and its chief designer (V.M. Petlyakov) were ordered to adapt some of the Pe-2 production aircraft to this role. Only 4 days were allowed to modify the fuel system, armament and radio equipment (as it was). Remarkably, the modified Pe-2 first flew on 7 August 1941 and had even passed some cursory factory testing by 10th August. Selected production Pe-2s were soon given the production designation Pe-3.

Following the factory testing, the Pe-3 was ordered into series production at **Zavod 39**. Initially every second Pe-2 on the assembly line was converted to a Pe-3. Pe-3 production continued until October 1941; with 16 completed in August, 98 completed in September and 82 completed in October. After **196 Pe-3s** had been produced, **Zavod 39 was evacuated to Irkutsk** in late October - November 1941, and when production restarted only Pe-2s were produced. Production of the Pe-3 was not resumed until April 1942 when the last 11 Pe-3s were produced. In May 1942 it was replaced in production by the Pe-3bis (bis - designating modified or/and upgraded), of which 134 were produced from May 1942 to early 1943. The initial production Pe-3 did undergo NII VVS testing from 29 August to 7 September 1941. They found the aircraft: weighed 5,730kg empty, weighed 7,860kg with normal load, could attain 444kph (276mph) at sea level, 535kph (332mph) at 5,000m, took 9 minutes to reach 5000m, had a service ceiling of 9,000m, and had a maximum operational range of 2,150km. With a 400kg bomb load the operational range was reduced to around 1,500km. (p. 185)

The first operational VVS unit to receive Pe-3s was the 95th SBAP (High Speed Bomber Aviation Regiment) in the Moscow Military District in September 1941. This unit was soon redesignated the 95th IAP (Fighter Aviation Regiment) and transferred to the VI PVO Corps responsible for the air defence of Moscow. Other units which received the Pe-3 during 1941 included the 9th, 40th, 54th, 208th (later the 208th IAP) and 511th BAPs (Bomber Aviation Regiments), and the 3 and 13 RAP (Reconnaissance Aviation Regiments).643 However, t**he Pe-3's combat debut was inauspicious: within three months of it entering service at least 50 aircraft were lost (or 26% of total 1941 production**) and its effect on *Luftwaffe* bombers can only be described as negligible. The VVS had yet to learn, as did the *Luftwaffe*, RAF and USAF, that producing an effective night-fighter would entail a great deal more work than simply adding some fuel tanks and minor armament upgrades to an existing twin-engine bomber.

As a heavy-fighter or night-fighter the Pe-3 had numerous major handicaps to overcome in combat. Most critically, **the armament was totally inadequate. Essentially the Pe-3 had only 2 heavy MGs with a total of 500 rounds to bring down an enemy bomber.** This meant it had to get close to be effective; well within the bomber's defensive MGs. It should be noted that the **He 111H-6 was bristling with defensive weapons for a 1941 twin engine bomber;** including a flexible mounted 20mm MG FF cannon (protecting the frontal arc), a 13mm MG131 heavy machine gun in the dorsal position, and 6 other 7.92mm MGs. Its defensive armament was considerably more deadly than the Pe-3's offensive armament. The Ju 88A-4 was also heavily armed (including 2 13mm HMGs and another 3 7.92mm barrels) and its top speed was not much less than that of the Pe-3. On top of this, the Pe-3 crew had no frontal armour protection at all, so as they approached an enemy bomber they were fully exposed to enemy defensive fire (and were also well within effective range). . . A number of 1941 production Pe-3s were upgraded in the field with some of these changes during late 1941, but the large majority of Pe-3s didn't survive long enough for it to make much difference. (pp. 185-86)

By late 1941 the *Wehrmacht* was threatening Moscow. As already mentioned, a large proportion of the Pe-3s were already assigned to the 9th, 40th, 54th, and 511th **BAPs** (Bomber Aviation Regiments). As the situation around Moscow grew more critical, these **Pe-3s were thrown onto ground attack and ground support roles,** and their losses were heavy. **The Pe-3 was not well suited to this role as it lacked adequate protection, had only mediocre low altitude performance and was not designed to deliver a heavy payload. In addition, the dive brakes had been removed so they were unable to dive like Pe-2s, and their improvised bomb release systems made bombing release that much less accurate and more risky**. It does seem rather wasteful that the VVS had developed the Pe-3 for bomber interception, and then the promptly used them in the ground attack role for which they were not well suited. On the other hand, the VVS considered the Pe-3 to be a multirole fighter-bomber and the situation around Moscow could be described as desperate in November 1941. It is rather ironic that Pe-3s saw more action as bombers than as fighters in 1941, and in hindsight it would have been better if they had kept their airbrakes. A small number of Pe-3s also saw service in the anti-shipping role in the Black Sea and the Northern Fleet.

Overall the Pe-3 (and to a less extent the Pe-3bis in 1942) was always going to be a temporary fix to meet the VVS's specialised long range heavy-fighter / night-fighter need. Because it was based on a sound and successful aircraft design (the Pe-2), **it turned out to be a reasonably successful interim solution**. However, considering the effort needed to produce the Pe-3, the disruption to Pe-2 production, the minor effect on German bombers and the fact that such a large proportion of Pe-3s were expended as bombers anyway, it is very arguable that the USSR would have been better off simply producing more Pe-2s. (p. 186)

h. Hawker Hurricane IIB

The history of the development and use of the **RAF's first monoplane fighter** is well documented elsewhere, and is not particularly relevant here. Sufficient to say that by 1941 the Hurricane had been largely superseded as a pure fighter: it was already marginally inferior to the Bf 109E in 1940, and essentially outclassed by the Bf 109F and the new Fw 190A series by 1941. However, the Hurricane was of basically sound design, had a tough airframe and had relatively thick wings. For various reasons, the latter feature was not always a good idea on a pure fighter, but was definitely a good feature for any ground-attack aircraft needing to carry heavier wing mounted armaments. **The development of the Hurricane into a more specialised ground-attack aircraft proceeded quickly, and the first Hurricane II prototype flew on 11th June 1940.** The Hurricane II was based around the powerful (for its day) Rolls Royce Merlin XX V12, which could deliver 1,300hp at sea level and 1,460hp at 1,905 metres. (p. 187)

The original interim Hurricane IIA used the same wings as the Hurricane I and was still a fighter (armed with 8 0.303in MGs). A few were delivered to RAF squadrons in the UK in late September-October 1940. It was very rapidly superseded by the **Hurricane IIA2**, which featured strengthened fuselage longerons for the fitting of wings which could carry external stores. The **Hurricane IIB** quickly followed and it was **fitted with 12 wing-mounted 0.303in MGs, and was able to carry 2 227kg bombs or (on later models) 8 3in (7.62cm/27kg) rockets. The Hurricane IIB first entered RAF service in May 1941. By the standards of the time, the Hurricane IIB was a relatively formidable ground-attack aircraft**: it carried a powerful gun armament, a respectable bomb-load (over 450kg), had a maximum speed of 528km/h (328mph) at 5,486m, and a useful range of 748km. When fitted with drop tanks, which was not a problem with such strong wings, the Hurricane IIB's range was extended to an impressive **1,505km** (935m).

In late **August 1941, 39 Hawker Hurricane IIB fighters arrived at Murmansk** along with ground-support staff and pilots from the RAF's 81 and 134 squadrons. These aircraft were immediately pressed into operational service with the VVS; with **most serving in the Northern area of operations**. At least another 29 Hurricane IIBs arrived from October to December 1941. A **total of 315** western supplied fighters were accepted by the VVS in 1941 and used in combat units, and at least **68** were Hurricane IIBs. (p. 187)

For some reason, it seems trendy in some modern literature (but not all) to denigrate the Hurricane as 'passed it' by 1941. The same sort of ridicule seems reserved for the Sherman tank; **and, as usual, the rhetoric doesn't live up to the reality**. Admittedly, by 1941 the Hurricane II could not perform as well as the Yak-1 or possibly even the LaGG-3 in air to air combat. However, as clearly demonstrated above, **by mid-1941 the Hurricane II was clearly optimised for ground attack, and in this role it proved superior to any of the Soviet fighter-bombers in 1941-42.** The main reasons for this were the considerably more powerful **Rolls Royce engine**, larger airframe and stronger wings, which enabled it to carry twice the bomb load and over twice the MG/cannon armament of any of the single engine Soviet fighter-bombers.

It is also worth pointing out that the **Hurricane IIC, first delivered in 1942**, had twice the 20mm cannon armament of the Ilyushin Il-2 (see below) and a similar overall ordnance load. The Hurricane IIC carried **4 20mm cannon**: a gun armament unmatched by any Soviet single engine fighter-bomber during WWII. Considering the **main function of the Soviet Air Force in WWII was ground support and ground attack**, and that the Soviets received **2,952 Hurricane IIs** during WWII, this is very significant. Finally, it is very noteworthy that the Finnish

Air Force, which encountered Hurricane IIs in significant numbers due to their allocated area of operations, considered the Hurricane II to be at least as dangerous as any other Soviet fighter type encountered during 1941-42. (p. 187)

2C. Ground Attack and Close Support Aircraft

a. Ilyushin Il-2:

More Ilyushin Il-2s were produced in WWII than any other aircraft type, and in terms of aircraft numbers it remains the most mass produced military aircraft in history.[55] Certainly the Il-2 was the *most famous Soviet aircraft to emerge from WWII*, introducing a new word to aviation vocabulary; the *Shturmovik*. The name comes from *Bronirovannyy Shturmovik* (BSh) for 'armoured ground-attack'. (p. 188)

Throughout the 1930s the Soviet air high command had been actively seeking an effective ground attack and anti-armour aircraft, and in 1935 the Kremlin authorised a specification for a BSh aircraft which could fulfil this role. At the time, the two main competing OKBs were those headed by **Sergey. V. Ilyushin** (chief of the TsKB - *Tsentral'noe Konstruktorskoe Byuro* - Central Design Bureau) in the **Moscow plant**, and Pavel. O. Sukhoi (OKB Sukhoi) located in Kharkov. The Ilyushin design was designated the TsKB-55 and comprised a 2 seat, low-wing, cantilever monoplane with main undercarriage units which retracted backwards into underwing fairings, leaving the wheels partially exposed. **The most significant feature was the incorporation of a 4-8mm armoured 'bath', which protected the engine, coolant, pipes, radiator, fuselage fuel-tanks, and crew from ground fire. The armoured body was integral to the fuselage primary structure, and was assembled from stamped sheets of armour 4mm to 8mm thick.** For the first time on a Soviet attack aircraft, the **cockpit windshield was made of K-4 bullet resistant glass**. The rear fuselage was a **wood monocoque**, the wings and tail unit were made of **duralumin**, and the elevators were fabric covered. The initial design called for 4 wing-mounted 7.62mm MGs with a fifth 7.62mm MG in the rear cockpit, while the expected normal payload was around 400kg.

The **prototype design** was presented in **January 1939**, and 2 TsKB-55 prototypes were ordered. The first prototype flew on **2 October 1939**, but initial tests showed the aircraft was underpowered and had a tendency to exhibit longitudinal instability. On the second prototype the centre of gravity was moved forward slightly and the tail plane was enlarged. The **second prototype first flew on 30 December 1939 and demonstrated a marked improvement in stability, but remained underpowered**. Manufacturer's tests continued through to March 1940 and in April 1940 the second prototype was delivered to the NII VVS for **State acceptance trials**. By this time the aircraft had received the official designation BSh-2 (*Bronirovannyy Shturmovik* - Armoured Attack Aircraft). The State tests showed the *BSh-2 was relatively stable in flight and not difficult to fly. However it was now very apparent that it was severely underpowered*. In addition, Ilyushin was also unhappy with the relatively weak gun armament. Fortunately **a new and more powerful engine had become available in 1940**, namely the Mikulin AM-38 liquid cooled V-12 engine. There followed a flurry of activity during the next four months in which the original (first) BSh-2prototype was modified and a third prototype emerged. The new prototype was designated the TsKB-57, and along with numerous other improvements, was powered by the new Mikulin AM-38 engine. (pp 188-89)

The TsKB-57 first flew on 12 October 1940, and immediately showed itself to be a much superior machine. It proved easy to fly and could reach a top speed of **423kph** (263mph) clean at sea level and **437kph** (272mph) at 2,800m. This was good considering that it was carrying around **700kg of armour**, which represented approximately 18% of the aircraft's total (empty) weight. A series of State acceptance trials and further development followed. With the extra available power it was now practical to **upgrade the armament** as well. Initially, 2 23mm

[55] **Note: 36,136 Il-2s** were produced in World War 2. In terms of aircraft engines, material and production resources consumed, the US Consolidated B-24 Liberator was easily the most mass produced aircraft of WWII. This was a 4 engine heavy bomber with an 'empty' weight of over 17,200kg compared to the 4,500kg Il-2. A staggering **18,482 B-24s** were produced.

MP-6 cannon were installed on the wings in place of 2 7.62mm MGs, as well as **launching racks under the wings for up to 8 RS-82 82mm rockets**. However the recoil forces from these cannon proved too great and the cannon were downgraded to **2 20mm ShVAK cannon**. The cannons were tested on what was then designated the TsKB-57P (*pushechnyy* - cannon armed), and was first flown on **29 December 1940.** This aircraft was now effectively the prototype for the first production aircraft. (p. 189)

Before State acceptance testing was complete, the BSh-2 (TsKB-57P) was **ordered into series production at Zavod 18 at Voronezh**. It is unclear exactly when the type was officially designated the Il-2, but it appears to have been late March or April 1941. The **first production Il-2** (from Zavod 18) was test flown on **10 March 1941** and a second aircraft was complete before the end of the month. In April the production rate ramped up so that 74 were produced in May and **159** in June. The 1941 production Il-2s were single-seaters armed with **2 20mm ShVAK cannons, 2 7.62mm ShKAS MGs, 4 100kg bombs, and up to 8 RS-82 82mm rockets.** The bombs were carried in 4 small internal bomb-bays positioned just inboard of the landing gear, while the rockets were mounted on the underside of the outer wing area. The 1941 production Il-2 was able to attain a speed of 414kmh (257mph) at 2,500m, 380kph (236mph) at sea level, and had a good range of some 740km. However, the climb rate was only moderate; taking 2.2 minutes to climb to 1,000m, and its operational ceiling was low at only 6,200m. The maximum weapons load was around 600kg.

It is worth pointing out here that **the 1941-42 Il-2 was only 4kph faster than the contemporary Ju 87D-1, which could carry over 3 times the bomb load (1,800kg)**. The Ju 87D-1[56] also had superior operational ceiling and range. **In terms of performance and ordnance carried, the Il-2 was outclassed by the other principal German ground attack aircraft in the spring of 1941; namely the Bf 110E.** Several versions of the Bf 110 were by now being optimised for ground attack duties and the BF-110E-1 had a usual weapons load of around 1,200kg (usually 2x500kg of bombs and 4x50kg Bombs). It also had superior speed, climb rate, turning rate, operational ceiling and operational range.[57] The main reason these German ground attack aircraft could carry much heavier loads and over longer distances was that they did not have to lug around some 700kg of armour. In reality, this weight in armour came at a very high price in reduced ordnance as well as performance; and **explains why Il-2s were relatively easy prey for German fighters in 1941-42, especially those fighters armed with a 15-20mm cannon.** (pp. 189-90)

By 22 June 1941 a total of **249 Il-2s** had been completed. On 1 June 1941 there were only **57** Il-2 attack aircraft in VVS service, and of theses **only 18 Il-2s were actually deploye**d with combat units in the Western Military Districts while another 39 were deployed in the Kharkov Military District. All the Il-2s in operational units were still undergoing evaluation and familiarisation, so their *pilots and ground-support crews were very inexperienced with this particular aircraft. This did not, however, prevent Il-2 units from being thrown into the air battles in the western USSR in June and July 1941*. (p. 190)

An example is the **4th ShAP** (*Shturmovoy Aviatsionnyy Polk* - Ground Attack Aviation Regiment) which was initially deployed in the (internal) Kharkov Military District. This was the most combat ready Il-2 unit in the VVS on 22 June 1941 with **39 aircraft** (all operational on 1 June) on strength (it was authorised 62). **Even this unit was so recent that the pilots had barely any flight training, had no tactics training, and had not flown any armament and attack exercises. Furthermore, the ground crews had had almost no training in servicing or arming the aircraft. Despite this, 4 ShAP was immediately transferred west (from the Kharkov region) and thrown into action against German forces crossing the Berezina River (east of Minsk) in early July 1941.**

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[56] **Note:** The Ju 87D-1 had a top speed of **410kph** (255mph) at 3,840m (12,600ft), a climb rate of around 300m/min, an operational ceiling of 7,290 metres (23915ft), and an operational range of **998km** (600mls). The most common weapons load was around 1,200kg (usually 1x 1000kg bomb and 4x 50kg bombs or 2x 100kg bombs).

[57] **Note:** Good to know! That the **Il-2** was totally outclassed in 1941/42 by the **Bf 110.** The Bf 110E-1 had a top speed of 528kph (328mph), a climb rate of around 652m/min, an operational ceiling of 9,754 metres (32,001ft), and an operational **range of 1,200km** (745mls).

Unsurprisingly, in the first few days of combat the 4th ShAP had already lost 10 Il-2s to enemy action, and further 19 were lost to other causes. Most important is that 20 valuable IL-2 pilots had already been killed before they had any chance to work out how to best use the Il-2 in combat and pass this knowledge on. By 10 July 1941 the 4th ShAP was down to 10 aircraft, of which barely a handful were operational. **No air-force unit or pilots, no matter how good the aircraft or brave the pilots, could withstand this type of abuse from its higher commands.** However, as we shall see later on the sections on Soviet bombers, this type of VVS command decision was not unfortunately restricted to the Il-2 units. (p. 191)

Output of the Il-2 at Voronezh continued through the second half of 1941, with peak production reaching 12 aircraft per day. I**n late October 1941 Zavod 18 was evacuated to Kuibyshev in southern Siberia which severely disrupted production, and for 35 days this plant produced no Il-2s at all**. Very limited production was started at **Zavod 1 in Moscow** and the new Zavod 381 in Leningrad, but these were mainly just assembling aircraft from existing components during 1941. Production of the Il-2 only really got underway again in January 1942 when the relocated Zavod 18 managed to get production back up to 7 aircraft per day.672 The disruption to production meant that from 23rd June to 31st December 1941 a further 1,061 Il-2s were completed, which was only moderate production in Soviet terms.

These Il-2s were issued to various new and old ShAP units through 1941, but there **losses continued to be extremely heavy**. By 31 December 1941 ca. **1,100 Il-2s** had already been irrecoverably lost. These losses are confirmed by IL-2 strength returns during 1941. For example, in late November 1941 there were only 144 Il-2s available across the whole Eastern Front, and barely half of these were considered ‘combat capable’. This was despite the fact that virtually every available IL-2 was being issued to front line VVS units as soon as they became available. Despite much broad (and now, dated) aviation literature stating “the Il-2 gave a good account of itself in 1941”, *there appears little actual evidence to support this statement*. **In fact, this author has yet to find a single report by a senior German panzer officer that states any significant German mechanised offensive was stopped (or even significantly hindered) by Il-2s during 1941.** (p. 191)

As a measure of Il-2 crew survival rates, consider that during 1941 the average Il-2 only survived 13 sorties.676 Around half of these losses were attributed to German Army and *Luftwaffe* mobile flak units, so one really has to question the principle behind heavily armoured aircraft. The reality is that a direct hit from an exploding 37mm flak round would easily cause an entire wing or tail section to fail, and then it really didn’t matter how much armour the basic fuselage had. This extremely high loss rate (per sortie) continued well into 1942, and it was only the advent of the improved 2 seat IL-2 that the loss rate dropped to one aircraft lost per 26 sorties in late 1942. Undoubtedly, one of the main reasons Il-2 units suffered so badly during 1941 (and early 1942) is to do with the way they were used (or misused). In general, VVS ShAP units were prematurely committed to action almost as soon as they received their Il-2s. The early lessons of 4 ShAP in July 1941 were not heeded. **These ShAP units were rarely given time to train adequately and prepare**. Furthermore, in more established ShAP units (which received replacement Il-2s) the pilots rarely lived long enough to bring their knowledge and experience home to increase the overall Il-2 pilot proficiency and develop suitable combat tactics. It is very arguable, of course, that the VVS and Red Army had no choice but to commit their inexperienced Il-2 units in the desperate battles during late 1941 and into 1942. (pp. 191-92)

After the Soviet winter counteroffensive had run out of steam in March 1942, even the VVS high command realised the Il-2 loss rate was unacceptably high. There followed a *series of conferences in which ways were investigated to improve the Il-2’s survivability without seriously affecting production*. The latter was vital because IL-2 production in the newly moved factories was still relatively slow, and no one wanted to upset Stalin by slowing down the production rate any further. . . The required improvements were implemented in steps. . . The new 2 seater IL-2 started manufacturing tests in **March 1942** and it was soon demonstrated that the increase in armour weight and heavier armaments, predictably, came at a cost. The maximum speed was reduced by some 20kph and the 2 seater proved more difficult to handle. 680 When committed to combat in the summer of 1942, Il-2 bomb loads rarely exceeded 200kg and in many cases only the much lighter rockets were carried. **This was**

simply Il-2 pilots and their units (sensibly) attempting to minimise casualties over the front lines in what was now a lumbering aircraft. (p. 192)

Finally, for those interested in a more objective and realistic analysis of the Il-2's actual performance against German tanks and assault guns during WWII, refer to Appendix B, titled '***A Reassessment of the Il-2's True Effectiveness Against Armour***'.

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A Reassessment of the Ilyushin Il-2's Effectiveness against Tanks (Appendix B)

It is always enlightening when one examines any weapon system's performance figures impartially and with cold mathematical style analysis, alongside the 'historical record'. **The Ilyushin Il-2 is one of WWII's particularly interesting cases because its performance figures were not at all exceptional for the time, and yet this aircraft is given very favourable historical treatment** in the large majority of literature which mentions this aircraft. However, in historical descriptions of this aircraft *I see a lot of identical phrases repeated over and over again (and, it seems, mutually copied from one book to another)*. As usual, this type of historical treatment immediately raises alarm in my mind. The core of these flattering accounts of the Il-2's exploits remains its apparent ability to kill German tanks during WWII. Of all the accounts, these are the ones most filled with the generally accepted 'received wisdom' about the history of this aircraft. However, there is almost *invariably no real objectivity, no questioning, no original thought, and, perhaps worst of all, no attempt at verification with any historical record.* (p. 698)

It is as though someone in the 1940-50s wrote the anti-tank history of this aircraft, and then this has somehow become the widely accepted 'truth'. In this essay I have put together more objective thoughts on the Il-2's true anti-tank capability **as measured by the contemporary standards of WWII**. The following is not a reflection on **the Il-2's achievements in attacking soft-targets behind the German lines, which was almost certainly the Il-2's greatest achievement.** These targets included critical supply lines, supply depots, trains, train marshalling yards, truck columns, bridges, airfields, etc. In this regard the Il-2's achievements were similar to those of the better known Western Allied ground-attack aircraft during WWII. However, tanks (and AFVs in general) remained one of the most difficult and hazardous targets for any aircraft to attack during WWII. They were small hard-targets which were often mobile, concealed and well protected by light and medium flak.

This essay is focused very specifically on the true anti-tank capability of the Il-2, and its achievements in this regard during WWII. Its aim is to help the reader become more aware of the physical and historical reality behind many of the Il-2's anti-tank 'stories', and at least question the *many clichés that abound in most descriptions of this*
aircraft.

The Anti-Tank Armament on 1941-42 Production Il-2s

On first glance the 1941-42 production Il-2 **appears to be formidably armed.** *In fact it was relatively lightly armed for a ground-attack aircraft of the day, and especially for one which was supposed to be a specialised anti-tank weapon system*. The 1941 production Il-2s were single-seaters armed with **2 20mm ShVAK cannons, 2 7.62mm ShKAS MGs, 4 100kg bombs (FAB-100 HE) and up to 8 82mm rockets (RS-82).** The effectiveness of the small RS-82 rockets against tanks is covered later (below). The bombs were carried in 4 small internal bomb-bays positioned just inboard of the landing gear, while the rockets were mounted on the underside of the outer wing area.

For comparison, the contemporary Messerschmitt **Bf 110E-1** fighter-bomber routinely went into action with 2 20mm MG FF/M Cannon, 4 7.92mm MG17s, 1 (rearward facing) 7.92mm MG 15, 2 500kg bombs and another 4

50kg bombs: a 1,200kg bombload and altogether a far more lethal ordnance load and better defensive gun load than the Il-2. At the same time, the contemporary Junkers **Ju 87D-1** was capable of delivering a massive 1,800kg bomb load with far greater accuracy (**easily the most accurate air-borne delivery system in the world at that time**). This bomb load included a single 1,400kg PC 1400 armour-piercing bomb. With this weapon (or even the more common 1,000kg bomb) the Ju 78D-1 effectively became an 'anti-everything' weapon: it was capable of destroying everything from the heaviest tanks to bridges, to bunkers, to battleships.

The Il-2's 100kg bombs had very little effect on heavily fortified or armoured targets, mainly because little short of a direct hit was going to seriously damage tanks. Also, note, all these aircraft dropped their bombs from lower altitudes, so invariably the bombs were not moving at particularly high speeds upon impact.[58] Even the diminutive Henschel Hs 123A-1 (dedicated to extreme close-support dive bombing) normally carried 450kg of bombs into action, and one of these was normally a 250kg bomb. This was easily on a par with the Il-2's load. But, **along with the Ju 87, the Hs 123 was able to deliver bombs with almost ridiculous accuracy compared to the Il-2** (or, for that matter, any of the fighter-bombers and bombers in WWII which normally attacked at angles less than 40 degrees from the horizontal, including the Bf 110). (p. 698)

Both the Bf 110E-1 and Ju 87D-1[59] **were contemporary aircraft being delivered to *Luftwaffe* units in the spring of 1941**, and both were optimised for ground attack. These aircraft (along with several other similar variants) were considerably more lethal to tanks than the Il-2 during the whole Operation Barbarossa period and well into 1942. And yet, neither aircraft type (with the arguable exception of the Ju 87) is commonly mentioned as a particularly effective 'anti-tank aircraft' in WWII aviation literature. When a breakdown of Soviet and German tanks losses is carried out, we find that, in actuality, **during 1941 and 1942 both these aircraft types (and especially the Ju 87) destroyed considerably more tanks per aircraft lost than the Il-2 ever did.** (p. 699)

The VYa-23 Armed Il-2

So what about the armaments on later models of the Il-2, including the most mass produced model, namely the **Il-2m3**? ***By early 1942 the VVS (and the Luftwaffe) had pretty much concluded that the 20mm cannon was ineffective against armoured vehicles***. In late 1941 a new Soviet 23mm cannon became available for aircraft with the designation VYa-23. This weapon was gas-operated and belt-fed with a rate fire from 550-600rpm. It was a relatively large and heavy weapon; almost 2.2 metres long and 68kg empty. The recoil and loading action was violent for an aircraft weapon, and it was always rather susceptible to ammunition-feed jamming, especially after being in service for a while. In fact the weapon's action was so violent that its use on fighters was effectively ruled out. On the upside, the VYa-23's API (Armour Piercing Incendiary) round had a muzzle velocity of 905m/s and it was shown to be able to penetrate 25mm of armour (of unknown hardness) at a range of 400m at zero degrees angle
of impact. **The VYa-23 was first mounted on Il-2s in mid-1942, and then progressively became the standard weapon on the Il-2m, Il-2m2 and the Il-2m3**. All these aircraft most commonly carried 2 VYa-23 cannon with 150 rounds per gun. **Unfortunately, the VYa-23 cannon proved to be a disappointment in its intended anti-tank role**. (p. 700)

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[58] **Note:** It was (and is) common for the heaviest bombs, dropped from high altitude, **to reach supersonic terminal-velocity speeds.**

[59] **Note:** Just so the reader fully appreciates the kind of damage inflicted by Ju 87s, consider the following. **The 10 German Ju 87 aces**: Rudel, Nordmann, Heinz-Ruffer, Plenzat, Wosnitza, Stahl, Hubsch, Noller, Polz and Studemann, flew an incredible **11,950** combat-missions during WWII. They are credited with the destruction of **1,354** tanks, as well as innumerable trucks, bridges, ships of all sizes and types, armoured trains, trains, fortifications, aircraft, and other targets! (And this is only 10 of a very long list of Ju 87 aces). *It is very likely that the Ju 87's tank-kill claims are also highly exaggerated (as with all WWII ground-attack aircraft), but even if they destroyed a quarter of this number, it is an astonishing total*. The figure above does equate to only 1 tank destroyed for every 8.8 combat missions, and given the expertise of these pilots and the bombing accuracy of the Ju 87, the number of tanks destroyed seems a lot more plausible.

So the reader is clear, **the chances of an Il-2 armed with the VYa-23 cannon penetrating a Panther or Tiger tank were very slim to non-existent**, and the large majority of Il-2s used this weapon during WWII. The thinnest armour on the Panther was 16mm on the turret top while the Tiger I's armour was pretty much impervious (25mm on all upper surfaces). This correlates with the historical record: **very very few of these tanks was ever irrecoverably lost to cannon fire from Soviet (or Western Allied) aircraft in WWII.** Occasionally, one of these tanks was temporarily disabled if a cannon shell penetrated the engine grilles and caused engine related damage. I am tired of reading poorly researched books which state that the Il-2 could readily destroy German Panthers and Tigers with its 23mm cannon. *This statement is a total cliché and is totally unsubstantiated by either Russian (ex-Soviet) or German historical records.*

The NS-37 Armed Il-2

As one might expect, given all the above, in **1943** attempts were made to improve the anti-armour performance of the Il-2's cannon. The weapon selected was the **37mm NS-37.** This was a brute of weapon for any aircraft. It was recoil operated and belt fed with a rate of fire from 240 - 260rpm. It was 3.4m long and weighed some 160kg empty; too large to place inside a wing. Fitting to the Il-2 began in June 1943 and the NS-37 was installed in large underwing pods with a single weapon under each wing. These aircraft are sometimes called the Il-2-3m, or the Il-2-37. Each gun had 40 rounds, and in this configuration the gun and ammunition weighed around 237kg. This meant the Il-2's bomb load was reduced to a maximum of 200kg and sufficient ammunition was carried for only 9-10 seconds of firing. In addition the Il-2's top speed was reduced by 25-30kph, its climb rate and ceiling were adversely affected, and the aircraft was more difficult to handle. (p. 701)

As it turned out the biggest problem with the Il-2 mounted NS-37 was not its penetrative ability, but its ability to actually hit anything that it was aimed at. There were two main reasons for this. Firstly, the effect of 'strafing dispersion' due to a low rate of fire, and, secondly, the effect of the weapon on the firing aircraft. Continuing to look at the basic physics is the simple effect of 'strafing dispersion'. (p. 702)

A total of around **3,300 Il-2s were eventually fitted with the NS-37 cannon**, around 9% of total production. The majority were built in **1944**. **Overall, the NS-37 Il-2 was barely more effective at destroying German armour than the VYa-23 Il-2,** despite the harder hitting cannon. Ultimately the NS-37 Il-2 was a less reliable and less accurate weapon system, had a degraded flight performance compared to earlier models, and never proved popular with its pilots. Given all the above, it is not surprising that most Il-2 pilots preferred going into action with the 23mm cannon armed Il-2. (p. 703)

The RS-82 and RS-132 Armed Il-2

Apart from the 20-37mm cannon, the next most common anti-tank weapons carried by Il-2s during WWII were the **RS-82** (Roketniy Snaryad-82 or Rocket Projectile-82) and the RS-132 rocket systems. . . **The real problem with the RS-82 turned out to be much the same as that which plagued every air-launched and unguided anti-tank rocket used in WWII: namely very poor inherent accuracy made far worse by being fired from a rapidly moving aircraft**. Rocket effectiveness tests carried out by the VVS in late 1942 showed that out of 186 BRS-82 rockets fired at a stationery tank at a range of 500m, only 2 (around 1%) could be regarded as hitting the tank. Just as bad was that none of the hits were considered to have inflicted significant damage (the type of tank is unspecified). The test was reduced to a firing range of 300m against a small column of tanks and other light AFVs (again, exact number and type is unspecified). This time around 3.7% of the BRS-82 rockets hit a target, but the damage results were still very poor. **It was found that a direct hit was required to disable a light tank (presumably something like a Pz Kpfw IIF) or an armoured halftrack. Near misses as close as one metre did no damage to any of the armoured vehicles.** (pp. 703-04)

In 1942 the 132mm **RS-132** rocket design was revisited, possibly when it was realised how inadequate the RS-82 was against hard targets. . . With this type of penetrative ability, and if hit in the optimum fashion, the BRS-132

could penetrate the large majority of tanks fielded during WWII. However Soviet testing showed that out of 182 BRS-132 rockets fired at a stationary tank at a range of 500m, none hit the target! In this test the range was reduced to a mere 200m and 134 BRS-132 rockets were fired against a small column of tanks and other light AFVs. In this case only 2 rockets hit targets, both of which were considered destroyed. **As with the BRS-82, near misses by the BRS-132 did no significant damage to light or medium tanks. Overall, the accuracy of the RS-132 was shown to be actually worse than the RS-82.** This was compounded by the fact that the RS-132 had a significantly longer range which meant pilots typically launched them when they were further away from the target. Based on these and the RS-82 results, it soon became apparent that even large unguided rockets were close to useless against medium and heavy tanks. (p. 704)

The PTAB Armed Il-2

We now come to the last significant anti-tank weapon system deployed on Il-2s to destroy armour, namely the **PTAB bombs** (*Protivotankovaya Aviabomba* - Anti-tank Aviation bombs). These were a relatively effective and unique anti-tank weapon developed by the Soviets, when they realised that aircraft cannon and rocket were not 'doing the job'. The VVS started thinking about the accuracy problem in a different way, and instead of trying to blast the target with a single large cannon shell or rocket, they realised that by dropping many smaller bombs in clusters they would increase the chances of a direct hit. **Thus the PTAB was, in effect, an early version of the modern cluster bombs**. **With the advent of shaped charges (High Explosive Anti-Tank - HEAT) it became possible to build very small bombs which could still penetrate quite thick armour.** (pp 704-05)

Development commenced in **1942-43** and proceeded very rapidly. The PTAB bomb (or more accurately, bomblet) was designed by I.A. Larionov, weighed 2.5kg and contained around 0.5kg of explosives. It was capable of penetrating around 60mm of non-face hardened homogenous armour if it struck at 90 degrees to the armour plate. **This was sufficient to penetrate the top armour of even heavy tanks of the period**. The Il-2 was chosen as the main delivery platform and special delivery canisters were designed, each of which could carry **48 PTAB bomblets.** The Il-2 was able to carry 4 canisters, or **192** bomblets, in total. **Soviet post-war claims for the success of the PTAB in destroying German tanks are abundant**, and a large number were dropped during the war (mostly during 1944-45). Specifically, Soviet records show that **1,171,340** were dropped in 1943 (or 6,100 Il-2 sorties equivalent), **5,024,822** were dropped in 1944 (or 26,170 Il-2 sorties equivalent), and **3,242,701** (or 16,889 Il-2 sorties equivalent) were dropped in 1945. (p. 705)

However, there are *at least two major inconsistencies in the historical record which do not support the view that the Germans suffered extraordinary tank losses to this weapon*. The first is that **German tactical reports from 1943 to 1945 do not regularly attribute exceptional tank losses to PTAB attacks**, over and above the relatively small number lost to other weapons like the NS-37 or BRS-132. **In fact it is difficult to find any first-hand accounts by German panzer crews on the Eastern Front describing anything more than the occasional AFV loss to direct air attack.** From mid-1944 to 1945, one would have expected such reports to be commonplace as this was when the Soviet air-superiority and PTAB usage peaked. **German Panzer crews did, however, spend plenty of time 'complaining' about hidden Soviet anti-tank guns, artillery and riflemen with anti-tank rifles.**

The *second major historical inconsistency* is the total number of German tanks, assault guns and other types of fully tracked AFVs lost to air attack on the East Front during WWII (and particularly in 1944). Total German fully tracked AFV (irrecoverable) losses on the East Front **from 1941 to 1945 amounted to approximately 36,100 fully tracked AFVs**.[60] This includes German tanks, command tanks, flame-thrower tanks, assault guns (StuGs), assault artillery, tank destroyers (including self-propelled anti-tank guns) and self-propelled artillery (such as the Wespe and Hummel). It also includes around **3,500** AFVs 'captured' by the Soviet forces when Germany

[60] **Note:** The figures break down as: **20,570** German tank, flame tank and command tank losses, **8,595** German assault gun and assault artillery losses, and **6,917** German tank-destroyer, SP AT gun and SP artillery losses. This amounted to over 72% of the total production of these vehicles (including 74% of all tank production) since 1938.

surrendered in May 1945. **The vast majority of German tank, assault gun, assault artillery and tank destroyer losses were due to enemy anti-tank guns, artillery, tanks, tank destroyers, mines, infantry assault, or simply abandoned as operational losses.**

At most, 7% of these AFVs were destroyed by direct air attack,[61] which amounts to approximately 2,500 German fully tracked AFVs lost to direct air attack. A significant portion of these were due to other Soviet aircraft types such as the Petlyakov Pe-2 (which, as far as is known, did not use PTABs). If we give the PTAB the benefit of any doubt, and make the assumption that as many as 40% of all German fully tracked AFV losses to aircraft were attributable to PTAB weapons from 1943 to 1945 (which is on the high side), then this equates to some 1,000 AFVs. From the above data on the total number of PTABs used, we can see that approximately 9,440 PTABs were expended for each fully tracked AFV destroyed by PTABs. An alternative way to think of it is that, **on average, the equivalent of 49 Il-2 sorties were flown, each with a full load of PTABs, for each fully tracked AFV destroyed by PTABs.**

Continuing on with why the PTAB system was less effective than expected. Because of the nature of the PTAB HEAT warhead, and the relatively low speed of impact (i.e. a light bomblet dropped from low altitude), the PTAB **was one of the easiest anti-tank weapons to protect against.** The PTAB used a s**haped charge warhead** and for this to work properly it needed to make contact with the armoured surface it was trying to penetrate. **The shaped charge literally blasts its explosive gases at hypersonic speeds against the armour until it melts and gives way. The explosion then continues into the interior of the tank and causes damage, fire, etc. . .** (p. 707)

After the **Battle of Kursk**, where the PTAB was first used in significant numbers, the Germans had become aware of the potential PTAB threat so the average German tank crew started to take appropriate precautions (apart from the obvious dispersing of armoured vehicles along roads, etc, when on the march). **As with all shaped charge (HEAT) warheads, this involved placing items on the armoured surface (preferably with an air space) to prematurely detonate the warhead before it came into contact with the actual armour.**[62] For a weapon like the PTAB which was light and easy to trigger, there were many items that would do and which were not too heavy. They were easily emplaced on the tank's horizontal surfaces with special attention to more important areas such as engine grill covers, fuel tanks and turret tops. Suitable items included: spare tank tracks (perfect for the job as they were easily strong enough, had air gaps and the tank usually already carried them), metal tool boxes preferably with the tools inside, Jerry Cans full or half full of water, sandbags, *the large coiled metal cables used to tow broken down tanks*, planks of wood (preferably a few layers) and *even thick wire mesh placed on frames*. The latter were more often used to protect open top vehicles like Sd Kfz 251 halftracks or some armoured cars. As long as the PTAB was triggered some distance away from the armoured surface, the 12-25mm of top armour would do the rest. **A medium or heavy tank festooned with such items over its vital surfaces was pretty close to being invulnerable to critical hits from PTABs.** (p. 707)

In addition to all this, **Soviet PTAB cluster bombs were one of the most hazardous (to the carrying aircraft) types of air-ordnance carried during WWII.** *This was because all 192 bomblets (in an Il-2's full load) were armed with contact fuses in their canisters when loaded.* The closer the bomblets were dropped together, then the higher the chances of two or more colliding and exploding just after release when they hit the airstream (with the

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[61] **Note: Less than 7% of German tanks, assaults guns and tank destroyers were lost to direct air-attack in the entire Normandy campaign in 1944**. The Western Allies had complete 'air-supremacy' which is above just 'air-superiority. They conducted what amounted to the most intense, concentrated and destructive ground-support and air-interdiction campaign of WWII. Even USAF and RAF strategic bomber forces were involved in carpet bombing whole areas (and this was a relatively small battlefield). To estimate that as many as 7% of all German fully tracked AFVs were lost to direct air attack on the East Front *is being extremely generous to the Soviet VVS.* The figure was probably more in the region of 4-5%. **Another example is that only 2-5% of Soviet tanks lost in the Battle of Kursk were due to direct air attack**, despite the *Luftwaffe's* intense air-campaign and **very exaggerated claims of destroying hundreds of Soviet tanks.**

[62] **Note:** This was the defensive measure used against HEAT projectiles before advent of reactive armor.

possible adverse consequences to the launch aircraft). Even more dangerous was if one or more bomblets released, or became dislodged, while inside the canister when in transit to the target. (Note: the bomblets were especially designed to release very easily and rapidly. If this occurred there was a significant chance that a bomb would detonate on the canister walls, especially if the aircraft was subject to violent movement as a result of flak or air to air combat. All in all, one starts to wonder if the PTAB weapon system (as developed in WWII) was more dangerous to the Il-2 aircrew than the enemy tank crew.) From the Russian Il-2 loss figures quoted later in this appendix, it is apparent that the Il-2 suffered a very high rate of 'operational losses' or 'non-combat losses'. One is left to wonder if losses due to PTAB 'accidents' were considered operational losses? (pp. 707-08)

Lastly it is worth looking at the total number of PTABs used. The previous figure of **9,438,863** PTAB bomblets used during WWII seems like a lot. However this actually equates to some **49,160 Il-2 sorties** with a full PTAB weapon load, or an average of 73 sorties per day from 5 July 1943 to 8 May 1945. When one considers the size of the whole Eastern Front (over 3,000km long), the thousands of aircraft sorties flown by the VVS every day, and the thousands if Il-2s that were operational in 1944-45, then 73 sorties per day is a relatively small number. **It does mean that the PTAB was not a commonly used weapon in Soviet terms**, and the very large majority of Il-2s only ever went into action with cannon, rockets and bombs. (p. 708)

Examples of the Il-2's Completely Exaggerated Anti-Tank Performance

For examples of the Il-2's hugely exaggerated anti-tank performance during WWII, I have selected some repeated descriptions relating to the Battle of Kursk. **During this battle in July 1943, the VVS and post-war Soviet accounts claimed many hundreds of German tanks totally destroyed by Il-2s**. The following examples appear in numerous aviation books on aircraft (with almost identical phrasing) and are presented as 'fact'. I have included some of these publications in the footnotes for illustration purposes. In none of these has the author even attempted to verify the validity of the Soviet claims.

> 1. On 7th July 1943, in one 20 minute period it has been claimed Il-2s destroyed 70 tanks of the 9th Panzer Division.
>
> It actually turns out that close to the start of the battle on 1 July 1943, 9th Panzer Division had only one tank battalion (the II./Pz Regt 33) with only 83 tanks of all types in the Division. These comprised 1 Pz Kpfw II, 38 Kpfw Pz III, 38 Kpfw IV and 6 command tanks (Pz Bef). The division had no assault guns. **The 9th Panzer Division didn't record any such loss in July and only registers an air-attack referred to as heavy strafing.** According to the Soviet VVS accounts the 9th Panzer Division should have lost 84% of all its tanks in one day. The 9th Panzer Division remained in almost continuous action for over three months after this so called 'devastating attack'. It covered the 9th and 2nd Panzer Army's withdrawal north of Orel and Kirov, and in August 1943 it fought a whole series of mobile defensive actions (against Red Army tank units) east of Bryansk. During this time 9th Panzer division received almost no replacement tanks, and most of its initial 83 tanks remained operational.
>
> 2. During the battle of Kursk, the Soviet VVS Il-2s claimed the destruction of no less than 270 tanks (and 2,000 men) in a period of just two hours against the 3rd Panzer Division.
>
> Just prior to the battle, on 1 July, the 3rd Panzer Division's 6th Panzer Regiment actually had only 90 tanks on strength. These comprised 7 Pz Kpfw II, 59 Kpfw Pz III, 23 Kpfw IV and 1 command tank (Pz Bef). The division had no assault guns. **This means the division had 180 fewer tanks than claimed as destroyed by the VVS in two hours!** To put it another way, the VVS claimed the destruction of three times more tanks then existed in the entire division. On 13 July (well after the Kursk battle) the 3rd Panzer Division still had 41 operational tanks. The 3rd Panzer Division continued fighting throughout July, mostly with 48th Panzer Corps. It did not record any

extraordinary losses to air attack throughout this period. **As with the other panzer divisions at Kursk, the large majority of 3rd Panzer Division's tank losses (at most, 49 tanks) were due to dug in Soviet anti-tank guns and tanks.**

3. Perhaps the most extraordinary claim by the VVS at Kursk, is that over a period of four hours (during the Battle of Kursk) Il-2s destroyed 240 tanks, and in the process virtually wiped out the 17th Panzer Division.

On 1 July 1943 the 17th Panzer Division had only one tank battalion (the II./Pz Rgt 39) with a grand **total of only 67 tanks**. These comprised 4 Pz Kpfw II, 29 Kpfw Pz III, 32 Kpfw IV and 2 command tanks (Pz Bef). The division had no assault guns. This time the VVS claimed only 173 more tanks destroyed than existed in the division, or 3.6 times more tanks then existed in the entire division! When Operation Citadel was launched on 5 July 1943, the 17th Panzer Division was not even in the main attack sector: it was deployed further south with 1st Panzer Army's 24th Panzer Corps. The *17th Panzer Division's records do not register any abnormal losses due to aircraft in the summer of 1943, and definitely not tanks during the Battle of Kursk*. During late July and into August the division then fought a series of mobile rear-guard actions to cover 1st Panzer Army's withdrawal from the Donets River. During this whole period the 17th Panzer Division averaged 25-30 operational tanks in its II./Pz Rgt 39. The division was never withdrawn for a rest and refit, and remained in continuous action. In 1944 it participated in the relief of the Korsun-Cherkassy Pocket, and later the breakout from the Kamenets-Podolsky (Hube) Pocket; both extremely hard fought tank battles. Altogether miraculous for a division that had been 'annihilated' less than a year earlier.

One might imagine these claims to be some of the worst over-claims from WWII, but unfortunately this type of claim (and rhetoric) is actually not that unusual in descriptions of the Il-2's apparent anti-tank accomplishments. ***Regrettably, it is now clear that almost all VVS claims regarding tanks destroyed, and enemy losses in general, need to be treated with a great deal of scepticism***. Far more modern and objective analyses of the Battle of Kursk reveals that, in actuality, total German tank losses in Operation Citadel amounted to 1,612 tanks and assault guns damaged and **323** totally destroyed; the vast majority to Soviet anti-tank guns and AFVs.[63] Admitted Soviet tank losses in this battle were 1,614 tanks totally destroyed: around 5 times higher than German tanks 'totally destroyed'. It is clear that the many hundreds of German tanks 'destroyed' by Il-2s during July 1943 is nothing more than wishful thinking. (p. 709)

The Bottom Line

Total German tank production from 1938 to war's end was **27,769** tanks, command tanks and flame-thrower tanks. They also produced **12,175 assault guns and assault artillery AFVs, and 9,944 tank-destroyers, self-propelled anti-tank guns and self-propelled artillery AFVs.[64]** These **49,888** fully tracked AFVs are the only vehicles that could be considered 'tanks' in any real sense. Even though the assault guns, assault artillery and tank destroyers did not have a rotating turret, they were fully (and often heavily) armoured like a tank. The fully-tracked self-propelled AFVs were not really 'tanks' as their amour was very light, they had open tops and usually did not have a rotating turret. These vehicles were specialised machines and were only suited for specialised roles. However they are included here because they were still fully tracked AFVs and were obviously subject to direct air attack. (p. 710)

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[63] **Note:** N. Zetterling, *Kursk 1943: A Statistical Analysis*, Frank Cass, London-New York, 2000, p 216.

[64] **Note:** P. Chamberlain, H Doyle, T Jentz, *Encyclopedia of German Tanks of WWII*, Arms and Armour Press, London, 1978, appendix VII, pp. 261-262. This includes a moderate number of AFVs converted from one type to another. For example, old Pz 38(t) tanks being converted to self-propelled anti-tank guns (i.e. the **Marder III Sd Kfz 139 or the Sd Kfz 138**).

Of these AFVs, around 36,100 (ca. 72% of the total) were lost on the East Front during WWII. The figures break down as: 20,570 tank, flame tank and command tank losses (74% of production), 8,595 assault gun and assault artillery losses (71% of production), and 6,917 tank-destroyers, self-propelled anti-tank guns and self-propelled artillery losses (70% of production). **These loss figures include around 3,500 AFVs which were 'strategic losses', i.e. they were 'lost' when Germany surrendered in 1945**. Strictly, these should not be included as 'combat losses' or 'operational losses', which is what we are considering here.

As we have seen, all the 'weapon systems' deployed on Soviet aircraft during WWII were not particularly effective against tanks. This then largely explains why, at most, **only 7% of all German fully tracked AFV lost on the East Front were directly attributable to direct air-attack**. This amounts to approximately 2,500 German fully tracked AFVs lost to direct air attack, a portion of which were lost to other aircraft types (apart from the Il-2) such as the Petlyakov Pe-2. The large majority of German fully tracked AFV losses were due to enemy anti-tank guns, artillery, tanks, tank destroyers, mines, infantry assault, or simply abandoned as operational losses.

During WWII a total of 36,136 Il-2s were produced, and in terms of aircraft numbers it remains the most mass produced military aircraft in history. This figure does not include the **similar but much improved Il-10, which entered production in October 1944 and first went into action in February 1945**. However, the Il-2 was also probably the most 'shot down' aircraft fielded during WWII, and losses were very heavy throughout the war. Official Russian figures indicate that from 22 June 1941 to war's end, ca. **23,600 Il-2 and Il-10** ground attack aircraft were irrecoverably lost. (p. 710)

True to form on the Il-2, it seems, some have chosen to minimise the admitted Il-2 losses during WWII, largely by neglecting the so called 'operational losses'. For example, one source indicates only 10,762 Il-2 aircraft were lost during WWII. Another well-known (Russian) author states, "The *Luftwaffe* command claimed that the Russians lost 6,900 Il-2s in 1943 and 7,300 in the following year. Although these figures were exaggerated by a factor of 2 to 2.2..." Even taken in context, the author implies that the VVS lost only around 6,760 Il-2s during the whole period from 1 January 1942 to 31 December 1944! ***In fact it is apparent that the German claims were remarkably accurate when compared to the actual Il-2 losses.*** In 1943 the official Russian figures indicate 7,200 Il-2s lost in 1943 and 8,900 lost in 1944: the German claim is therefore 96% of the actual losses (from all causes) in 1943, and only 82% of the actual losses (from all causes) in 1944. The same source indicates that 3,300 (46% of 7,200) in 1943, and 4,800 (54% of 8,900) in 1944, were Il-2 'operational losses'. (p. 711)

So what conclusions can be drawn from all these figures if the number of tanks destroyed is the measure of success? Well, to put it bluntly, considering the Il-2 was supposedly the most 'successful' ground attack aircraft in WWII, and considering it was one of the premier anti-tank aircraft of the war, **then its average performance against German fully tracked AFVs was nothing short of dismal.**

On average, over 9.4 Il-2s were irrecoverably lost for every German fully tracked AFV irrecoverably lost on the East Front due to direct air attack (23,600 vs. 2,500). *The real reason for this figure is, of course, that Il-2s spent far more time and effort attacking targets which were not tanks*, and this is where this aircraft excelled both in quality and sheer quantity. Critical targets included supply lines, supply depots, trains, marshalling yards, truck columns, bridges, airfields, artillery emplacements, bombardment support for infantry and tank attacks, etc. *It was in this regard that Il-2s did by far the most damage to the Axis war machine.* Unfortunately the images of destroyed trucks, trains, horse-carts and supply depots will never fire the imagination like the image of a burning Panther or Tiger tank. (p. 712)

Having said all this, *the Il-2 was at least as good at killing tanks as any aircraft fielded by the Westen Allies during WWII.* To be fair, the RAF and USAF claims of German tanks destroyed in Normandy, and the Western Front in

general, were no more realistic than the VVS's claims.[65] It is hard to distinguish the winner between the RAF, USAF and VVS for the title "having achieved the most tank kill over-claims during WWII". **The reality is that right up to the end of the war, tanks remained one of the hardest targets to hit with effective anti-armour weapons, and tank battlegroups remained one of the most hazardous targets for any ground-attack aircraft to engage**. In addition it was very difficult for a pilot flying away from a tank, probably under enemy fire and obscured by smoke and debris, to accurately assess the real damage inflicted. The problems and difficulties the Il-2 faced in attempting to destroy German tanks were replicated by all the Western Allied ground-attack aircraft fielded during WWII, as well as by the ***Luftwaffe's*** **Hs 129** and late war fighter-bombers. (p. 712)

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b. Sukhoi Su-2:[66]

The Sukhoi Su-2 was an **early Soviet attempt to produce a fast, short-range and multi-purpose bomber**. This important project became known within the Soviet aircraft industry by the name 'Ivanov' **due to Stalin's direct involvement**.[67] In early 1936 proposals were sought from five design groups headed by: **A. N. Tupolev** (then the TsAGI Chief Designer), N. N. Polikarpov (then TsKB Chief Designer), I. G. Neman (KhAI Chief Designer), D. P. Grigorovich and S. Kocherigin. At this time, one **Pavel Sukhoi** was working as the head of the engineering and design team No. 3 within the TsAGI collective headed by Tupolev (OKB 156).

In OKB 156 the design which eventuated was designated the SZ (*Stalinskoye zadaniye* - Stalin's assignment) within the design bureau. In only six months (in 1937) Sukhoi supervised the design and construction of a single-engine, low cantilever wing monoplane with retracting undercarriage, aimed at meeting the UVVS specification. OKB 156 was ordered to focus on the use of light alloys in the design of the prototype, **so the SZ-1 was of all metal construction.** The 2 man crew was accommodated under a raised glazed canopy which terminated in a ring mounting for a light perspex turret which was traversed by hand. . . The engine selected for the prototype was the Shvetsov M-62 9 cylinder radial engine, which provided 830hp at sea level driving a 2 blade 2.8m variable pitch propeller. The internal bomb-bay was designed for a 200kg bomb load, and **3 self-sealing fuel tanks** were incorporated in the forward fuselage and wing panels (with 930 litres of total capacity). The proposed gun armament was 4 wing mounted 7.62mm ShKAS MGs (with 750 rounds per gun), a single 7.62mm ShKAS MG in the **dorsal** ball turret, and another 7.62mm ShKAS MG in a **ventral** hatch.[68] Both the latter weapons (with 500 rounds per gun) were meant to be operated by the observer / rear-gunner. External bomb racks were also fitted for 200kg of bombs (**making a 400kg bomb load in total**).

The first prototype was designated the ANT-51 and first flew on **25 August 1937**. The flight tests indicated the *aircraft was underpowered and the engine was unreliable*, but it exhibited good flight handling characteristics, and had good longitudinal and lateral stability in flight. A second prototype SZ-2 was completed by December 1937 and was submitted for State trials from 29th January 1938. Tests indicated a top speed of 403kph (250mph) at 4,700m, and it took 16.6 minutes to reach 5,000m. **The testing soon confirmed the M-62 engine was not powerful enough and was too unreliable**. This was graphically illustrated when the second prototype crashed due to engine failure on 3 August 1938. (pp. 193-94)

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[65] **Note:** However, d*uring the war the British Army at least initiated a series of detailed reports which analysed the causes of German tank losses* (based on surveys of wrecked vehicles). These reports were released post-war, and revealed that only around **7% of the German tank wrecks** littering the Normandy battlefield could be attributed to direct air attack. This still did not stop many Western authors perpetuating the myth that aircraft like the Hawker Typhoon and P-47 Thunderbolt were prolific and efficient tank killers in 1944-45.

[66] **Note:** One of sources used for Su-2: Y. Gordon, *Soviet Airpower in World War 2*, Midland Publishing, Hinckley, UK, 2008,

[67] **Note:** Interesting that Stalin had his nose so many of these weapons-development efforts!

[68] **Note:** "dorsal" – on top of the fuselage, sometimes referred to as a mid-upper turret. "ventral" – underneath the fuselage, often on US heavy bombers, a Sperry-designed ball turret.

Around this time Sukhoi was given control of his own design bureau, and this collective officially became the **Sukhoi Design Bureau** (OKB-51) in mid-1939. Meanwhile work continued on developing the ANT-51. The **power plant was replaced with a 950hp Tumansky M-87 engine**, and this third prototype (the SZ-3) first flew on 17th November 1938.694 On 27th January 1939 the NIIVVS began the aircraft's State trials, and these continued until April 1939. During this time the SZ-3's engine was replaced with a more reliable Tumansky M-87A engine driving a 3 blade VISh-23 propeller.

On 7 July 1939 the M-87A powered SZ-3 was ordered into series production at **Zavod 135 in Kharkov**. The new bomber was designated the BB-1 (*Blizhniy Bombardirovschik* - Short Range Bomber). What was now the Sukhoi Design Bureau was also relocated to Kharkov with orders to oversee BB-1 mass production, and on 29 July 1939 Sukhoi was appointed Chief Designer of the Zavod 135 aircraft factory. *The production aircraft differed from the prototypes in not being of all metal construction (probably due to the strategic shortage of duralumin).*[69] The production BB-1 used a wooden monocoque fuselage and all-metal dihedral wings made up of steel spars with duralumin ribs. **Unfortunately, the M-87A engine (also) soon proved to be unreliable with consistent failure of the reduction gearbox gears.** By early 1940 the Tumansky M-88 engine had by now passed its State acceptance tests and was considered to have an acceptable level of reliability. In April 1940 the **State acceptance tests** for the M-88 powered BB-1 were successfully completed and **the M-87 engine was promptly replaced on the production lines with the 1,100hp Tumansky M-88 engine.** It was around mid-1940 that the Sukhoi bureau was allowed to attach its name to the project, and the BB-1 was now officially designated the Su-2.

Limited production of the M-88 powered Su-2 was also initiated at Zavod 31 in **Taganrog** and Zavod 207 at **Dolgoproodnyy (near Moscow).** However, only a few dozen Su-2s were ever produced at Zavod 31 (which soon converted to producing LaGG-3 fighters) and Zavod 207 remained a relatively small plant. The M-88 Su-2 (1940 production) was able to achieve a top speed of **460kph** (286mph) at altitude, **375kph** (233mph) at sea level, had a service ceiling of 8,800m, had an operational range of 1,200km, and could climb to 5,000m in 12 minutes. The **designed offensive armament remained 4 7.62mm ShKAS MGs in the wings and 4 100kg bombs. The maximum bombload also remained 600kg. The overall performance had barely changed from the M-87A powered Su-2.**

Initially, the M-88 engine also gave problems, although it was a significant improvement over the M-87. The Tumansky (engine) Design Bureau (OKB-300) continued to work on the M-88, and soon produced the 1,100hp Tumansky M-88B engine. . . The M-88B engine was incorporated into the Su-2 production lines as soon as the engines became available. These 1941 production aircraft also had modified exhaust outlets (to improve any thrust benefits) and the new TSS-1 turrets in place of the older MV-5 dorsal turret. The normal bomb load remained 400kg, which enabled the Su-2 to achieve a range of **1,190km.** With a heavier 600kg maximum bomb load the range was reduced to around 850km, which was still a very good range. With these modifications the M-88B powered production Su-2 was now capable of 468kph (291mph) at altitude, 375kph (230mph) at sea level, and had a service ceiling of 8,800m. (pp. 194-95)

On 1 June 1941 there were **332 Su-2s in VVS first line units**, of which **209** were in the Western Special Military Districts and 123 were in the (internal) Kharkov Military District. This was not a large number considering the Su-2 had been in production (albeit limited) since 1939. The plus side was that the bomber regiments partially or

[69] **Note:** Duralumin: **Duralumin** (also called **duraluminum**, **duraluminium**, **duralum**, **dural(l)ium**, or **dural**) is a trade name for one of the earliest types of age-hardenable aluminium–copper alloys. The term is a combination of *Düren* and *aluminium*. Its use as a trade name is obsolete. Today the term mainly refers to aluminium-copper alloys, designated as the 2000 series by the international alloy designation system (IADS), as with 2014 and 2024 alloys used in airframe fabrication. **Duralumin was developed in 1909 in Germany**. Duralumin is known for its strength and hardness, making it suitable for various applications, especially in the aviation and aerospace industry. However, it is susceptible to corrosion, which can be mitigated by using alclad-duralum materials.

fully equipped with the Su-2 had had plenty of time to fully train on the aircraft, and overall they were in a far better state of readiness than any of the new Il-2 units. Most of the Su-2s were deployed in BBAP (*Blizhne-bombardirovochnyy Aviatsionnyy Polk* - Short Range Bomber Aviation Regiment) units in the VVS's bomber (BAD) and composite (SAD) aviation divisions. Later they were also deployed into various ground attack (ShAD) aviation divisions, where it was hoped they could fulfil their intended role of level bombing and ground support at low and medium altitude. It is unknown how many of the 209 Su-2s deployed in the Western Military Districts on 1 June 1941 were lost in the initial *Luftwaffe* attacks, but it was likely significant. This is because **182** Su-2s were deployed in forward airbases in the Western and Kiev Special Military Districts, and these were the hardest hit in the initial attacks. (p. 195)

As with many inexperienced air arms of that era (with fast light bombers), **it was assumed that the Su-2's speed would enable it to operate without fighter escort**. On top of this, the chaotic situation facing the VVS in the summer of 1941 meant that **few VVS bombers received adequate (if any) fighter escorts**, and the Su-2 was no different. Consequently the existing Su-2 regiments were thrown into the maelstrom **where they proved no match for the *Luftwaffe's* fighters**, especially at low to medium altitude where they were meant to operate. Predictably, losses were heavy. However, **it is apparent that the Su-2 units fared considerably better than the Il-2 or SB-2 units operating on the East Front from June to September 1941.** The Il-2, which is generally seen as a tougher and superior aircraft to the Su-2, suffered an average of one aircraft lost per 13 sorties during 1941. In comparison the few Su-2 operating on the East Front in 1941 were completing over twice the number of sorties per aircraft lost. (pp. 195-96)

A proviso on these types of figures is that the inexperienced Il-2 units suffered a much higher proportion of operational losses compared to the more experienced Su-2 units. **Apart from better trained crews, the Su-2 proved to be very durable and able to absorb a considerable amount of battle damage**. In addition, the Su-2's rear gunner afforded a level of rear-protection that the single seat Il-2s did not enjoy in 1941. It should be noted, however, that being a rear gunner in a Su-2 was extremely hazardous: **on average the rear gunner was replaced every 7 sorties!** The Su-2 offered no protection to the rear gunner, who also had no firm support and had to sit on a canvas belt in the rear cockpit when operating the rear ball turret. Noticeably, when the 2 seat IL-2 was produced in 1942, the Il-2's losses per sortie approached that achieved by the Su-2.

Su-2 production continued at an accelerated rate, with most production coming from **Zavod 135 in Kharkov**. However by August 1941 the factory was the target of enemy bombers and was in danger from the approaching German Army. **Most of the factory was evacuated by rail (just before this was also cut), and was re-established in Molotov (renamed from the city of Perm in 1940) near the Ural Mountains.** This severely disrupted Su-2 production because production in Molotov only restarted in late December 1941 or early 1942. In total, only **525** Su-2 production aircraft were produced in the whole of 1941. This brought total Su-2 production to **685** aircraft from July 1939 to 31st December 1941, and of these, around 306 were produced in the last six months of 1941. (p. 196)

In 1942 an attempt was made to *improve the Su-2's performance and hence survivability*. At least one prototype was built with the new 1570hp Shvetsov ASh-82 (M-82) radial engine in January 1942. . . Su-2s continued to serve in BBAP and ShAP regiments until late 1942. Before being phased out of front line service, 2 or 3 Su-2s were typically attached to newly formed Il-2 regiments to act as formation leaders and fly reconnaissance missions. The surviving Su-2s were progressively withdrawn from front-line combat units and had been relegated to training or reconnaissance roles by 1943. (p. 197)

c. Arkhangelsky Ar-2

The Arkhangelsky Ar-2 (or *Arkangelski, or Arkhangel'skiy,* depending on preference) was a **ground attack (dive-bomber) version of the Tupolev SB bomber series**. The development and use of this very important VVS bomber is detailed in the next entry. The Ar-2 came into being as a result of ongoing attempts to improve on the SB bomber

in order to extend its useful life, as well as produce an aircraft capable of carrying out low-medium level ground attack missions. As part of this brief, the Ar-2 was designed to be capable of dive bombing. *Ultimately the modifications to the original SB bomber's design were so extensive that the Ar-2 could almost be regarded as a completely new aircraft.*

The origins of the Ar-2 go back to mid-1939 at the **Zavod (factory) 22 in Fili, Moscow**. At this time part of the Tupolev OKB was there, and in charge was one **Alexander A. Arkhangelsky.** Arkhangelsky was in charge because **Andrei Tupolev had been arrested** (**along with many other imminent aerospace engineers**) and by 1939 he had been sent to work at an NKVD run OKB near Moscow. Arkhangelsky had already been one of the leading designers on the SB bombers, and since 1936 he had also been responsible for overseeing SB production. He was therefore ideally suited to be in charge of further SB development. (p. 197)

While the SB-RK was still undergoing development, the TsAGI (*Tsentral'nyy Aerodinamicheskiy I Gidro-dinamicheskiy Institut* - Central Aerodynamics and Hydrodynamics Institute) had been working on a new bomb launching system for dive-bombing called the PB-3. Testing showed the system could safely function in aircraft diving as much as 80 degrees from the horizontal. At the same time, ongoing development of new aircraft (such as the Pe-2) meant the whole future of the SB series as level bombers was in doubt. **It was therefore decided to adapt the SB-RK design, and the PB-3 system, into an advanced twin engine dive-bomber**. In order to achieve this, further extensive rework was required. The most important of these were: the **fitting of dive brakes on the outer wings, fitting the PB-3 system with improved bomb racks, fitting a fully automatic dive recovery system** . . . (p. 198)

Two prototype aircraft (still designated the SB-RK) were delivered in **October 1940** and immediately began factory testing. A third prototype was delivered to the NII-VVS for testing in early November 1940. With its turbocharged M-105R engines delivering 1,100hp, the **SB-RK dive bomber** was able to achieve a top speed of 505kmh (314mph) clean with a service ceiling of around **10,000m**. **The dive recovery system included an overload limiter which limited the load (stress) on the airframe to a pre-set value**. This was usually set at around **4-5g**, and its function took account of the diving angle, speed, and stick position. **Note, the SB-RK was never going to be a Ju 87 'Stuka': such an aircraft was able to withstand forces in the region of 10g, with the best pilots withstanding around 7.5g before blackout occurred.** This meant the SB-RK could release its bombs between 3,000m and 4,000m (9,840ft - 13,120ft) and still have time to recover from a 75 degree dive angle. (pp. 198-99)

The **State acceptance tests soon revealed the SB-RK to be the most advanced and effective SB bomber yet built.** Even before factory testing was complete, the government decreed that it was to replace all other SBs in production immediately, and limited production commenced at **Zavod 22** in late October-November 1940. In December 1940, the **Arkhangelsky OKB was allowed to attach its name to the aircraft and it was officially designated the Arkhangelsky Ar-2**. The production Ar-2 had an empty weight of 4,430kg and a loaded weight of
6,650kg. It was capable of a top speed of 480kph (298mph) at 4,700m and 410kph (255mph) at sea level. Its operational service ceiling was around 8,200m (26,900ft), and its operational range with a **1,000kg bomb load** was around 1,200km (621mls). Its maximum operational range was 1,500km (932mls) and its maximum bombload for short range missions was **1,500kg**. Its defensive armament consisted of 3 7.62mm ShKAS MGs (1 forward, 1 dorsal and 1 ventral). (p. 199)

Series production of the Ar-2 only lasted until late March 1941. Around this time it was decreed that production of the **new and faster Pe-2 tactical bomber** had priority, and the superior bombing accuracy of the Ar-2 (as a dive bomber) along with its (now) stronger airframe, were discounted. **In the end only 198 Ar-2s were produced (including an estimated 8 prototypes and other experimental test aircraft) at Zavod 22**. As far as is known, 63 Ar-2s were delivered to VVS units in late 1940, and another 120 were delivered before 22 June 1941. The last 7 were in 'transit' and were delivered after 22 June 1941. On 22 June 1941 there were **170 Ar-2s** assigned to VVS

combat units, of which **139** were in the Western Special Military Districts and 31 were in the (internal) Moscow Military District.

There were insufficient Ar-2s available to form dedicated ground-attack units, with the result that they were mainly assigned in groups of 12 - 24 aircraft to existing SBAP (*Skorostnoy Bombardirovohchnyy Aviatsionnyy Polk* - high speed bomber aviation regiments) units where they served alongside the older SB bombers. Presumably it was also hoped that the support ground crews in the SBAP regiments would be able to service the Ar-2s more readily due to their familiarity with the SB. **In the event, most Ar-2s went into action in 1941 as normal bombers, rarely with any fighter escort, and rarely able to use their dive-bombing abilities to any effect.** In the end, the Ar-2s didn't fare much better than the SB bombers, and those that survived 1941 were withdrawn from front line units by late 1942. The most successful use of the Ar-2 seems to have been its use in the anti-shipping role by the VVS-KBF; the air arm of the Red Banner Baltic Fleet. (p. 199)

2D. Bomber Aircraft

a. Tupolev SB

The Tupolev SB (*Skorostnoy Bombardirovshchik* - high-speed bomber) **series of bombers were numerically the most important bomber types available to the VVS from the mid-1930s to 1941**. **On 22 June 1941, SB bombers of various vintages comprised 54% of all bombers in the VVS** (including the VVS-KA, VVS-VMF and all PVO forces, and excluding Il-2 and Su-2 'assault' aircraft). **In the Western Special Military Districts, SB bombers comprised 75% of all bombers**, excluding bombers in the DBA (*Dal'ne-Bombardirovochnaya Aviatsiya* - long range bomber aviation) forces in these districts. This very important aircraft type therefore formed the **backbone of the VVS's tactical bombing force in 1941**, which was a vital component of the Soviet High Command's pre-war plans. (p. 200)

The origins of the SB can be traced back to the **1931-33 period.** At this time progressive Soviet military thinkers were still finalising their theories about the nature of modern mechanised warfare, and the concepts of '**deep operations' and 'deep battle**'. Part of this whole equation were questions about the role of modern air-power. It was felt that *a fast bomber was needed with sufficient payload and range to be effective at interdiction deep behind enemy lines*. Such an aircraft would be operating within the Red Army's and VVS's control at the Front level, so a
very long range was not essential (i.e. *it was not a strategic bomber*). The really critical part of the 'requirement', and the most difficult to achieve, was that the *new bomber had to be fast enough to operate without any fighter escort*. At this time the average maximum speed of bombers was around 260kph (162mph), and they had to be covered with a fighter escort.

In early March 1934 the VVS issued the specifications for the ANT-40 (to TsAGI). It called for a bomber capable of 330kph (205mph) at 4,000m, a ceiling of 8,000m, a range of 700km, a 500kg bomb load, and 3-4 MGs protecting the front, dorsal and ventral sides. Tupolev and his team soon finalised the design which would become the USSR's first bomber using **stressed skin construction**. . . Around this time it was decided to build 2 prototypes, the first would be **powered by US built 730hp Wright R-1820 Cyclone air-cooled radials**, and the second would be powered by **French built** 780hp Hispano-Suiza 12Ybrs liquid-cooled V-12 engines. The first prototype, the ANT-40-1, commenced construction on 25 April 1934. It was also given the designation SB-2RTs at around this time (*Skorostnoy Bombardirovshchik-2 Rait-Tsiklon* - High-speed Bomber-2 Wright Cyclones). The ANT-40-1 first flew on 7 October 1934. The aircraft experienced some handling problems and after 9 flights it crash-landed on 31 October. In the meantime the second prototype, the ANT-40-2, started construction on 15 May 1934. (p. 200)

Factory flight testing of the ANT-40-2 commenced on 31 December 1934 and continued until 21 January 1935. These tests were very promising and revealed a top speed of 430kph (267mph) at 4,000m, clean. **More demanding**

State testing continued through February and into early March 1935 with the NII-VVS (*Nauchno-Issledovatel'skiy Institut Voyenno-Vozdooshnykh Seel* – Air Force Scientific Test Institute). . . By now the ANT-40 was probably one of the most tested combat aircraft in the world, and later WWII Soviet bombers would not undergo this level of pre-production testing. **In terms of performance, it was also probably the most advanced twin engine bomber anywhere.** (p. 201)

SB-2M-100 and SB-2M-100A

Long before the final State acceptance tests were completed, it had become obvious to the Soviet authorities that the ANT-40 was the best available design to meet the Red Army's and VVS's fast bomber needs. . . In the meantime, the Russian engineer Vladimir Klimov had been **sent to France in order to obtain a license for Soviet production** of the Hispano-Suiza 12Ybrs. This was duly obtained, and there followed series of design changes which helped the engine cope with a colder climate. The new engine entered production at Zavod 26 (**in Rybinsk, Yaroslavl)** in late 1935 and was designated the Klimov M-100, rated at 750 hp.

The first pre-production SB was produced in **1936** and was designated the SB-2M-100, using the 750hp M-100 engines driving 2 blade propellers. . . Despite some manufacturing difficulties, the demands for this aircraft were such that a total of around **268** SB-2M-100 aircraft were delivered before the end of 1936. Of these, **31 were sent to assist the Spanish Republican Air-Force in October 1936** during the Spanish Civil War. They were initially flown and supported by Soviet 'volunteers'. One can only believe the Soviets sent their best available bombers (still with teething problems) to gain combat experience with the type. **Initial combat reports were promising: the SB-2M-100 was able to outpace aircraft like the Fiat CR.32 and Heinkel He 51 biplane fighters of the Nationalist forces, and conduct bombing missions almost unmolested**. A further 62 SBs were sent to Spain from June 1937 to June 1938, and as far as is known these were mainly SB-2M-100s. **Unfortunately, from March 1937, German Bf 109Bs of the Condor Legion had started operating in Spain, and the SB bombers were no longer able to outpace all fighter opposition.** When the Spanish Civil War ended on 1 April 1939, **74 SBs had been lost** (including those written off or lost in transit) of which at least **40** were 'total losses' due to enemy action. The remaining 19 SBs were taken over by the Nationalists, and used to form their own SB bomber squadron. (p. 202)

In December 1936, the first SBs were produced with the improved 860hp Klimov M-100A engines driving 3 blade propellers (vs 2 previously), and these were designated type **SB-2M-100A**. Testing revealed the data shown in the table below [not included here] (Tupolev SB Bombers from 1934 to 1941). The overall performance of the SB was significantly improved, especially the climb rate and top speed, which was now **423kph** (263mph) at 4,000m. The SB-2M-100A was produced through the first half of 1937 and *experience gained from Spain resulted in additional changes.*

In July 1937 the **Second Sino-Japanese War started,** and, mainly to frustrate Japanese interests in the Far East, the **USSR quickly signed the 1937 Sino-Soviet Non-Aggression Pact**. This included the supply of military equipment to the Chinese, including aircraft and their supporting personnel. **At least 122 SBs (along with the Soviet personnel to operate them) were delivered to China between September 1937 and early 1938**, and as far as is known these were mainly SB-2M-100As. They commenced combat operations in December 1937: their missions included attacking Japanese ships on the Yangtze River, attacking Japanese airfields as far Taiwan, and supporting the troops in the field (especially during the **Battle of Wuhan**). Precise SB losses in China are unknown, but they are known to have been heavy. However, there losses were as much to do with the continuous exposure to combat as enemy fighters.

At the time the main Japanese fighter in theatre was the **Mitsubishi A5M**, which entered service in early 1937. Even later versions of this aircraft such as the A5M4 (top speed 434kph) could only just overhaul the SB-2M-100As, and even then only at altitudes below 6,000m. Furthermore, both the Mitsubishi A5M and later (and better) **Nakajima Ki-27** were armed with only 2 7.7mm MGs. This meant the SB's vulnerability to heavier

weapons like 15-20mm cannon was not yet appreciated, and the SB's propensity to catch fire (*and the need to explore the use of self-sealing fuel tanks) was also not understood*. These vulnerabilities would come back to haunt the SB later, especially against the *Luftwaffe* in 1941. (p. 202)

SB-bis-2M-103 and SB-2M-103 (10th Series)

During 1936 and 1937 Klimov and his team at Zavod 26 (in **Rybinsk**) had continued to develop the M-100 engine, and by mid-1937 they were ready to supply the improved 960hp Klimov M-103 V12 engine. A prototype was built with the new engines at Zavod 22 and 156 (the latter being the Tupolev OKB's experimental shop), and was ready by September 1937. The prototype designation was SB-bis-2M-103 (sometimes called the SB-bis, the bis signifying 'modified'). . . On the downside, the aircraft's gross weight had increased to 6,426kg, which meant there was relatively little improvement in performance. However, in September 1937, Mikhail Alekseyev still managed to set a new payload-to-height world record when his SB-bis-2M103 reached 12,246m with a 1,000kg payload. (pp. 202-03)

Despite the disappointing performance improvements, it was decided to start limited production of the SB-bis-2M-103 (*until a better engine arrangement design appeared*). External bomb racks were fitted under each wing inside of the engines, each capable of holding a 250kg or 500kg bomb, or an auxiliary 368 litre fuel tank, or a gas dispenser. The maximum bomb load was now raised to **1,500kg** (with 500kg internal). Other minor changes included a higher pilot windscreen with a higher mirror. This production version was designated the SB-2M-103, and series production commenced in early 1938.

SB-bis-3 2M-103 and SB-2M-103 (14th and 18th Series)

In the meantime, another prototype using the 960hp Klimov M-103 engine had been prepared; this time with more radical and better engineered changes. . . The new prototype was designated the **SB-bis-3 2M-103** (sometimes called the SB-bis-3) and it underwent testing in November 1937. This version of the SB was the best yet; achieving a top speed of **445kph** (276mph) at 4,500m and **375kph** (233mph) at sea level. It loaded weight had been reduced to 6,013kg. . . State acceptance tests were completed by 17 January 1938, and the *only really negative element reported was overall engine reliability*. Zavod 22 was ordered to start pre-production of the aircraft, also with the designation SB-2M-103. Further testing of the pre-production aircraft continued from 27 July to 19 September 1938. (p. 203)

In overload the SB-2M-103 could carry 3 500kg bombs (1,500kg total), **but this resulted in a severe loss in performance**. In this configuration the **top speed was reduced to 378kph** (235mph) at 4,000m, and 330kph (205mph) at sea level. The rate of climb, range and service ceiling were also all severely impacted. Carrying 1,500kg, the SB-2M-103's overall performance was only just comparable to the 1936 production SB-2M-100 (while its top speed was actually 15kph slower). **For this reason the SB-2M-103 almost never carried 1,500kg into action. The most common bombload was 500kg-1000kg,** in the form of 4 250kg bombs, or 5 100kg bombs internally and 2 250kg bombs externally. **Nevertheless, the SB-2M-103's overall performance was still impressive by the standards of 1938, and it entered series production in late 1938.** The SB-2M-103s produced in late 1938 and into 1939 are sometimes designated SB-2M-103 14th Series. In order to increase production, SB-2M-103 production was also commenced at **Zavod 125 in Irkutsk** (as well as continuing at **Zavod** 22). (p. 203)

Through 1939, further refinements to the SB-2M-103 production aircraft were completed. By November 1939 the SB-2M-103 now included: provision for 2 380 litre external fuel drop-tanks . . . 3 blade variable-pitch propellers, streamlining fairings on inlet pipes and hinges on control surfaces, and polished wing and tail leading edges. The **MV-3 dorsal ball turret** (first tested in 1937) and MV-2 **ventral extendable gun support** were also featured on aircraft manufactured from 1940. The SB-2M-103s produced into and during 1940 are sometimes designated

SB-2M-103 18th Series. Apart from some minor tweaking, **this now represented the definitive production version of the SB**. It was able to attain a top speed of **450kph** (280mph) at 4,100m.

Production of the SB-2M-103 continued at a frenetic pace until early 1941, when it was decided there were finally sufficient numbers to meet any threat from Europe (or to conduct offensives westwards into Europe), and to
start retooling for production of the new **Petlyakov Pe-2**. By the time series production ended, a total of **6,656** SBs of all types had been produced in the USSR (excluding 178 prototypes and various experimental and development aircraft which did not enter series production). Of these, around **5,520 were built at Zavod 22 in Moscow** (excluding the 3 prototypes at the Tupolev OKB) and another 1,136 at Zavod 125 in Irkutsk. Over 4,000 of the total were produced from 1939 to 1941. (p. 204)

During peak production in 1940, SB-2M-103s were being produced at the **impressive rate of 11 aircraft per day** at two of the USSR's largest aerospace plants: Zavod 22 in Moscow and Zavod 125 in Irkutsk. The above table [not shown] excludes an additional 111 aircraft built in Czechoslovakia under licence pre-war. **By 1941 the Tupolev SB was by far the most produced twin engine bomber in the world, and in June 1941 it comprised the bulk of the world's largest bomber fleet.**

Most WWII commentators have stated that the Tupolev SB **was either obsolete or approaching obsolescence by June 1941**. If this is true, then the SB's prodigious production rate does raise an interesting question: *why did the USSR persist with producing huge numbers of apparently obsolete bombers, and even dramatically increased production in 1940?* Like most historical events there are many aspects to this question, and some of the basic assertions in the question really only become arguable with the gift of hindsight. For example, consider the following:

● **The SB functioned well during the border clashes between the Soviet Union and Japan in Manchuria from July to August 1938**. It exhibited more vulnerability in the same region at the Battles of Khalkhyn Gol from May to September 1939. **However, the Soviet SB losses in these actions were relatively light** and the Red Army and VVS emerged victorious, so it is likely that any reports of weakness in the SB were lost in the 'celebrations'.

● In 1939-40 when production peaked, the SB-2M-103 was at least as good as, or better than, the majority of contemporary bombers recently introduced into service in the West. For example, it had a superior performance in almost all respects to the following: the **Armstrong Whitworth Whitley** (entered service March 1937, top speed 367kph), the **Handley Page Hampden** (entered service September 1938, top speed 426kph), and the **Potez 63** (entered service May 1938, top speed 425kph).

● **The SB really started to show its vulnerability during the 1939-40 Winter War with Finland**. Here there were clear warning signs that the *aircraft's speed was insufficient to keep it away from modern monoplane fighters then in service.* However, even here there were major provisos that disguised this fact. By the end of the three month war approximately **100 SBs** had been lost in combat, but a large proportion of these were the older SB-2-M100A models which entered VVS service in 1937-38. Furthermore, the SB losses were not out of proportion to the number fielded: other types like the **Ilyushin DB-3 bomber**, as well the Polikarpov I-153 and I-16 fighters, also suffered proportionate losses. (p. 206)

● The VVS flew around **100,970 sorties** (around 44,000 bomber sorties) during the Winter War; **this equates to around one aircraft lost in combat per 194 combat missions.** By WWII standards, this was actually a low loss rate (even for the USAF and RAF in Europe in late 1944-45, when they had almost total air supremacy). Therefore, given the magnitude of the air war over Finland, it was not readily apparent that the SBs had any exceptional problems.

● **Finally, and definitely not least, from 1937 to 1939 no VVS officer (who wished to stay alive) wanted to make 'defeatist comments**' regarding the USSR's best bomber in the midst of one of Stalin's deadly purges. It was far healthier to show no initiative what so ever, and go along with any opinion that the SB was a state of the art bomber.

In terms of overall flight performance and ordnance carried, **it is clear that in 1939-40 the SB-2M-103 was not as 'obsolete' as commonly perceived in much post-war literature.** However, having said this, there were two areas that were major weaknesses, and these were never addressed as the aircraft was developed. The first was the **relatively weak arrangement of the defensive MGs**. The SB-2M-103 carried 4 7.62mm MGs which was pretty standard for the time. However, the forward dual MGs were only ever able to traverse with a relatively limited arc of fire forward (they were not in a turret) and these had to be operated by the navigator. Only later model SBs had the MV-3 dorsal ball turret, but even this was a 'low silhouette' design so the gunner had difficulty tracking targets coming directly behind the tail.

The second and more serious major weakness of the SB was **its non-existent fuel protection system**. Essentially the SB's fuel tanks remained unprotected. In particular, the gravity-feed tanks over the engines were particularly prone to catching fire if hit. I**n addition, the 15-20mm cannon armament on modern fighters (with cannon shells that exploded on impact) were particularly lethal to aircraft with unprotected fuel tanks**. **By 1940, the US, UK and Germany were all investing in self-sealing fuel tank technology.** Essentially, self-sealing tanks of this era used multiple layers of rubber and reinforcing fabric in the fuel-tank walls. The inner layer was normally **vulcanized rubber**, while the outer layer was made of untreated rubber, or an equivalent material, which expanded when it came into contact with any fuel. *When the fuel-tank wall was ruptured, the outer layer absorbed the leaking fuel, causing it to swell and thus seal the puncture*. Alternatives to rubber were investigated during WWII, particularly in Germany where rubber-substitutes had to be fabricated due to rubber shortages. The main problem was that self-sealing fuel tanks were heavier than unprotected tanks, which made the aircraft heavier. This was why bombers were the first to use them (and they needed them most). **By 1941, German bombers like the Junkers Ju 88 were already using self-sealing fuel tanks, which greatly improved their survivability**. Later in the war, as fighter engines became much more powerful and weight was less of an issue, most single engine aircraft also had some form of fuel protection. Of the major powers in WWII, **the USSR and Japan lagged behind in self-sealing fuel tank technology.** The USSR didn't start installing such technology until late in the war. This was evident in all Soviet bombers and fighters until around 1943-44 and many were never fitted with any significant fuel protection. (pp. 206-07)

On 1st June 1941, approximately **3,714 Tupolev SBs** were assigned to active combat regiments in the VVS, with **1,825 in the Western Military Districts** (including the VVS-KA and VVS-VMF naval aircraft). The large majority of these aircraft were **late version SB-2M-103s**. Unfortunately, *on 22 June 1941 most of the SBAP and BAP regiments near the border had their SBs neatly lined up on airfields*. Why they were deployed so close to the border and in a relatively (exposed) offensive posture is **something of a mystery.** Whatever the reason, these Soviet airfields were completely surprised by the German attack and had taken almost no precautions regarding dispersal etc. Consequently **many hundreds of SB bombers were lost to the initial German airfield attacks without ever getting off the ground.** (p. 207)

Much worse was to come. The Soviets still believed the SB could operate without fighter protection, and in the early days of Operation Barbarossa large waves of unescorted Soviet bombers made repeated attempts to attack German airfields and ground units. **What followed is best described as a massacre**, as German fighters decimated these bomber waves. **It has to be said that these Soviet pilots exhibited incredible bravery in persisting with attacks as entire flights were literally wiped out.** For example, 18 SBs from 39BAP/10SAD attacked forward units of Army Group Centre crossing the Bug River on 22 June and all 18 bombers failed to return. Another flight of 21 SBs, attempting to attack the airfield of StG 77 at Biala Podlaska, was entirely wiped out by fighters and ground fire.

The rapid loss of the SB bomber force in the Western Military Districts, and **much more importantly the loss of the cream of experienced VVS bomber crews**, was the result of several factors working together. First and foremost, the Soviet pilots should never have been asked to attack in broad daylight and without any significant fighter protection; especially against one of the most highly trained and concentrated fighter forces in the world flying state of the art fighters. . . It appears the VVS (and Red Army) were following a pre-war plan to immediately launch air attacks against enemy ground forces following an invasion. They would have been much better to evacuate eastwards with their very valuable bomber and ground crews, consolidate their forces, and wait for at least some fighter support to become available. (pp. 207-08)

The second major factor was that the SB was suddenly exposed to significant numbers of a fighter type in a different class to anything it had experienced before. The cannon armed BF-109F and E were far more powerful than the few Bf 109B-1 (armed with only 2 MGs) encountered in Spain. In addition, these fighters were flown by some of the most experienced fighter pilots in the world, or by pilots having undergone very extensive training. **The German fighter pilots very quickly learned** the best way to approach the SB to avoid any defensive fire, and soon learned **that a few bullets into the fuel tank of these aircraft usually resulted in fire and the aircraft's total destruction.** In the event, the Soviet DBA (*Dal'ne-Bombardirovochnaya Aviatsiya* - long range bomber aviation) forces, mainly flying Ilyushin **DB-3, fared only a little better** (see next entry). By the time the various Soviet high commands had realized their mistakes, the majority of the Soviet pre-war bomber force (easily the largest in the world in June 1941) had been completely decimated**.** (p. 208)

Official Russian estimates confirm the USSR lost a total of around **7,200** bombers in 1941 (excluding ground attack aircraft and fighter bombers). Of these, around 3,800 (or **53%) were SB bombers of all types**. The rapidly declining numbers of available SBs gallantly soldiered on through 1941 and into 1942, with significant numbers switching to night bombing missions. In 1943 the surviving SB bombers were mostly withdrawn from service, or were switched to naval patrol, training and transport missions.

b. Ilyushin DB-3 / DB-3F

The Ilyushin DB series (including the **DB-3, DB-3F and Il-4**), became the most widely used **Soviet medium bomber type of WWII**. Its genesis can be traced back to the discussions being held at the highest levels in the Soviet military in the early 1930s, *regarding the role of modern air-power.* These ideas eventually led to a specification being issued which led to the SB series of (tactical) bombers discussed in the previous entry. In addition, **it was realised that a new long range strategic bomber was going to be needed to start replacing the TB-3 in service within the next five or so years**. The new operational requirements called for an aircraft capable of lifting a 1,000kg bombload over a distance of around 1,500km, and with a top speed of 350kph (217mph) at its cruising altitude. . .

In the meantime, Ilyushin had taken a more radical and far reaching approach. He decided that with the *rapidly evolving technology around engine power and efficiency,* it would be possible to produce a twin-engine long range bomber with lower aspect ratio wings. At the same time, Ilyushin took advantage of the *latest metallurgical advances and manufacturing technology,* with special attention paid to the wing designs. He specified lightweight chromium-molybdenum alloy steel for the spar tubes, and the same stressed skin construction as used on the SB (i.e. smooth skin with no corrugations and flat rivets). In 1934 the Ilyushin OKB received authority to proceed with a prototype, which was duly given the design bureau designation TsKB-26 (*Tsentral'noye Konstruktorskoye Byuro-24*, Central Construction Bureau-26). The engine chosen for the first prototype was the **800hp French Gnome-Rhone K14 Mistral Major air-cooled radial engine**. **This engine was being readied for licence production in the USSR at this time**, under the direction of A. S. Nazarov. It entered licence-production in the USSR in late 1934, with the designation M-85, which was rated at 760hp. Interestingly, the Gnome-Rhone K14 engine was also chosen for the doomed ANT-37 prototypes, presumably because it weighed only 600kg and had demonstrated a *high level of fuel efficiency (essential for a long range bomber*). (p. 209)

The **TsKB-26** first flew in the summer of 1935, and even with its wooden fuselage (used to speed up construction) it immediately outperformed the ANT-37 prototypes, which were also experiencing wing flutter and buffet problems. The TsKB-26 was so impressive that it was **used to set the USSR's first aviation world record** on 17 June 1936. On this day V. K. Kokkinaki reached an altitude of 11,294m with a 500kg payload. In the meantime the **second prototype, the TsKB-30**, was prepared and was ready for its first flight by March 1936. The TsKB-30 should be considered the first true prototype because it incorporated most of the features expected in any production version of the bomber. These included: licence-built 760hp M-85 engines, all metal construction, a longer (metal) fuselage with an extended nose, an aft-sliding canopy with a fixed windscreen, improved engine cowlings, larger landing wheels, a defensive armament of 3 7.62mm ShKAS MGs, **and a fully equipped internal bomb bay (configured to carry 10 100kg bombs).**

DB-3 [Long-Range Bomber]

The TsKB-30 was almost immediately submitted for State testing with the NII-VVS (*Nauchno-Issledovatel'skiy Institut Voyenno-Vozdooshnykh Seel* - Air Force Scientific Test Institute). These showed the TsKB-30 could attain a top speed of **415kph** (258mph) at 4,800m, 335kph (208mph) at sea level, and took 12.8 minutes to reach 5,000m altitude. After successfully completing the State acceptance trails, the TsKB-30 was introduced to VVS service in August 1936 with the designation **DB-3** (*Dahl'niy Bombardirovshchik-3* - Long Range Bomber-3). **Series production of the DB-3 commenced at Zavod 39 (in Moscow) and Zavod 18 (in Voronezh) in late 1936 or early 1937.** These production DB-3s are sometimes called DB-3 2M-85. This was possibly the first time the DB-3 'project' actually ran into some serious problems. From the start, Ilyushin and his team had wanted to build a state of the art bomber with the latest available technology, and production issues had taken second place. Placing a lower priority on ease of manufacture was rather unusual in the USSR . . . Despite the assistance of various Ilyushin OKB engineers at Zavod 39's experimental workshop, both factories had only produced **45** DB-3s by the end of 1937. (p. 209)

The DB-3s that were produced continued to demonstrate their capabilities. From May to October 1937 a production DB-3 (being tested by the NII-VVS) was able to attain **390kph** (242mph) at 5,000m and 325kph (202mph) at sea level, with a loaded weight of 6,600kg. The range was also extremely good: **a range of 4,000km** was possible with a 500kg bombload, while **3,100km** was possible with a 1,000kg bomb load. **Production DB-3s were also fitted with 3 external bomb racks under the fuselage which could take 500-1000kg bombs**. The maximum bomb load that could be carried was **2,500kg**. This was a record for a twin engine bomber of the time, but this load was always considered an 'overload' which could only be carried for much shorter distances. The defensive armament was light: it consisted of a 7.62mm MG in the nose (operated by the navigator), a 7.62mm MG in a small dorsal turret and a 7,62mm MG operating through a ventral hatch (both operated by the radio-operator who had to change positions as in the SB). Overall performance of the production DB-3 was not quite as good as the TsKB-30 prototype, but was still excellent. **In terms of top speed and payload-range delivery, the DB-3 was the best all-round bomber in the world at this time**. (pp. 209-10)

The closest competitor to the DB-3 in 1937 was probably the **Heinkel He 111B** which entered *Luftwaffe* service in late 1936. The He 111B-2 was able to achieve 370kph (230mph) at 4,000m, and 299kph (186mph) at sea level, and a range of 910km (565mls) with a **1,500kg bomb load**. The He 111B was considered to have better overall stability and handling. In addition, the He 111B had 4 crewmen (vs. 3 in the DB-3) so all its defensive MGs were manned in combat. It is interesting to note, however, that the **first batch of 30 He 111Bs were sent to Spain with the Condor Legion in February 1937**. There, the *Luftwaffe* obtained invaluable combat experience with the type. As far as is known, no DB-3s were ever sent to join the Republican forces in Spain (and yet the equally secret and valuable SB-2M-100 was sent). Possibly the USSR wanted to keep the DB-3's details secret (although this seems very unlikely given the massive publicity already attributed to this aircraft), or/and the type was not considered combat ready (even in 1937-38?), or/and the slow production rate continued to restricted the type's availability. (p. 210)

In 1938 the **M-85 engine was replaced** by the similar but more powerful 950hp M-86. These production DB-3s are sometimes called DB-3 2M-86, or simply the DB-3A. This resulted in improved take-off performance, but negligible improvements in speed at altitude. Also in 1938, the **M-87A engine** was introduced into production DB-3s with VISh-3 variable pitch propellers. In 1938 and 1939 production of the DB-3 increased rapidly compared to 1937. Another factory was brought on line in 1938 (namely Zavod 126 in Komsomolsk), and it was hoped this would increase production by around 400 aircraft per year. With 3 factories working, a total of **1,528 DB-3s** (of all types) were produced from 1937 to mid-1939, when production of the improved DB-3F started. It should be noted that **these DB-3s lacked fuel protection in the form of self-sealing fuel tanks, which made them much more vulnerable to fire (as per the SB in the previous entry). This was arguably the DB-3's greatest single weakness during Operation Barbarossa.** It should be noted, however, that *German fighter pilots reported that all DB-3s were harder to shoot down than the SB bombers*, and generally absorbed considerably more punishment. (p. 210)

DB-3T and DB-3TP

The VVS-VMF (*Voyenno-Vozdushnye Sily - Voyenno-Morskoy Flot* SSSR, Military Air Force - Naval Forces of the USSR) had been looking for a suitable land based torpedo bomber for some time, with sufficient range to cover an area the size of the Baltic Sea. The DB-3 seemed the obvious choice, and a variant designated the DB-3T (torpedonosets) was soon adapted to this role. . . On 1 June 1941, there were **72 DB-3s** with the VVS-KBF (Red Banner Baltic Fleet) and another **48 DB-3s** with the VVS-ChF (Black Sea Fleet). **Around 83% of these were DB-3Ts** assigned to the 1 MTAP (*Minno-Torpednyy Aviatsionyy Polk* - Mine-torpedo Aviation Regiment) with the VVS-KBF, and the 2 MTAP with the VVS-ChF. An additional 127 DB-3s were stationed in the Far East with the VVS-VMF (Pacific Fleet), but it is unknown how many of these were DB-3Ts. . . Unfortunately, the potentially useful **DB-3TP** never went beyond the 2 prototypes (TsKB-51) built. The project was stopped for operational reasons: it was felt that the supporting infrastructure needed to operate this type of aircraft was too great versus any potential benefits it might bring to the VMF. (p. 211)

DB-3F

The production of **1,528 DB-3 bombers** in two and a half years (from 1937 to mid-1939) was a good number by Western standards, but by Soviet pre-war standards it can only be considered a moderate production rate at best (especially when factoring in that this was the output of 3 major plants). The DB-3 was built using traditional methods; best described as 'cut and fit'. This involved cutting steel components to measure, the manipulation and moving of multi-component steel structures, the bending of sheet metal, and the welding of a great many small joints (often in awkward positions and which often had to be checked using X rays). **The outdated and difficult manufacturing techniques needed to produce the DB-3 would have to be addressed**, and this was one of the key requirements of the next major upgrade of the design; namely the DB-3F (*Forseerovanny* - roughly translates as uprated).

Work on the DB-3F had begun in 1938. The first thing was to **re-work the aircraft's frame**, which was now composed of pressed profiles rather than specialised alloy pipes. . . Apart from improving the manufacturing process, the DB-3F aircraft itself incorporated a number of important enhancements. The engine reliability problems in the M-87A had been addressed with the release of the M-87B engine. . . The single SU dorsal turret and
LU ventral machine gun mount remained as in the DB-3. The DB-3F first flew on 21 May 1939, and started **State acceptance testing** on 31 August 1939. In testing, the DB-3F (with M-87B engines) was able to reach 445kph (276mph) at 5,400m, and its maximum range with a **1,000kg** bombload was **3,500km**. **Series production of the DB-3F had already begun before testing was complete.**[70] (pp. 211-12)

[70] **Note:** Some kind of concurrency in the development of VVS types appears quite common.

In late 1939 it was decided to increase the power available, and **replace the M-87B engines with M-88 engine.** The main feature of the M-88 was it employed a 2 speed geared centrifugal supercharger, which enabled the engine to generate 1,100hp on take-off and around 1,000hp at 6,000m. DB-3Fs with the M-88 engine first rolled off the production line in January 1940. However, due to shortages of the M-88 engine, production of some DB-3s with M-87B engines continued until June 1941. Unfortunately the M-88 engine was released somewhat prematurely, and in service it had numerous teething problems which caused frequent engine failures.

In early 1941, the first DB-3Fs with M-88B engines entered series production.[71] These aircraft also had an improved defensive armament layout. The existing SU dorsal turret was replaced with the improved MV-3 dorsal turret, while the LU ventral gun mount was replaced with a newly designed MV-2 ventral gun mount. The weapons themselves remained single 7.62mm ShKAS MGs. Perhaps even more important for the aircraft's defence was the **addition of a fourth crewmember, which meant all 3 defensive MGs could now be simultaneously manned** if under attack from enemy fighters. The bulkier MV-3 and MV-2 turrets, and increased weight, meant the 1941 production DB-3F was a somewhat slower machine:[72] it was able to attain 422kph (262mph) at 6,600m and 345kph (214mph) at sea level. Interestingly, this actually made the 1941 production DB3-F slower than the 1939 production DB-3.

By early 1941, the DB-3F production rate (from 3 plants) was around 1,000 aircraft per year: a marked improvement on the DB-3's production rate. An estimated 2,000 DB-3Fs had been completed from the start of production in 1939 to the eve of Operation Barbarossa, and of these 974 were completed from January to June 1941. Of the latter, 93 (10%) still had M-87B engines. Thus, **by 22 June 1941, a total of approximately 3,528 DB-3s of all types had been produced** (including around 2,000 DB-3F). However, at most, around 881 were DB-3Fs with M-88B engines and new turrets, which represented 25% of all DB-3 and DB-3F production. (p. 213)

On 1 June 1941, **2,203 DB-3 / DB-3F** were assigned to VVS front-line units and most of these were early production DB-3Fs. Of this total, around 1,830 (**81%**) were with the **VVS-DBA** (*Dal'ne-Bombardirovochnaya Aviatsiya* - Long Range Bomber Aviation) units. Another **247** were with the VVS-VMF (**naval**) forces. The VVS-DBA was the **USSR's strategic bomber force** in June 1941, and fortuitously this meant that the DBAP (*Dal'nebombardirovochnyy Aviatsionnyy Polk* - Long Range Bomber Aviation Regiments) units were deployed well away from any immediate front on 22 June 1941. It was thought, correctly, that the DB-3's range would ensure that the DBAP units would still be immediately available for combat-operations in the event of war. (Note: on 22 June 1941 the DBA Command did not report directly to any of the VVS-KA Commands in the Western Special Military Districts. **The consequences of this were that the DBA airfields avoided the initial annihilating attacks on Soviet airfields in June 1941. In addition, DB-3 units were not immediately tasked with as many unescorted and suicidal daylight attacks against German ground forces as the SB-2 bomber force was.)**

Unfortunately, as the SB bomber force was rapidly decimated during June and early July 1941, the DBAP regiments were soon drawn into the fray (despite their more strategic nature) in a desperate attempt to stem the German advances. During July 1941 large formations of the DB-3s and DB-3Fs were committed to attacking German ground forces directly, or interdicting targets behind the front such as bridges and rail yards. These operations were usually carried out in daylight at medium or even low altitude, and with no (or with minimal) fighter cover. The reasons for this were varied but included: limited fighter availability, poor coordination of attacks, lack of sufficient numbers of airborne radios, and the lack of coordinated mission-training between DBA and fighter units. Ultimately, DB-3 losses during 1941 were extremely heavy, and were not much better than the SB-2 losses during this period. As before, it was the loss of the valuable bomber crews (and the DBA tended to have the cream of these) that would ultimately be felt most. (p. 213)

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[71] **Note:** From 1939 to 1941, the **DB-3** was fitted with *four different engines.*

[72] **Note:** Virtually anytime you add weight—if everything else stays the same—you lose range and speed.

By 22 October 1941 there were only **439** bombers left in DBA units, of which only **310 were DB-3s.** This represents an **83%** reduction in DB-3 strength (from 1,830 to 310) in only four months! By 15 December 1941 the number of bombers in the DBA had fallen to only 273, of which 182 were DB-3s. This situation was made worse by the relatively modest production rate of DB-3Fs in the second half of 1941 **due to shortages of strategic material and production disruption** (only 315 were produced). These loss figures correlate with other sources, which confirm the **USSR lost a total of 7,200 bombers in 1941** (excluding ground attack aircraft and fighter bombers). Around **38% of these losses, or 2,700 aircraft, were DB-3s and DB-3Fs**. With this level of losses we would expect the DB-3 strength decline during the course of 1941. **On 22 June 1941 the Soviet DBA forces represented the largest strategic bombing force in the world, and yet in just over five months this force had all but been wiped out.** (p. 214)

DB-3s did attempt to **carry out a few 'strategic' missions in 1941**. It is rather ironic that it was naval DB-3Ts from 1 MTAP which were the *first Soviet bombers to carry out a strategic bombing raid against Berlin.* This is because of all the DB-3 units, the MTAP units were considered the least strategic and the most tactical (i.e. they were meant to attack individual ships and not strategic targets, and were not even in the DBA). It is a measure of how committed the DBA was to trying to stem the German Army's advance (at the tactical-operational level), that only naval air-units from the VVS-VMF could be spared for these missions.

With 800kg internal bomb loads, two *Eskadrilyas* (authorised 24 aircraft) from 1 MTAP flew from a base on the **island of Osel to bomb Berlin on the night of 8 August 1941**. The 15 aircraft involved flew a 1,770km (1,100mls) round trip, with **6 bombers reaching Berlin proper**. The flight duration was around 7 hours, which left around 25 minutes of fuel reserves. Although successful and a good morale booster[73] (which was probably its main aim), this raid was more an exercise in night navigation and proof of the DB-3's long range with nominal bomb load, than any actual damage inflicted. The VVS-VMF also carried out further night bombing raids on a small scale during 1941. These included s**mall night-raids on Konigsberg, Danzig, Helsinki and Warsaw, and a few daylight raids around Constanta.** None of these raids inflicted significant damage to the Axis war effort in 1941. **Ultimately the DBA (reorganised as the ADD in March 1942) would never become a significant strategic bombing threat to Germany**, and the vast majority of DBA/ADD raids during WWII were against Axis ground forces on the East Front. This situation did not change for the duration of World War II, and any effective strategic bombing of Germany itself was left almost entirely to the Western Allied USAAF, RAF, RCAF and RAAF. (p. 214)

1941 production aircraft included a wooden navigator's station, cockpit floor and tailcone. **Self-sealing fuel tanks were not fitted until late 1942** (initially only 1 fuel tank, and later the 3 fuel tanks in the wings). Unfortunately, in **late October 1941 Zavod 126 was evacuated eastwards which further disrupted DB-3 production**. The reduced production rate meant that **only 315 DB-3Fs** were produced from 23 June to 31 December 1941. Taking into account all 1941 production, the most common DB bomber model to be fielded by the VVS in the second half of 1941 was probably the **DB-3F with M-88B engines** (but only just). This is because the precise number fitted with M-88 and M-87B engines (in 1941) is unknown, so we have to assume the majority of the bombers had M-88B engines.

In March 1942 the DB-3 was **officially redesignated the Ilyushin Il-4.** With a few relatively minor enhancements, the IL-4 continued in series production until 1944. By this time a total of 1,528 DB-3s and 5,096 DB-3F / IL-4s had been completed. A further 160 Il-4s were completed post-war, bringing total DB-3 / IL-4 production to **6,784** aircraft. (p. 215)

c. Petlyakov Pe-2

[73] **Note:** Kind of analogous to our Doolittle Raid of April '42.

The Pe-2 was the most successful aircraft design attributed to **Vladimir M. Petlyakov**, **and the most successful and widespread Soviet multirole tactical-bomber used in WWII.** In September 1937, Petlaykov was a senior director at the TsAGI (*Tsentral'nyy Aerodinamicheskiy i Gidrodinamicheskiy Institut* - Central Aerodynamics and Hydrodynamics Institute) prototype construction plant, or ZOK (*Zavod Opytnykh Konstrooktsiy*). He was already an experienced designer who had worked with the Tupolev OKB, which was at that time closely aligned with (and sponsored by) the TsAGI in Moscow. Petlaykov had designed the wings for the ANT-6 (TB-3) heavy bomber, and had headed the development team for the advanced ANT-42 (TB-7) heavy bomber. (p. 216)

Unfortunately, on **21 October 1937 Petlyakov was arrested, together with Tupolev and the entire directorate of the TsAGI, on fabricated charges of sabotage, espionage and of aiding the Russian Fascist Party.** In Petlyakov's case, he was accused of deliberately delaying development of the ANT-42. Petlyakov was lucky, however, because he was not summarily executed as were many of his colleagues. By 1939 Petlyakov (along with Tupolev and other surviving TsAGI personnel) had been sent to work as prisoners in several NKVD run OKBs near Moscow. Petlyakov was incarcerated in CCB-29 (special prison at Zavod (factory) 156), and tasked with **heading a team of around 50 prisoner-engineers** to design a new long-range and high-altitude fighter. The design and prototype which eventuated was designated the **VI-100** (*Vysotny perekhvatchik* - high altitude interceptor 100). It was an **extremely advanced design** which incorporated numerous innovative features. The aircraft was a twin engine and cantilever low-wing monoplane, which employed the latest technology in *stressed skin construction*. The power plants chosen were the new 1,100hp Klimov M-105 V12 liquid cooled engines, which were **turbocharged** for improved altitude performance. . . The proposed armament was to be 2 20mm cannon and 2 7.62mm ShKAS MGs in the nose, a single ShKAS MG in the tailcone, and provision for 2 external 250kg bombs. All in all, the prisoners at CCB-29 had outdone themselves (perhaps because their lives literally depended on it), and had **produced one of the most advanced aircraft designs in the world.**

A total of 2 V-100 prototypes were built, and the first flight occurred on 22 December 1939. In some ways the VI-100 was (arguably) a bit too advanced: the initial flights revealed numerous teething problems, as well as a few more serious ones. Problems included engine unreliability due to oil-system cooling problems (one engine failed on the maiden flight) and unreliable undercarriage. Nevertheless, the VI-100 looked so promising that in early March 1940 the State Committee of Defence authorised the manufacture of 10 VI-100 pre-production aircraft at Zavod 18. Following some modifications, the prototype VI-100s commenced more strenuous State acceptance testing with the NII-VVS on 11 April 1940. The VI-100 was able to achieve a speed of **538kph** (334mph) at 6,600m, and **455kpg** (283mph) at sea level. Unfortunately the VI-100 continued to exhibit some major problems. The second prototype was damaged beyond repair on its second test flight after it crash-landed following a cockpit fire (caused by a leak in the fuel system). (p. 216)

PB-100

In the event, **events elsewhere drove the VI-100 project in a very different direction**. On 10 May 1940, the same day that the VI-100 completed its initial NII-VVS tests, the Germans launched their offensives into France. This success (as well as the successful Polish and Norwegian campaigns) finally **convinced the VVS Command that they urgently needed a ground-attack aircraft as effective as the Ju 87**. It was apparent that a dive-bomber was required, and although the Soviets had dabbled in this area, they now realised that a new design was needed. The IL-2 and Su-2 were not dive bombers, and the Polikarpov SPB (D) dive-bomber project was looking to be a failure. **In the meantime the Soviets had got their hands on a German Ju 88A, which featured an incredibly strong air-frame, dive brakes, an automatic dive recovery system, and the ability to carry heavy bomb loads**. This provided yet more evidence that twin-engine dive bombers were the future (and presumably also convinced the Soviets that this was what the German were working on). Urgent specifications were issued, and the two ongoing projects with the most potential were: the conversion of the experimental SB-BK into a dive bomber (**which led to the Ar-2**, see previous entry), and the possible conversion of the VI-100 into what would be called the PB-100 (*Pikiruyushchii Bombardirovshchik* - Dive Bomber). The VVS Commander in Chief (Y.V.

Smushkevich) was pessimistic that the SB-BK **conversion into a dive bomber** would provide a long term solution, and priority was soon given to the PB-100. (p. 217)

In June 1940 the State Committee of Defence decided to order the PB-100 into pre-production at 2 Moscow plants before the full design was even complete (and way before any sort of prototype was actually built). The order was for 30 aircraft from Zavod 39 and 50 aircraft from Zavod 22, with delivery in 1940. The original March 1940 order for 10 VI-100 pre-production aircraft at Zavod 18 remained in effect. The pressure was now on Petlyakov and his team (presumably with a promise of release if successful), **and they were given only 45 days to make the conversion**. It is doubtful if any other aircraft design team anywhere was facing this type of time constraint for such a project!

The first task was the removal of the engine turbochargers, the entire cockpit pressurisation system and the experimental VISh-42 constant-speed propellers (replaced with simpler VISh-61B propellers). The fuselage was restructured: . . . In addition to the internal bomb bay (capable of carrying 4 100kg bombs), small door enclosed bomb compartments were installed in the rear of the engine nacelles (for 2 100kg bombs), and 4 small external bomb racks were installed under the wing roots (for up to 4 100kg bombs). The maximum bomb load on the original PB-100 design was 1,000kg. So far (in the above) the only modifications contributing to a 'dive-bombing' capability were the forward glazing and the pilot's PBL-1 bomb-sight. To enable dive-bombing, dive-brakes were added to the wings, and an automatic AP-1 (Avtomaht Pikeerovaniya -1) dive-control system was added which modulated the air-brakes according to the dive angle and airspeed. **This system was reverse engineered from a similar system on the acquired Ju 88A.**

From a purely dive-bombing aspect, it is clear the PB-100 was never going to match the single engine dive bombers already in service in other countries, and it was barely going to match the Ar-2 still being developed. **Nevertheless, Stalin was pleased with Petlyakov's efforts (and perhaps worried about the production situation), and in October 1940 he was released from detention and appointed Chief Designer at Zavod 39**. Desperate to get at least one PB-100 airborne in 1940, the first flight took place on 15th December 1940. In tests the aircraft achieved a top speed of **535kph** (332mph) at 6,000m, and 455kph (283mph) at sea level, which met the required specifications. Around this time the PB-100 designation **was changed to Pe-2** (in honour of Petlyakov). (pp. 217-18)

The Pe-2

On **16th January 1941** the first 'production' **Pe-2s** were handed over to the NII-VVs for State acceptance trials. Almost inevitably, the incredibly rushed development of this aircraft, and the *improvised manufacturing techniques, ensured that the early pre-production Pe-2s had some very nasty problems*. Fixable problems included regular failure of the governors for the constant-speed propellers (leading to frequent emergency landings), and undercarriage shock absorbers which 'bounced' the aircraft on landing. Ultimately 187 problems were highlighted in aircraft produced at Zavod 39 and 100 were highlighted in aircraft produced at Zavod 22. These were mostly problems which were fixable with minor changes, but there were a **few more serious ones which would plague the Pe-2 for the whole of its career.** One of the biggest problems stemmed from the Pe-2's high altitude fighter pedigree. For this role, wing aerofoil sections were chosen which provided a high lift over drag ratio at high speeds, and a relatively constant aerodynamic centre position over a wide speed range. This was good for diving because it meant the aircraft remained relative steady as the dive speed increased. However, at low speeds the same aerofoil sections produce much lower lift over drag ratios, **and it was found that at only 11 degrees angle of attack the Pe-2 could stall on final landing approach.** The stall occurred asymmetrically along the wing span (causing a stall-spin), and could occur suddenly if the control stick was pulled back or in a turn. This was extremely dangerous for an inexperienced pilot, and **many Pe-2 crews perished because of it: especially those trying to land in a wing damaged aircraft.** (p. 218)

Despite the faults, the production Pe-2s continued to demonstrate their speed and climb performance. Early production Pe-2s were able to achieve a top speed of 540kph (336mph) at 5,000m and 452kph (281mph) at sea level, a climb rate of 5,000m in 9.3 minutes, and a service ceiling of 8,800m.821 By February 1941 the Pe-2 was considered ready for delivery to VVS combat units, and **series production was started at Zavod 22, 39, 124, 125 and 450.** It was planned to produce 1,100 Pe-2s in 1941, with 525 by the end of June 1941. In the event, **623 Pe-2s** were accepted by the Soviet military (including training and reconnaissance versions) by the end of June 1941, and another 34 were still at plants. This production was from 4 plants (but mainly Zavod 22 and 39), because Zavod 450 had terminated production. (p. 218)

On 1st June 1941, **289 Pe-2s** were assigned to VVS front-line bomber regiments, and of these **209 were assigned to units in the Western Special Military Districts**. As a general rule, Pe-2 bombers were assigned to selected SBAP regiments (already using SB bombers) because they were intended to perform the same tactical-bombing role as the SBs and Ar-2s. This would also enable SB pilots and SBAP ground staff to become familiar with the new Pe-2, and begin the transition process. *On 22 June 1941 most of these regiments were still becoming familiar with this aircraft, which was not the easiest aircraft to fly* (as we have seen) and which still had significant ongoing operational problems. Unfortunately this also meant that many of the new Pe-2s were deployed in the SBAPs in the Western Military Districts when the *Luftwaffe* struck on 22 June 1941, and significant (but unknown) numbers were lost immediately. It was fortuitous that more of the Pe-2s in the VVS's inventory had not been allocated to these SBAP regiments earlier.

Nonetheless, it wasn't long before the **Pe-2 was establishing itself as the most difficult Soviet bomber for fighters to shoot down**, and the type most able to complete its mission without fighter escort and survive. The only
Soviet fighters fast enough to act as escorts were the latest modern types (the Yak-1, LaGG-3 and MiG-3), while none of the I-15, I-16 and Hurricane types could keep up. The only bomber type operating on the entire East Front including *Luftwaffe* types) faster than the Pe-2 was the **extremely rare Yak-4.** German fighters (including the Bf 110C-4 and E-4 fighter-bombers) could still catch the Pe-2 at all altitudes, but they usually had to be able to approach at favourable interception angles. This was largely because German single engine fighters operating on the East Front during 1941 had limited range, and could not expend prodigious amounts of fuel in long chases, especially if operating behind the Soviet lines. On top of this the Pe-2 was relatively well-armed (especially the versions with the rear 12.7mm UBK MG), as well as being sufficiently manoeuvrable to present an attacking fighter with a difficult and relatively dangerous target. **German fighter losses were heavier when engaging Pe-2s than against any other Soviet bomber type fielded in 1941-42**. (pp 219-20)

Having said this, in 1941 the Pe-2s still had to operate for most of the time in conditions of German air-superiority, and losses were heavy. There were also ongoing technical and operational issue which took their toll. It was quickly found that the **Pe-2 was not an effective dive-bomber**, despite it being designed (or at least adapted) for this role. There were several critical problems. Firstly, the VISh-61B propeller's control system caused over-speeding when it went into a steep dive, which made the aircraft difficult to control. Secondly, and very dangerously, the air brake retraction system often failed to function, which meant that as the aircraft pulled out of a dive its airbrakes remained locked open. . . Fourthly, the control surfaces on the Pe-2 were always considered 'heavy', particularly when taking off and when pulling the control stick back: a problem first identified in testing in January 1941. . . As a result of combat and heavy operational losses, in 1941 *the Pe-2 rapidly reverted to missions involving rapid transit to the target with a 600kg bomb-load (or rockets) and without fighter escort, attacks in a shallow dive at lower altitudes, and then rapid withdrawal from the target zone.* This was precisely the type of role envisaged for the SB bombers early in the 1930s. A major downside of not dive-bombing (apart from the obvious loss of bombing accuracy) was that the aircraft was much more vulnerable to light flak at low altitude. **The IL-2 had its armour to protect it during low altitude attacks, but the Pe-2 had no such protection: it had to rely on its speed to avoid being hit. In WWII most Soviet bombers (including the Pe-2) attacked at lower altitudes, and around half of all Pe-2 losses in 1941 were from German light flak**. This vulnerability meant Pe-2s generally attacked

at higher altitudes than IL-2s, and were more often used in interdiction attacks on less well protected targets in rear areas (which also suited their superior range and speed). (p. 220)

Production of the Pe-2 accelerated after the German invasion with **1,014 Pe-2 bombers** being completed from 23 June to 31 December 1941. There were several modifications introduced in 1941, which were focused on improving the survivability and offensive load. **The Pe-2's relatively light bomb load (for such a large aircraft) was always considered one of its greatest shortcomings** as a bomber. Attempts were made to improve its lethality, which included the introduction of KMB-Pe-2 bomb-cassettes. These allowed larger numbers of bomblets to be carried for use against area targets. In September 1941, Pe-2s from some plants were **fitted with rocket racks for up to 10 RS-132 rockets**. The problem with this rather ad-hoc solution was that the speed fell by 25-30kph without the RS rockets fitted, and by 35-45kph with the rockets fitted. This was a big reduction in performance, and it is likely Pe-2s with rockets fired them off if intercepted by enemy fighters.

One of the interesting features of 1941-42 production Pe-2s is the progressive reduction in performance due to quality control issues. In fact, during production the Pe-2 suffered the greatest performance deterioration of any Soviet bomber during WWII. It should be borne in mind that during this period German production fighters were getting progressively faster and more heavily armed. The causes of the Pe-2's performance deterioration were: the stress and difficulties of accelerated wartime production, shortage of certain raw materials and the lack of available skilled workers. In addition, in late October and November 1941 the main Pe-2 production plants were evacuated eastwards. **Zavod 22 (the main plant) was moved to Kazan, and Zavod 39 was moved to Irkutsk.** It was not until late 1942-43 that production in these large plants settled down and the quality returned to pre-war levels. By this time the Pe-2 had undergone significant improvements, most notably more powerful 1,260hp M-105PF engines from February 1943. Numerous modifications and enhancements followed, and the **Pe-2 went on to become the mainstay of the USSR's tactical bombing force during WWII.** Ultimately, **11,427 Pe-2s were produced of all types** (including all trainers and experimental types) when production ended in early 1945. This made the Pe-2 the third most numerous twin engine aircraft to see service during WWII. (p. 221)

d. Tupolev TB-3

The Tupolev TB-3 (or ANT-6) was the **world's first cantilever wing 4 engine heavy bomber**. The TB-3's (*Tyazhyolyy Bombardirovshchik* - Heavy Bomber) origins go back to **1924. At this time the VVS was already thinking about a strategic bombing force**, and instructed the TsAGI (*Tsentral'nyy Aerodinamicheskiy I Gidrodinamicheskiy Institut* - Central Aerodynamics and Hydrodynamics Institute) to produce a suitable design for a long range bomber. Tupolev and his design bureau (the first such group in the USSR) were closely aligned with the TsAGI, and soon produced a design for a twin engine, all-metal monoplane with a **corrugated duralumin skin**. It was powered by **2 British Napier Lion engines**, and designated the ANT-4. The ANT-4 was constructed in Moscow in 1925 and underwent its first test flight on **26 November 1925**.[74] Testing was successful, and it was decided to put the ANT-4 into production as the **TB-1**. Production was delayed for various reasons including shortages of aluminium and by the need to find a replacement for the expensive imported Napier Lion engines. The **German BMW VI engine was initially used**, but later production TB-1s used the Mikulin M-17 engine (a somewhat inferior licence built version of the BMW VI which started production in 1930). **TB-1 production eventually started at Fili in Moscow in 1929**, and eventually 216 TB-1s were built (excluding the 2 prototypes) from 1929 to 1932.

As early as late 1925 it was recognised that the *TB-1 was never going to fulfil the desired strategic bomber role, and it was always considered a 'test bed' for new construction techniques and power plants anyway*. The Tupolev team were given the opportunity (based on their experience with the TB-1) to produce a much larger design which could meet the following relatively modest specification. The new design was to have a cruising speed of 150kph, a minimum 350km range, a 1,700kg payload (including fuel) and the ability to deliver a **1,000kg bomb load.**

[74] **Note:** Wow! The Soviets were testing a four-engine bomber in **1925!** And production models began in **1929!**

Tupolev and his team decided the new aircraft was to be an all-metal cantilever monoplane, with 4 engines mounted on the leading edges of the wings. **This would be the first aircraft ever built with this configuration. At this time most foreign designers (of bombers) were still thinking in terms of large biplanes with the engines mounted on supports between the wings. . .** The design and prototype was designated the ANT-6. (p. 222)

The ANT-6 prototype became airborne for the first time on an airfield near Moscow on 22 December 1930. State acceptance testing was completed by February 1931, and the aircraft was ordered into production at Zavod 22 (in Moscow) for the VVS RKKA with the designation **TB-3.** Initial production aircraft used the BMW VI engine, but this was quickly changed to the 730hp Mikulin M-17F engine driving **wooden 2 blade fixed-pitch propellers** designed by the TsAGI. This engine was the results of improvements to the M-17, but the M-17F was an entirely Soviet designed engine because the Germans had already stopped further development of the BMW VI. In 1931 the TB-3-4M-17F was **probably the most advanced heavy bomber in the world**: it had a top speed of **196kph** (122mph),[75] an operational range of 1,350km, a service ceiling of 3,800m, and could carry around 3,000kg of bombs (over short distances). Its defensive armament comprised 5 to 8 7.62mm DA LMGs, depending on whether single MG mounts (DA-1) or double MG mounts (DA-2) were used.839 The MG 'turrets' were open to the air, and
were located as follows: 1 in the nose, 2 in tandem on top of the mid-fuselage, and 1 (with a DA-1 only) in a retractable 'bin' located under each wing between the engine nacelles. Most of 1931 was spent preparing the Moscow factory for production, with the first production aircraft becoming airborne in January 1932. A total of around **400 TB-3-4M-17Fs were built in total from 1931 to 1934**. (pp. 222-23)

The need to improve the TB-3's performance, led to the use of the 830hp Mikulin M34 (30-40 built and designated the TB-3-4M-34), and then the 900hp M-34R (Reduktor) with reduction gearboxes, designated the TB-3-4M-34R. Tests showed the TB-3-4M-34R could attain a top speed of **288kph (179mph)**, had a service ceiling over 3,800m, and an 'overload' bomb load of 4,000kg. The maximum range with a normal 2,000kg bomb load was 2,500km. The TB-3-4M-34R commenced production in late 1934-35, and **this model formed the bulk of TB-3s produced after 1934.** . . **TB-3 production ended in 1939, after a total of 818 machines had been produced in total** (including a few experimental types and **a few which had been optimised to break several aviation records**). (p. 223)

TB-3s saw action for the first time in the summer of 1938 when **60 TB-3s were used to attack Japanese forces near Lake Khasan.** Similar numbers of TB-3s were also used during the Battles of Khalkhin Gol from May to September 1939. In these actions the TB-3s would bomb from medium altitude (close to their operational ceiling), and fighter opposition was (for the most part) relatively light. Several TB-3 units were also **used to bomb Finnish positions on the Karelian Isthmus in January 1940**. However, in the Winter War even the small Finnish fighter force was able to demonstrate the TB-3's vulnerability to modern fighters in daylight, so the bulk of the fighting fell to the SB bomber force. **By this time it was obvious to the VVS that the TB-3 was obsolescent as a strategic bomber in daylight**, and a large proportion of the existing TB-3 inventory had already been **converted to become military transports.**

On 1 June 1941 there were **364 TB-3s still in service with combat units** (as well as an additional **11 TB-1s**). Of these, 308 TB-3s were **assigned to Long Range Bomber Aviation (DBA) units,** and 25 were assigned to VVS-VMF (Naval) units. An estimated 152 additional TB-3s were also available as G-2 transports or in training schools (i.e. 516 aircraft in total). As the DBA units were stationed far from the front lines, *TB-3 units survived unscathed from the Luftwaffe onslaught on the VVS's border airfields in June 1941*. **Some DBA TB-3 regiments attacked German ground forces in late July and for six days in August 1941**, but it was very evident that the TB-3 could not survive for long in a modern combat environment during daylight. Its slow speed, lack of fuel protection, low

[75] **Note:** Just 122 mph???

operational ceiling and lack of manoeuvrability **made it easy prey for German fighters and medium to heavy flak guns (the 88s)**.

Very quickly, surviving TB-3 bomber units were switched to night operations where they could rely on the darkness (and lack of night fighters) for protection, or were withdrawn for use as military transports. The TB-3s greatest contribution to the Soviet cause in 1941 (and in WWII generally) was as a useful **heavy transport aircraft**. Of particular note are the airborne operations from December 1941 to March 1942. In December, the **4th Airborne Corps** (with large elements of the 9th and 214th Airborne Brigades) made a major parachute drop behind the German lines in support of the Soviet winter counteroffensive against the German Army Group Centre. Several smaller battalion sized airdrops were carried out from January to March 1942, involving elements of the 9th, 201st, 204th and 214th Airborne Brigades. **In all these operations the majority of transport aircraft used to drop the paratroopers, as well as airlift supplies and other forces after the initial landings, were TB-3 (G-2) transports**. The steadily declining numbers of surviving TB-3s continued to operate as military transport aircraft until the end of the war; and on 1st July 1945 the Soviet 18th Air Army still had 10 TB-3s on strength. (pp. 224-25)

e. Petlyakov TB-7 (Pe-8)

In the early 1930s the VVS had already realised that **a new design was needed for the eventual replacement of the TB-3 in service.** Since 1933 a design section at the VVA (*Voynno-Vozdushnaya Akademiya* - VVS Academy) called the VVIA, headed by **V. Bolkhovitinov**, had been working on a replacement for the TB-3. The VVIA design which eventuated led to the 4 engine Bolkhovitinov DB-A (*Dahl'niy Bombardirovshchik-Akademiya* – Long-Range Bomber-Academy). This advanced aircraft used the latest stress-skin construction techniques with a partially retractable undercarriage, and **first flew in May 1935**. However, technical and production problems precluded series production. **In August 1937 a DB-A, with the famous Soviet aviator Sigizmund Levanevsky on board, was lost without trace while attempting to fly from Moscow to Fairbanks, Alaska.** This incident, along with ongoing technical problems and the advent of the TB-7 (see below), sealed the fate of the DB-A programme. In the end only 14 DB-A aircraft were built (including the 2 prototypes). On 1 June 1941, there were still 5 DB-As operational and in VVS service. (p. 225)

In 1934 a VVS specification was issued to the TsAGI (*Tsentral'nyy Aerodinamicheskiy i Gidrodinamicheskiy Institut* - Central Aerodynamics and Hydrodynamics Institute) calling for a heavy bomber capable of 440kph (270mph), a range of 4,500km and a normal bombload in excess of 2,000kg of bombs. At the Tupolev OKB, a team lead by V. Petlyakov was assembled in July 1934 to design the new aircraft, which was given the bureau designation ANT-42. A preliminary design was submitted to the VVS in December 1935. It featured: 4 wing mounted engines, a 2 spar cantilever mid-wing, a **duralumin (stressed skin) monocoque fuselage** (with a pear shaped cross section), single wheel and fully retractable undercarriage, variable pitch propellers, and a narrow cockpit where the pilot and co-pilot sat in tandem. *The most difficult part of the specification to meet, and the one which would plague the ANT-42 into the future, was the high altitude requirement.* The problem was the USSR did not have a suitable engine in production which could deliver the required power at high altitude. The engines were unspecified in the preliminary design/mockup stage. After considerable deliberation, it was decided to use 1,200hp AM-34FRN engines still undergoing development. **In order to obtain sufficient power at altitude it was decided to install a fifth engine in the fuselage** driving a special supercharger to feed the bomber's main engines with compressed air in flight.

The ANT-42 prototype made its first flight on **27 December 1936**. However the ATsN super charging unit was not initially ready, and wasn't tested in flight until 11th August 1937. During State acceptance trails the ANT-42 achieved a top speed of 403kph (250mph) at 8,000m, a ceiling of 10,800m and a range of 3,000km.*A large number of problems were identified, but the main ones stemmed from the reliability of the AM-34FRN engines* and the ATsN system, which were still under development and had not passed their own State acceptance tests. **On 21 October 1937 Petlyakov, Tupolev and the entire directorate of the TsAGI were arrested on fabricated**

charges, and Petlyakov was accused of deliberately delaying the ANT-42 project. If the project wasn't delayed before, it certainly was now. Consequently the development work on the second prototype wasn't completed until January 1938, and its maiden flight was delayed until 26 July 1938. **Factory and State acceptance testing began on 11th August 1938**, and by now the NII-VVS had insisted it be placed in production. It was given the designation **TB-7** (*Tyazhyolyy Bombardirovshchik -Heavy Bomber*): **all reference to Tupolev having been removed.** (p. 226)

Despite plans to produce the TB-7 going as far back as 1937, these were not completed until 1939 when Zavod 124 (in Kazan) started production. However, the ongoing engine problems and the auxiliary supercharging system continued to plague this aircraft, and only the first 4 production aircraft had AM-34FRNV engines and the AtsN. . . When the supply of AM-34FRNV engines also became a problem in late 1939, the NKAP (*Narodnyy Komissariat Aviatsionnoy Promyshlennosti* - People's Commissariat for Aviation Industry) **had no choice but to instruct Zavod 124 to shut down production in early 1940.** One could safely say that at this point the entire ANT-42 / TB-7 project was a borderline failure.

Alternative power-plants were quickly investigated . . . One alternative was to use the still developing Charomskiy 1,475hp M-30 and 1,250hp M-40 aircraft **diesel engines**. From early 1941 to June 1941, at least 9 TB-7s were fitted with M-30 or more commonly M-40 diesel engines. These engines were very similar, differing in size and the number of turbochargers. Flight tests conducted in the **spring of 1941** showed the M-30 and M-40 engines were very efficient and increased the TB-7s range, but both engines proved unreliable at higher altitudes. **The second alternative was to use the new 1,350hp Mikulin AM-35A engine**, which had started production in 1940 primarily to produce MiG-1/3 fighters. In July 1940, 6 TB-7s at Zavod 124 were fitted with AM-35A engines (which were hard to come by because MiG-3 production had top priority). The AM-35A powered TB-7 soon proved to be the best aircraft to date, largely because this engine had been developed to meet the demands of a high altitude fighter. By the end of 1940, a total of 18 AM-35A powered TB-7 aircraft had been completed at Zavod 124 and delivered to the VVS. This aircraft was capable of **443kph** (275mph), had an operational range of 3,700km, and a service ceiling of 7,000m with a maximum bomb load of **4,000kg.** With a 2,000kg bomb load the maximum range was extended to around **5,445km**. (p. 227)

After 22 June 1941 and Operation Barbarossa commenced, **the TB-7 very quickly became low priority**, and production at Zavod 124 focused almost entirely on the Pe-2. In addition, the MiG-3 fighter had priority for the AM-35A engines. It is unknown precisely how many TB-7s were produced from 22 June to October 1941 (when TB-7 production temporarily halted), but it is probable that the only new TB-7s delivered were those close to delivery in June 1941. In all, no more than around **34 TB-7s** would have been available during 1941, with 27 available in the USSR on 22 June 1941 (of which around a third were operational). On 22 June 1941 the only VVS combat unit equipped with TB-7s was 2/14 TBAP / 18 DBAD attached to the **DBA (Long Range Bomber Aviation).** It had 9 TB-7s of which 5 were operational, and was stationed near Kiev-Borispol in the Kiev Special Military District. Unfortunately 2 TB-7s were destroyed in German airfield attacks, before the unit was able to withdraw further east. During late June and July 1941 the 14 TBAB was renamed 412 TPAP and later 432 TBAP, and this unit received virtually all the available TB-7s during this period. **On 10 August 1941, 432 TBAP used 8 diesel powered TB-7s on a long range night-mission against Berlin.** This ambitious attack was launched from an airfield near Leningrad, but **the raid was a disaster.** One TB-7 crashed on take-off, 3 others were shot down (apparently by friendly fire), 2 more crash landed due to heavy flak damage and were lost (in Finland and Estonia), and 2 managed to return to base. Only 3 TB-7s actually reached Berlin. The mission's failure was blamed on the reliability of the M-40 diesel engines, but it is obvious there were many other factors involved. **The 432 TBAP was gradually replenished with replacement TB-7s and continued operations against German targets in the deep rear at night. These included raids on Berlin, Königsberg and Danzig. In total, at least 16 TB-7s were irrecoverably lost in 1941.**

On 12th January 1942 Petlyakov was killed in a Pe-2 crash, and shortly after the **TB-7 was redesignated the Petlyakov Pe-8** (Petlyakov's apparent transgressions having been forgotten: he was now a hero of the Soviet regime). In May 1942 it was decided to step up Pe-8 production, but production of the AM-35A engine and the

MiG-3 fighter had already ceased. The remaining unused AM-35A engines mostly went into the few Pe-8s produced during 1942. (p. 227)

Production of the Pe-8 continued until the late spring of 1944 (with only 5 aircraft built in that year). When production was terminated **a total of 93 TB-7/Pe-8s had been built**. Combat missions with the Pe-8 stopped in August 1944, largely because the loss rate was considered too high. **874 Pe-8s remained in service as transports until war's end**, and a few remained in service well into the 1950s. (p. 228)

f. Yakovlev Yak-2 / Yak-4[76]

The Yak-2 was the first military aircraft to emerge from the OKB headed by **Alexander S. Yakovlev**. The Yakovlev OKB had officially been in existence since 1934, but up to that time it had only been involved in the design and construction of light single-engine utility aircraft and trainers. The Yakovlev OKB was also known as OKB-115, which stemmed from the fact that the design bureau had its experimental workshops and production base at **Zavod 115 in Moscow.**

The **Yak-2** was designed to be a high-speed reconnaissance light-bomber. . . An unarmed (clean) prototype was completed in the spring of 1939, and flight tests near Moscow showed it to be as fast as its appearance portended. NII-VVS testing soon showed that it was able to reach **567kph** (352mph) at 9,900m, and could climb to 5,000m in 5.75 minutes. . . **Entirely premature, the aircraft was ordered into production in the summer of 1939** as the BB-22 (*Blizhniy Bombardirovshchik* - Short Range Bomber). It is also known that Yakovlev was forwarding the plans to Zavod 1 (where production was initially planned) as early as April 1939 and before NII-VVS testing had even started.

Unfortunately for the Yakovlev OKB, the **laws of physics**[77] could not be broken by any amount of wishful thinking or staged tests: there was a catalogue of problems with the BB-22 which would ultimately prevent it ever becoming one of the great combat aircraft of the era. . . Painstaking development work continued on production aircraft (fortunately, with a slow production rate), and as one set of problems was solved, another set seemed to appear. . . The Yak-2 aircraft produced a Zavod 81 also showed an improvement in overall quality. These Yak-2s demonstrated an increase in speed of around 15kph, and could carry an 'overload' bomb load of 600kg. However, the critical instability issues remained, and it was recommended to stick with the 400kg internal bomb load. Production of the Yak-2 (powered by M-103 engines) ceased in 1940, after approximately **111 BB-22 and Yak-2** aircraft had been manufactured in total.

In an attempt to 'save the design' it was decided to upgrade the engines to the more powerful 1,100hp Klimov M-105 V-12 engines, which were an evolutionary development of the M-103 engines. The new aircraft was promptly designated the **Yak-4** (even though the initial **Yak-2bis** designation would have sufficed). Testing revealed the Yak-4 was capable of 458kph (284mph) at sea level, and 533kph (331mph) at 5,050m. However, the maximum bomb load of 600kg remained (with 400kg strongly recommended), and most of the unpleasant and dangerous flight instability issues remained. The chief if the NII-VVS, Aleksandr I. Filin, recommended that Yak-4 production be terminated as it 'did not meet the air force's requirements'. In April 1941 Yak-4 production was stopped after some 90 aircraft had been delivered. **A grand total of 201 Yak-2s and Yak-4s were therefore built before production was terminated.** (pp. 229-30)

On 22 June 1941 there were **121 Yak-2s and Yak-4s** in service with VVS combat units, and **all these were deployed in the Western Special Military Districts**. Of these, 28 aircraft were assigned to 314 RAP in the Western Special Military District, and 93 aircraft were assigned to the 316 RAP and 136 BAP / 19 BAD in the

[76] **Note:** These planes were more rare than unicorns, so I'm not posting much about them.

[77] **Note:** Great line from Nigel: Soviet acft designers often seemed to be contemptuous of the "laws of physics!" Or at least attempted to ignore them.

Kiev Special Military District. **This meant that those Yak-2/4s in operational units were severally hit by the initial German airstrikes in June 1941**. The surviving Yak-2s and Yak-4s continued to operate against German ground forces, but all the Yak-2/4 units were rapidly decimated and the losses (both operational and combat) were crippling. By the end of June 1941 the number of operational Yak-2/4s left on the whole East Front could be counted in **single digits**. (p. 230)

In general, it was found that the Yak-2 and Yak-4 **were considerably better at reconnaissance than operating as light bombers**. In combat the Yak-2 and Yak-4 proved to be too lightly armed, were easily damaged, and were excessively vulnerable to both German fighters and ground fire. However, in the reconnaissance role they could use their speed advantage without being encumbered with bombs, and on several occasions German fighters were unable to intercept them. *Unfortunately their limited range precluded them from being effective strategic reconnaissance aircraft, and the relative unreliability of their engines* (the cooling problems were never fully resolved, even on the Yak-4) made longer range missions even more risky. (p. 230)

2E. Short Range Reconnaissance, Army Cooperation and Support Aircraft

On 1 June 1941 the Soviet VVS KA (Army), VVS VMF (Naval) and PVO (Home Air Defence) Air Forces had a total of **767 aircraft which could be described as short range reconnaissance, or army cooperation and support aircraft,** assigned to combat units. These comprised 213 Polikarpov R-5, 104 Polikarpov R-5SSS, 292 Polikarpov R-Z, 119 Nyeman R-10 and 39 Polikarpov U-2S-2. (Note: this excludes **835 flying boats and seaplanes** which were in the VVS on 1 June 1941. These are included in the next section (refer Coastal Aviation, Patrol and Anti-Ship Aircraft)). (p. 231)

a. Polikarpov R-5 and R-5SSS

The Nikolai N. Polikarpov design team produced a prototype **R-5 reconnaissance-bomber biplane, which first flew in the autumn of 1928**. The R indicates *Razvedchik* - Reconnaissance. It was a single-engine sesquiplane biplane (i.e. the top wing was larger than the lower wing) built mainly of wood with a fabric covering. The R-5 proved to be a robust aircraft with excellent flying characteristics, and i**n 1930 it won an international competition (staged in Teheran) where it proved superior to competing British, French and Dutch designs**. After extensive testing, quantity production was initiated in late 1930 using a Soviet built 680hp Mikulin M-17B engine, which was a licence built version of the BMW Vib. By 1931 the VVS was rapidly expanding and they needed more aircraft to fulfil the light bomber and short range reconnaissance roles. The R-5 proved suitable, and production was soon stepped up to produce multiple versions of the aircraft. . . In 1932 the **R-5Sh** appeared which was armed with 5 forward facing PV-1 MGs, a twin DA-2 MG for rear defence, and a maximum bomb load of 500kg of bombs. Of the forward firing MGs, 4 were mounted on the leading edge of the lower wing and could be adjusted to fire obliquely downwards for low-level ground attack. In this configuration the aircraft weighed around 3,350kg when loaded with a 'normal' bombload of 300kg.

A total of **31 R-5 aircraft were sent to Spain to support the Spanish Republican Air Force in November 1936**, and at least some of these were R-5Sh types. However their slow speed and lack of manoeuvrability (especially when carrying bombs), made them vulnerable to contemporary fighters and they were soon relegated to night missions. R-5s also saw a considerable amount of combat during the **Battles of Khalkhin Gol against the Japanese in 1939, during the Soviet invasion of Poland in 1939, and during the Winter War against Finland in 1939-40.** On 1 June 1941 there were 213 R-5s still in service, but they had long since been replaced in the VVS's
bomber regiments. Of these, 191 were with the VVS KA (Army) and another 22 were with the VVS VMF (Naval) forces. The 'naval' R-5s were likely R-5a seaplanes. Of the army R-5s, 70 were deployed in the Western Special Military Districts and were mostly assigned to separate KAE (*Korpusnaya Aviatsionnaya Eskadrilya* - Army Corps Aviation Squadron) units. **During WWII the R-5s were mainly used for short range reconnaissance, as air ambulances (with panniers for patients under each wing) and as trainers.** (p. 232)

In 1934 the improved 730hp Mikulin M-17F engine became available. This was a Soviet designed improvement of the M-17B engine, as the Germans had stopped any further development of the BMW VI engine series. Other improvements included: improved streamlining, the use of lighter spruce wing spares to reduce weight, a redesigned spatted undercarriage and changing the PV-1 MGs to 7.62mm ShKAS MGs. The 'new' R-5 was **designated the R-5SSS** (*Skorostnoi, Skoropod'emnoi, Skorostrel'nyi* - Fast, Fast climbing, Fast firing). The R-5SSS was around 30kph faster than the R-5, and a ground attack version was produced (in very limited numbers) which used 4 wing mounted 7.62mm ShKAS MGs. Precise production numbers are unknown, but the best estimate is that around 600 R-5SSS were produced from 1935 to 1937. These are included in the 7,000 R-5 total production figure quoted above.

On 1 June 1941 there were **104 R-5SSSs still in service with front line units**, and they were all assigned to the VVS KA (Army). Of this total, 95 were deployed in the Western Special Military Districts and they were mostly assigned to separate RAP (*Razvedchik Aviatsionnyy Polk* - Reconnaissance Aviation Regiment) units. Only a few R-5SSS were assigned to the KAE (*Korpusnaya Aviatsionnaya Eskadrilya* - Army Corps Aviation Squadron) units.

b. Polikarpov R-Z

The Polikarpov R-Z was an extensively redesigned version of the R-5SSS, and it was intended that the R-Z would replace the R-5 in VVS service. It utilised the relatively new 820hp Mikulin M-34N engine, which was a supercharged (N - Nagnetatel) version of the M-34 engine. . . The R-Z first flew in **January 1935** and entered series production almost immediately at **Zavod 1 in Moscow** (where the design and development work had been conducted). The production R-Z had a top speed of **316kph** (196mph), weighed 2,007kg empty and 3,150kg with a standard load, had a range of around 1,000km with a normal **300kg bomb load**, and an operational ceiling around 7,500m. A total of **1,031 R-Zs were built at Zavod 1 from 1935 to the spring of 1937**, when production was halted. (p. 232)

As with the R-5, a total of 61 R-Z aircraft were sent to Spain to support the Spanish Republican Air Force in 1937. They saw extensive combat as light-bombers until the war ended, and 36 aircraft survived to be taken over by the Nationalist forces. R-Zs were also used in small numbers during the Battles of Khalkhin Gol against the Japanese in 1939 and during the Winter War against Finland in 1939-40. By now the R-Zs were primarily being used in the tactical reconnaissance and battlefield support roles.

On 1 June 1941 there were **292 R-Zs** in service with front line units, and they were all assigned to the VVS KA (Army). Of the total, **177 R-5s** (61%) were deployed in the Western Special Military Districts. They mostly operated alongside the R-5s still in service, and were mostly assigned to separate KAE (*Korpusnaya Aviatsionnaya Eskadrilya* - Army Corps Aviation Squadron) units. (p. 233)

c. Neman R-10

From 1934 to 1936 a design team at the KhAI (*Kharkovskii Aviatsionny Institut* - Kharkov Aviation Institute), led by **Iosif. G. Neman** (also commonly spelt Nyeman), **developed a light reconnaissance bomber** designated the KhAI-5. The original KhAI-1 design had been an advanced single engine transport monoplane, which was the first passenger aircraft in Europe to have a retractable undercarriage. This evolved into the KhAI-5 which featured: low cantilever and plywood covered wings with slightly swept back leading edges, **a semi-monocoque stressed skin fuselage**, retractable main undercarriage, a fully enclosed pilot's cockpit with a sliding canopy, and a glazed MV-2 rear-turret with a single MG for the observer/gunner positioned aft of the wing's trailing edges. A fuel tank and an internal bomb bay were positioned between the 2 crew compartments, and there were 2 additional wing tanks. The prototype KhAI-5 was initially powered by a 710hp **Curtis-Wright SR-1820-F3 Cyclone** air-cooled radial engine driving a 2 blade 2-pitch propeller.

The prototype KhAI-5 first flew in **June 1936**, and, despite its somewhat ungainly appearance, **it represented a significantly more modern approach to tactical reconnaissance than the R-5 and R-Z**. State acceptance tests were conducted from 29 August to 24 October 1936, and the KhAI-5 demonstrated that it was considerably faster than all contemporary tactical reconnaissance aircraft in service and had considerably more range. In tests the KhAI-5 had: an empty weight of 1,823kg, a loaded weight of 2,515kg, a top speed of **388kph** (241mph) at 2,500m, a service ceiling of 7,700m, a range of 1,450km, and could climb to 3,000m in 6.5 minutes. The KhAI-5 received unusual praise for an NII-VVS report and was recommended for immediate production.

Production was soon undertaken at Zavod 135 (in **Kharkov**) and Zavod 292 (at **Saratov**), and production aircraft were designated R-10. Initially they were powered by 730hp Shvetsov M-25A radial engines, but soon the 750hp Shvetsov M-25V was used driving a VISh-6 2 blade metal propeller.907 The R-10's maximum bomb load was 300kg (normally 6 50kg bombs) carried internally, and, in addition to the rear-turret 7.62mm ShKAS MG, there were 2 more wing-mounted 7.62mm ShKAS MGs. **For reconnaissance work the observer also had an AFA-13 camera mounted in the fuselage floor**. The R-10 entered VVS service in 1937, and eventually **493** were built from 1937 to early 1940 when production stopped. . . (p. 233)

All further work at the Neman OKB effectively came to an abrupt end, when, unbelievably, Iosif. G. Neman was arrested on 11 December 1938 on the usual fabricated charges of sabotage. In his case it was apparently because some of the production aircraft had a few teething problems! If this same standard of criticism and state sponsored tyranny had been applied to Yakovlev, he would have been lucky to survive a month in 1938-39. (p. 234)

From 1937 the R-10 was primarily used to replace the obsolescent R-5 in VVS reconnaissance units. Modest numbers of R-10s participated in the Battles of Khalkhin Gol against the Japanese in 1939, and a few R-10 regiments participated in the Winter War against Finland in 1939-40. In the latter conflict the R-10 earned a reputation for being able to operate in the worst possible flying weather, and became well respected for its reliability in the freezing conditions of the far north winter.

On 1 June 1941 there were **119 R-10s** in service with front line VVS units. Of these, 98 were with the VVS KA (Army) and another 21 were with the VVS VMF (Naval) forces. Of the total, 69 R-10s (58%) were deployed in the Western Special Military Districts, and a **large proportion of these were destroyed on the ground in the initial *Luftwaffe* strikes against the VVS airfields. . .** In late 1941 surviving R-10s were largely used as harassing night bombers to avoid further losses to enemy fighters. The last R-10s were withdrawn from VVS front-line units in 1943, although by then there were very few left.

d. Polikarpov U-2 (Po-2)

The Polikarpov U-2 was originally a **general purpose biplane designed in 1926**. However the incredible record of this aircraft meant that **small numbers were still in service with the Soviet Air Force in 1954**, when it was given the **NATO code name of 'Mule'**. This was an appropriate appellation, **as the tens of thousands of aircraft built in its 25 year production life were employed in almost every conceivable type of military and civilian role.**

The U-2 was originally developed to meet a VVS specification for a basic trainer to replace the U-1, which was a licence built version of the Avro 504 (around 700 built). It was a 2 seat biplane of conventional design; primarily made of wood and with a stretched fabric skin. . . **The first prototype was designated the U-2PK and first flew in 1927, but it exhibited poor handling characteristics**. After some redesign work on the wings and some additional weight saving measures, a second prototype flew on **7 January 1928** and proved satisfactory. State testing of the prototype and pre-production aircraft proceeded during 1928, and full series production commenced in **1929.** Initially the main production plant used was **Factory No. 23 in Leningrad** (later called Zavod 23).

In the early 1930s it was proposed that the U-2 could be armed and used in a combat role. . . Testing of 4 more converted U-2s in June and July 1933 revealed a top speed of **130kph (81mph)**, a ceiling of 3,120m and an all up weight of 1,281kg (with a 200kg bomb load). The aircraft underwent NII-VVS trials in February-March 1933, and it was found that its stability and controllability were almost unchanged. Obviously its top speed, range, and ceiling had all deteriorated, but it remained a viable and manoeuvrable light-bomber and tactical reconnaissance aircraft. Testing of 4 more converted U-2s in June and July 1933 revealed a **top speed of 130kph (81mph)**, a ceiling of 3,120m and an all up weight of 1,281kg (with a 200kg bomb load). However, it was decided not to place the armed U-2 in production at this time; largely because the R-5 was already fulfilling a similar role and it was a markedly superior combat aircraft. All this work would, however, **lead to the U-2VS** (*Voyskovaya Seriya* – Military Series) after June 1941. (pp. 234).

By June 1941, between **13,000 and 13,500 U-2s had been manufactured** in multiple versions, and were being used across the USSR in **over a dozen distinct roles** (excluding numerous experimental types). The most significant of these were: U-2 and U-2UT **trainers** for both military and civilian pilots, U-2M **seaplanes** (with a central main float and two outrigger floats), U2-A, U-2AP and U-2AO crop dusters and agricultural aircraft, U-2S, U-2SS and U-2S-1 **air ambulances** (pilot, medical attendant, one stretcher patient), U-2S-2 air ambulance (pilot, medical attendant, two stretcher patients), U-2S-3 air ambulance (pilot, two stretcher patients), U-2S-4 air ambulance (like the S-2 but with cylindrical stretcher containers on top of each lower wing, and a small nose wheel for landing safety), and the U-2SPL **passenger aircraft** (enclosed three seat cabin). (Note: all the above variants were manufactured before Operation Barbarossa started, and some of these variants (e.g., the U-2UT and U-2S-3) produced in the late 1930s used the improved 125hp Shvetsov M-11D engine.)

On 1 June 1941 the VVS KA (Army) and VVS VMF (Naval) forces are known to have had at least **403 U-2** and U-2UT trainers on strength. However, the VVS front line units were not equipped with U-2s, except for some U-2S series ambulance aircraft. There were at least 39 U-2S-2 aircraft on VVS strength on 1st June, and most of them were deployed in the Western Special Military Districts.

It wasn't until several months after the German invasion that the U-2 started appearing in front line combat units in significant numbers. In September 1941, several civilian U-2s were used near Odessa to attack Axis positions, and around the same time a manufacturing programme was started to produce armed U-2s. Polikarpov supported the project, and under his leadership the U-2VS (*Voyskovaya Seriya* - Military Series) was created using the experience gained while arming the U-2 during the 1930s (see above). These aircraft were usually powered by the **125hp M-11D engine**, were armed with a **single 7.62mm ShKAS MG** (or a 7.62mm DA-1 MG, depending on availably) operated by the observer, and were **able to carry up to 6 50kg bombs**. The forward PV-1 MG on the fuselage was not used as this involved propeller synchronisation, which added complexity and delayed production. In this configuration the U-2VS had an empty weight of around 770kg, a loaded weight of 1,368kg (with a 300kg bomb load), **a top speed of 145kph (90mph),** an operational ceiling of 3,000m and a range of approximately 470km. (p. 235)

It was soon readily apparent that the U-2 could not survive for long as a bomber in daylight over the front-line. **The U-2 did prove quite difficult for fighters to shoot down, because its slowest speed was well below the stall speed of modern fighters.** If attacked, the U-2 would drop to very low levels, and then turn sharply when attacked while still maintaining altitude. The enemy fighter was forced to pass at relatively high speed, which dramatically reduced the chances of a hit. The U-2 was not the only aircraft to employ this very effective defensive technique: other examples included the **Fi 156 and the Fw 189**. However, unlike reconnaissance aircraft, the **U-2VS was intended to attack targets with bombs at low levels.** With a maximum target approach (and departure) speed in the region of 130kph (81mph), the U-2 was a very easy target for any enemy 20-40mm flak guns. With this speed and altitude, if a light-medium flak gun could see the U-2 (in range) it was probably going to get hits. **Even though the U-2 had a remarkable ability to take superficial bullet damage, it was unlikely to survive exploding 20-40mm shell hits.**

Within a very short time the most common armed U-2 was redesignated the U-2LNB (*Legkii Nochnoi Bombardirovshchik* - **Light Night Bomber**). These were essentially U-2VS aircraft with an engine silencer attached to reduce engine noise, which, naturally, also reduced performance (but only by a small amount). A number of dedicated NBAP (*Nochnoy Bombardirovochnyy Aviatsionnyy Polk* - Night Bomber Aviation Regiment) units were mobilised in 1941 with around 32 aircraft on strength, and these units **soon conducted night 'nuisance' and harassment raids on German positions.** The number of NBAP units fielded by the VVS grew rapidly into 1942, and the U-2 continued with these night raids until the end of the war. **In this role the U-2 became one of the most disliked (by the Germans) VVS weapons** due to its ability to loiter undetected at night and then swoop on any tell-tale light source. These raids were difficult to counter on dark nights, and as if demon-strating that *copying is the greatest form of flattery, the Luftwaffe formed their own 'night harassment units' after 1941 with obsolescent combat aircraft*. (p. 235)

A total of **1,009 U-2VS/U-2LNB** were manufactured between 22 June and 31 December 1941. In 1941 the large majority of these went into the newly formed NBAP units or into BBAP (*Blizhnebombardirovochnyy Aviatsionnyy Polk* - Short Range Bomber Aviation Regiment) units. After 1941, U-2 production accelerated (see below) and the types produced continued to proliferate. The two most significant new types, as far as combat on the East Front is concerned, were the U-2LSh and the U-2NAK. The U-2LSh (*Legkii Shturmovik*, also known as the U-2VOM-1) was similar to the U-2LNB, except it could carry 120kg bomb load and **4 RS-82 (82mm) rockets.** The U-2NAK (*Nochnoy Artillereeyskiy Korrektirovshchik* - Night Artillery Spotter) was a night artillery observation aircraft built from 1943.

As a final note on the U-2 it is worth examining the overall production figures for the U-2/Po-2 as there seems to be several different perspectives. A.S. Yakovlev suggested a figure of **33,000** (a figure commonly accepted), while aviation historian V.B. Shavrov puts the figure as high as 40,000. It appears the exact figure is somewhere in between. **It is generally accepted that around 13,500 U-2s of all types were produced from 1928 to 22 June 1941**. According to the records of 'Aircraft Deliveries of the NKAP Plants during the War', from 22 June 1941 to 9 May 1945 a total of 11,918 U-2/Po-2 were produced. This figure breaks down as follows: 1,009 in 1941 (after 22 June), 2,130 in 1942, 2,812 in 1943, 4,382 in 1944, and 1,585 in 1945 (up to 9 May). If we add the pre-war production and war-production figures, we get a total of **25,418** aircraft. According to a relatively recent study of the Eastern Front air war, a total of **32,711** U-2s were produced from 1928-29 to 1949 (in Russia). This is likely how Yakovlev and most current Western publications get their 33,000 figure. [With production continuing in Poland from 1948-54] it is possible that 40,000 U-2/Po-2 were produced, but the most likely figure is around 37,000. One thing is certain, however, and that is the **U-2/Po-2 remains by far the most mass-produced bi-plane in history.** (p. 236)

2F. Coastal Aviation, Patrol and Anti-Ship Aircraft

On 1 June 1941 the Soviet VVS had a total of **835 aircraft** which could be described as coastal aviation, patrol and anti-ship aircraft assigned to combat units. 926 Of these, 823 were assigned to the VVS VMF (Naval) forces and only 12 were assigned to the VVS KA (Army) forces. These aircraft comprised: 761 Beriev MBR-2, 16 Beriev KOR-1 (Beriev-2), 3 Beriev KOR-2 (Beriev-4), 11 Chyetverikov MDR-6 (Chye-2), 22 Tupolev MR-6 (R-6), 4 Heinkel HD-55 (KR-1) and 18 GST (PBY Catalina).

a. Beriev MBR-2

The **MBR-2** (*Morskoi Blizhnii Razvedchik* - **Marine Short Range Reconnaissance**) was by far the most important **Soviet flying boat** to see service before and during WWII. The MBR-2 originated as one of the first designs produced by Georgy M. Beriev in 1931. . . The design featured a shoulder-wing monoplane with fixed outrigger floats, which employed a single pusher engine mounted on N pylons above the fuselage. The wings were of metal and mainly wood construction, the fin and rudder were made of metal, while the two-step hull was constructed

entirely of wood. A strut-braced horizontal tailplane was set high on the single fin. . . The power unit chosen for the prototype was an imported 500 hp BMW VIZ V-12 water-cooled engine driving a 4 blade wooden propeller (in the pusher mode). The prototype was ready in December 1931 and it was transported to Sevastopol for trials in the spring of 1932. The prototype first flew on 3 May 1932, and tests soon indicated the design was relatively stable in flight and possessed good hydrodynamic properties. . . so after successful State testing (from January to August 1933) the Beriev design was selected for production as the **MBR-2. . .**

Production of the MBR-2 was undertaken at Zavod 24 (**Sevastopol**) and Zavod 31 (**Taganrog**), and started in early 1934. The production version was initially powered by a 680hp M-17B V12 engine, which was a Soviet licence built version of the BMW VIb engine (sometimes designated the MBR-2M-17). Production aircraft featured: an open cockpit with 2 pilots seated side by side, an open gun position in the bow with a single 7.62mm DA MG, a second open gun position midway along the top of the fuselage with another DA MG, external racks for up to 300kg of bombs or depth charges, and provision for fixed wheel or ski undercarriage to be fitted. All these added features reduced the top speed to around **200kph (124mph),** the ceiling to 4,400m and the operational range to around 650km. (p. 238)

In 1935 Beriev carried out an extensive redesign based around the more powerful 860hp Mikulin AM-34NB engine. . . On 1 June 1941 there were **761** MBR-2 / MBR-2bis in VVS service, with 5 aircraft assigned to the VVS KA (Army) forces in the Far East. Of the MBR-2 naval aircraft in the western USSR, 49 were assigned to the VVS-SF (**Northern Fleet**), 122 were assigned to the VVS-KBF (**Red Banner Baltic Fleet)** and 134 were assigned to the VVS-ChF (**Black Sea Fleet**). Despite being designed for European waters, several hundred MBR-2s were also deployed with the VVS **Pacific Fleet.**

On 22 June 1941 most MBR-2s were deployed well away from the front lines and were not impacted by the initial *Luftwaffe* strikes (although a number were lost to strafing attacks on Odessa, Sevastopol and Riga in June and July 1941). **The MBR-2 acquitted itself well in 1941, and remained in front-line naval-air units for the duration of the war**. Obviously the MBR-2's survivability in the presence of enemy fighters was low, but it had sufficient range to operate where fighters were not usually present. This included avoiding most Finnish fighters in the Baltic and Rumanian fighters in the Black Sea. It was used for naval reconnaissance (some with cameras fitted), anti-submarine patrols, air-sea rescue of downed pilots, supply and communication to isolated islands and garrisons (e.g., Hanko), and minelaying at night. The ability to operate with skis also enabled the MBR-2 to operate in the far north and from iced-over bases during winter. (p. 239)

b. Beriev KOR-1 (Beriev-2)

By the mid-1930s the VMF (*Voyenno-Morskoy Flot* SSSR - Naval Forces of the USSR) was looking for a Soviet built replacement for the **Heinkel HD-55** aircraft. A number of these aircraft (and their catapult systems) had been purchased to fulfil the *need for catapult launched aircraft on the Navy's larger warships* (refer HD-55 / KR-1 entry below). The Beriev OKB was tasked with designing a more modern Soviet aircraft to fulfil this shipborne role, which led to a design designated the Beriev-2 (by the design bureau) in late 1935-36.

In the meantime the Beriev OKB strove to remedy some of the defects, but really only succeeded in producing a land-based wheel version in 1938-39. In these aircraft the floats were removed and a fixed undercarriage was attached using V shaped struts (sometimes with spats over the wheels). **These aircraft were essentially an admission that the KOR-1 was a failure as a shipboard catapult aircraft** (even though the KOR designation remained) and that it might have some use as a trainer or light reconnaissance aircraft. When production stopped in 1940 the total number produced is unknown, but estimates range as high as 300. If this is correct, very few of them ever found their way on board a ship, and most never entered VVS or VMF service with front-line units. They were primarily based on land and operated as **custom patrol aircraft**, or (most) were relegated to training units as **trainers.** On 1 June 1941 there were **only 16 KOR-1 in service** with front line VVS units. Of these, 3 were with the VVS KA (Army) and another 13 were with the VVS VMF (Naval) forces. (p. 240)

c. Beriev KOR-2 (Beriev-4)

The Beriev-4 came into being as a result of the failure of the KOR-1. By 1939 it was realised that it would be more constructive in the longer term to use the Beriev OKB's experience **to develop a completely new catapult aircraft for ships**, and the Beriev OKB was soon ordered to do so. The resulting design was initially designated the Beriev-4, and from the design it is apparent that Beriev went back to his 'flying-boat roots.' The Beriev-4 was a small, single-engine and parasol-winged flying-boat. . . The prototype was made of metal with **stressed skin construction**, and first flew on 21 October 1940. Its armament at this time was envisaged as a single 7.62mm ShKAS MG facing forward, a single 7.62mm ShKAS on a flexible mount in the dorsal position, and up to 300kg of bombs or depth charges on wing mounted racks. The aircraft weighed 2,055kg empty and 2,760kg when loaded. Initial tests were positive and the new aircraft was able to reach a top speed of **356kph** (221mph) and a ceiling of 8,100m, and had an operational range of 950km. (p. 241)

State trials and **catapult testing** of the Beriev-4 was continued through to January 1941, and then the aircraft was ordered into limited pre-production at Zavod 31 (**at Taganrog**) with the designation KOR-2 (*Korabelnii O Razvedchik* - Shipboard Catapult Reconnaissance). However, only a handful (possibly as few as 3) of the pre-production aircraft had been produced and released to the VVS for further testing prior to the German invasion. Before series production got underway, **the factory at Taganrog was evacuated to Omsk and then to Krasnoyarsk**, where limited KOR-2 production continued in May 1943. The precise number of KOR-2 produced from 1943 to 1945 is unclear, but the best estimate is around **45-50** aircraft.

It is known that there were 3 KOR-2 assigned to the VVS KA on 1 June 1941, but all 3 aircraft were still not yet operational and it is very likely they were still undergoing testing prior to full production commencing. The few available KOR-2s in 1941 served with the VVS-ChF (Black Sea Fleet) on **naval reconnaissance and patrol missions.** It is possible that some served as catapult aircraft on the **Black Sea Fleet's cruisers** in 1941; namely the **Molotov late in 1941 and the Voroshilov.** (p. 241)

d. Chyetverikov MDR-6 (Chye-2)

During the mid-1930s, one of the **VMF's continuing requirements was for a long range maritime patrol seaplane**, and to date the Soviet air-industry had not managed to fully meet this requirement. The three Soviet design bureaus with the knowledge and experience to build such an aircraft were the Beriev OKB, the Tupolev OKB, and the small and relatively unknown **Chyetverikov OKB**. Chyetverikov had been the lead designer of the ARK-3, which was a twin engine flying boat with a 1,500km range developed for arctic operations. Although the ARK-3 was only partially successful, it was really an experimental design which had demonstrated Chyetverikov's talents. As a result, Chyetverikov was allowed to lead a separate design team specialising in flying boats in 1936. (p. 242)

The prototype Chye-2 first flew in July 1937.945 Testing in 1937-38 revealed the prototype was underpowered and also revealed that there were some potential structural problems. Nevertheless, in 1939 the aircraft was ordered into limited production at Zavod 31 (at Taganrog) with the designation MDR-6 (*Morskoi Dalnii Razvedchik* – Marine Long-Range Reconnaissance). The production version of the MDR-6 was powered by considerably larger and more powerful 1,100hp Shvetsov M-63 radials, and around 20 aircraft were ordered. The increased power enabled the MDR-6 was to achieve a top speed of **360kmh** (224mph) at 4,000m, a maximum ceiling of 9,000m and a maximum range of 2,650km (clean). The empty weight was 4,100kg and the maximum loaded weight was 7,200kg. The armament comprised a single 7.62mm ShKAS MG in the front turret, a single heavy 12.7mm UBT heavy MG in the dorsal turret, and **a maximum 1,000kg load of bombs or depth charges** over short distances (normally around 400kg for long range operations). The first MDR-6s were delivered to the VVS in **1940** and continued into early 1941 (when the initial order of 20 was completed).

On 1 June 1941 there were **11 MDR-6 assigned to air-combat units** in the VVS. They were all assigned to VVS VMF (Naval) forces, and they were all operational (presumably the remaining 9 production aircraft were in repair, in training / evaluation units, or were destroyed). During 1941 the few available MDR-6s mainly operated as part of the VVS-KBF (Red Banner Baltic Fleet) flying long range reconnaissance, patrol, anti-submarine and anti-shipping (interdiction) missions. By 1942 most surviving MDR-6s were, at least temporarily, out of commission due to structural problems. Production of the MDR-6 was not recommenced in 1942-44 due to the USSR's aircraft industry having much higher priorities. (p. 242)

e. Tupolev MR-6 (R-6)

The Tupolev R-6 (*Razvedchik* - Reconnaissance) was a **long range reconnaissance aircraft and light bomber** which was developed to meet a VVS requirement for such going back to **1928.** Its bureau developmental name was the ANT-7, and it was essentially a scaled down version of the Tupolev TB-1 bomber. The ANT-7 was designed by a team at the TsAGI, and was a twin-engine cantilever monoplane with a fixed undercarriage. The 4 crew were all in open positions, and these comprised the pilot, a nose gunner, a dorsal gunner and a ventral gunner in a 'bin' suspended between the undercarriage struts. The prototype was powered by 2 650hp BMW VI engines driving wooden 2 blade propellers, and first flew on **11tSeptember 1929**. (p. 243)

Following some changes to the tail elevators as a result of NII-VVS testing, the type entered production in late 1930 at **Zavod 22 in Moscow** with the **VVS designation R-6**. Production R-6s were powered by 715hp Mikulin M-17F V-12 engines. The first R-6s were delivered to VVS units in November 1931 and production continued until 1934. By this time some **410** aircraft had been built, including all variants but excluding the prototype. The basic R-6 had a top speed of 216kph (134mph) at 3,000m, a service ceiling of 5,620m and an operational range of around 965km with a light 115kg bomb load. **By June 1941 the R-6 had all but retired from VVS service, except for a number of MR-6s**. On 1 June 1941 there were still **22** Tupolev R-6/MR-6 on VVS strength, with 1 R-6 attached to the VVS KA (Army) and 21 MR-6s attached to the VVS VMF (Naval) forces. As far as is known, 9 MR-6s were still in the VVS-KBF (Red Banner Baltic Fleet) and 12 were in the Pacific theatre where their longer range proved useful. *It is unlikely the MR-6s ever flew as torpedo bombers against the Axis forces in1941, but they likely flew long-range naval reconnaissance and patrol missions. In 1942 any surviving R-6/MR-6s were finally withdrawn from front-line service* and relegated to transport and /or training duties.

f. Heinkel HD-55 (KR-1)

As part of modernising the VMF (*Voyenno-Morskoy Flot* SSSR - Naval Forces of the USSR) in the late 1920s, it was decided to add catapult launched aircraft to the larger warships in the manner being explored by the larger Western navies. However, the new Soviet Navy had little to no experience in this area, and so Soviet officials **approached Heinkel in Germany in May 1929**. Heinkel, who were producing catapults for German naval and civil use, offered the Soviets an integrated catapult and aircraft system. The catapult was the K-3 system which was 21.53m long and capable of accelerating a 3,500kg aircraft to 90kmh. The aircraft offered was the Heinkel HD-55. The Soviets agreed to purchase 20 aircraft and at least 2 catapults. One HD-55 was **delivered in 1930 and another 19 were delivered in 1931.**

The production HD-55 was **a biplane flying boat** with the lower wing attached to the top of the fuselage-hull, and small outrigger floats attached underneath the lower wing. . . The HD-55 was made of wood and fabric, which meant it only weighed 1,520kg empty and 2,270kg when fully loaded. It had a top speed of 194kph (121mph), a maximum ceiling of 4,800m and a maximum range of 800km. In Soviet service the aircraft was designated the KR-1 (*Korabelniy Razvedchik* - Shipboard Reconnaissance), and was armed with a single 7.62mm PV-1 MG facing forward and a 7.62mm DA-1 or a DA-2 (twin mounted) flexible MG for the second crew member (the observer/rear gunner). (p. 243)

The first K-3 catapult was installed on the battleship Parizhskaya Kommuna in the Black Sea Fleet in October 1930. Trials revealed problems with the catapult and the aircraft. The HD-55 / KR-1 functioned as required, but its
light construction meant it was easily damaged (mainly due to structural failures). Nevertheless, the system was made operational and it was soon installed on the newly commissioned cruiser Krasnyi Kavkaz. KR-1s were also placed on the cruisers *Chervona Ukraina and Profintern* (renamed *Krasnyi Krym* in 1939), although they were installed without catapults.

All the aforementioned ships served with the Black Sea Fleet in June 1941. In the Red Banner Baltic Fleet, the battleships Oktyabrskaya Revoluciya (ex Gangut) and Marat also had KR-1s installed, but it appears neither had catapults. **The only other pre-war Soviet warships to have German sourced catapults installed were the modern Kirov class cruisers**, which included the Kirov (in the Baltic) and the Voroshilov (in the Black Sea). These ships were fitted with the more powerful Heinkel K-12 catapults. Later Soviet cruisers were fitted with Soviet built catapults. The KR-1 continued in service until 1940, largely due to the relative failure of its intended successor, the Beriev KOR-1 (Be-2, refer previous entry). On 1 June 1941 there were still **4 KR-1** in VVS-VMF service; the remainder having been scrapped, mothballed or relegated to naval-air training units. It is unclear if any (or all) of these aircraft were stationed on board ships on 22 June 1941. (p. 244)

g. Consolidated PBY (GST)

The GST (*Gidro Samolyet Transportnaya* - Hydro Aircraft Transport) was the VVS **designation for the Soviet licence built version of the Consolidated PBY Catalina flying boat**. The Catalina is generally regarded as the most widespread and successful flying boat ever produced, and the Soviet GST versions (as well as those received via Lend Lease later in the war) were *easily the best all-round flying boats to see service with the VVS-VMF* during WWII. The Soviets' 'Catalina history' started in August 1937 when they purchased the first commercial **PBY-1** (a Model 28-1) from an American explorer called Richard Archbold. The Soviets needed the aircraft to fly a search and rescue mission over the Arctic for the Levanevski flight which had disappeared. Although the search was unsuccessful, the Soviets were extremely impressed with the PBY's performance: it flew around 30,600km (19,014 miles) through some of the worst weather in the world during repeated search flights. **The Soviets very quickly realised that the PBY-1 was superior to any flying boat yet created by their own designers**. The original model 28-1 was eventually shipped to Moscow, and in late 1937 the Soviets placed an order for 3 Model 28-2 machines (PBY-2s). At the same time they also negotiated for a **licence to produce PBYs in the USSR**. As part of this contract, **18 Consolidated engineers were sent to Taganrog** (on the Sea of Azov) to assist in setting up the factory's production line.

Limited production of the Model 28-2 machines (effectively PBY-2s) commenced in 1938 at Taganrog, and they were given the Soviet designation GST. The Soviet production GSTs differed in several ways to the PBY. They were initially powered by 1,000hp Shvetsov M-62 radial engines, which were a development of the **Curtiss-Wright R-1820 Cyclone engines** . . . GSTs also had a bow turret of Soviet design with a 7.62mm MG, 2 7.62mm MGs in hatches in the fuselage sides (these hatches were changed to glazed blisters later, and this feature was also introduced on **PBY-4s in the West**), and a 7.62mm MG covering the ventral vectors via a tunnel-hatch. *The anti-shipping and anti-submarine ordnance* was carried on 6 external racks, and normally consisted of 600-1200kg of bombs, depth charges or mines. The precise load and weapon configuration depended on the range required for a particular mission. (pp. 244-45)

Soviet GST production continued at a slow rate through 1939 and into 1940, and it may have already shut down by 1941. **In October 1941 the factory at Taganrog was overrun by the Axis forces, so any immediate ability to manufacture the GST in 1941-42 was lost**. Production of GSTs up to that time amounted to **27 aircraft,** excluding the 3 imported Model 28-2s which were assembled at Taganrog (a total of 30 aircraft). On 1 June 1941 there were **18 GSTs** assigned to the VVS-VMF, of which 14 were operational. Of these, 7 were deployed with the

VVS-SF (Northern Fleet) and 11 were deployed with VVS-ChF (Black Sea Fleet). The remaining 13 aircraft (including the original Model 28-1) were being used as commercial transports or were no longer serviceable (lost).

From February 1943 to March 1945, 1**38 of the improved PBN-1** (Nomad) and **48 PBY-6A** were sent to the USSR as part of the **Western Lend Lease aid**. If we all add these together, we get a total of 217 aircraft which could possibly have operated as anything called a 'Catalina' by the USSR during WWII. (p. 245)

* * *

3. Tables of Organisation and Equipment (TOE) for Soviet Land Combat Units (22.6.-31.12.1941)

As mentioned previously, the term TOE is essentially a US military term. The Soviet equivalent military term was ***Shtat*** (*Shtaty or Shtatniy,* plural) and the German term was *Kriegsstärkenachweisungen* (KStN). The TOEs in an armed service show the internal composition, organisational structure and authorised equipment of the various combat units that make up that service. TOEs were created by the military high command in order to meet the perceived demands that they believed were most likely to be placed on their armed forces. As such, TOEs often reflected the state of the tactical, operational and strategic thinking, in the armed forces at that time. However a country's economy, infrastructure and available manpower, were often unable to physically supply all the resources needed to create combat units with their full TOEs.

In this sense, TOEs commonly did not reflect the reality: there was often a huge gap between a combat unit's TOE 'wish list' and the actual physical state of the combat unit. This was particularly true in the Red Army during 1941. As in most armies, many of the larger combat units in the Red Army, such as divisions, had a long history of evolution in terms of organisational structure. Obviously TOEs change over time as a country's situation, objectives, technology and understanding of war change. (p. 247)

In the Soviet military regulations each type of unit had a Shtat control number. This was then followed by a three digit number for the specific unit Shtat. For example, all rifle units' Shtaty had the control number 04 and all mechanised units had the control number 010. Each major sub-unit (such as a battalion) in that division would then have a separate Shtat number with the control number as a prefix. Thus a June 1941 rifle division's rifle regiment would be organised as per Shtat 04/401, while the same division's anti-tank battalion would use Shtat 04/404. When a regiment or battalion was organised as part of a larger unit, the above system took precedence over any 'branch' control number. For example, the Shtat (branch) control number for artillery units was 08, but if the artillery unit was attached to a division it used the divisional type number. Thus a June 1941 rifle division's light artillery regiment used Shtat 04/402.

In common with many other armies, the Red Army also adopted the system whereby the main sub-units within a large organisation would be numbered consecutively. In other words, within a division each regiment, battalion and company would normally have a unique number which followed the last number in sequence. For example, within a rifle regiment the battalions would be numbered 1st, 2nd, 3rd, etc, and the companies within the battalions would be numbered in sequence. Thus the 100th Rifle Regiment's 1st Battalion would have the 1st, 2nd and 3rd Rifle Companies and 1st MG Company, while the 100th Rifle Regiment's 2nd Battalion would have the 4th, 5th and 6th Rifle Companies and the 2nd MG Company.

Unfortunately not all the Soviet Shtaty are available. Where the unit's organisation has been reconstructed from secondary sources, these are also shown. These could include US intelligence archives published post-war (often based on German POW reports), German intelligence archives, and published Soviet (now Russian) post-war secondary sources. (p. 247)

A few important points should be borne in mind when considering the Soviet *Shtaty* and comparing them to the organisational tables shown in this chapter. For our purposes we need to 'convert' the Shtaty into useful tables based on the 'Soviet Personnel and Equipment Resource Database' detailed in the previous chapter. To do this there are certain 'rules' which need to be followed, and (for consistency) these rule types apply to the German and Axis units detailed in Volume II of this work. **For the Soviet land combat units these rules are as follows:** 1) All Soviet 'squads' (or sometimes called 'sections') must conform to the following table [below are key elements from the table]:

Soviet Light Infantry Weapon Equipped Squads

Rifle Squad: 11-12 man Squad with DP 1928 LMG
Rifle Squad (SMG): 11 man Squad, all with sub machine guns (PPD 1940G or PPSh-1941G)
Light Rifle Squad: 11-12 man Squad with no LMG, or 10 man Chemical Defence Squad with no LMG
Motor Cycle Squad: 8 man Motorcycle Squad and DP 1928 LMG, (includes motorcycles)
Cavalry Squad: 12 man Mounted Squad and DP 1928 LMG, (includes riding horses)
Light Cavalry Squad: 11 man Mounted Squad with no LMG, (includes riding horses)
Rail Repair Squad: 5 man Rail Construction and Repair Squad with no LMG
(p. 248)

3A. Red Army Rifle Units (Jun – Dec '41)

a. Rifle Divisions (June 1941)

In **1922** the first peacetime *Shtat* was issued for a Red Army rifle division (i.e. following the end of the Russian Civil War). It was authorised around **8,705** personnel, and consisted of 3 rifle regiments, a cavalry squadron, a small artillery battalion and a battery of howitzers. Over the next two decades, the progressive strength and firepower increases to the rifle division's structure reflected the growth of the Soviet economy and armaments industry during the 'five year plans'. These can be summarised in the following table:

Rifle Division Shtat Changes, 1922 to June 1941

1922: 8705 (manpower); **16** (artillery/mortars); **10,000** (horses) (first official *Shtat* for Rifle Divisions since the Russian Civil War)

1924: 12,800 (manpower); **0/74** (LMG, MMG); **24** (artillery/mortars) (from October 1924. Rifle grenade launchers introduced into service)

1929: 12,800 (manpower); **81/189** (LMG, MMG); **54** (artillery/mortars); **9000** (horses) (artillery expanded to: 4x 76mm Inf. Guns in each Rifle Regiment, a 30x 76mm in a Light Artillery Regiment, and 12x 122mm in a Howitzer Battalion. The DP (*Degtyarev Pechotnyi*, or *Degtyarev* Infantry) LMG introduced in 1927-28. Also, later, the 37mm M1930 AT gun was introduced into service (in limited numbers).

1935: 13,000+ (manpower); **354/180** (LMG, MMG); **96** (artillery/mortars); **57** (arm.cars/tanks). (major reorganisation. 12 man Rifle Squad (w. LMG) used with 4 squad Rifle Platoons (vs. 3). The ***triangular structure retained*** (i.e. 3x Rifle Co.- 3x Rifle Btln. - 3 Rifle Reg.). Additions included: a Tank Battalion (3x Tank Co., each with 15 tanks), an AT Battalion (24 37-45mm AT guns, if available), & an AA Battalion (18 light AA guns [on paper only]). Recon. Signal and Engineer units expanded to a Battalion (or 2x Company) size. The 45mm M1932 anti-tank gun also entered service (instead of the 37mm guns).

1937: 17,000 (manpower); **405/232** (LMG, MMG); **128** (artillery/mortars); **80** (arm.cars/tanks); **4155** (horses); **718** (mot vehicles/tractors)[78] (From 19 October 1937. The 82mm M1936 mortar introduced into the Rifle Regiments. This was soon followed by the 50mm mortar series (i.e. 50mm M1938, M1939 ..). The improved 45mm M1937 anti-tank guns was also introduced into service. Major attempts started to increase the overall motorisation of the division (*not least, due to horse shortages because of forced collectivisation of the agriculture in the USSR*).

1939: 18,906 (manpower); **534/162** (LMG, MMG); **273** (artillery/mortars); **28** (arm.cars/tanks); **6208** (horses); **746/92** (mot vehicles/tractors) (From 13th September 1939 (Based on 04/20-38 *Shtat* Series). Now had a large

[78] **Note:** Figure is not broken down between vehicles and tractors.

allocation of 129 mortars, including the new 120mm M1938 heavy mortar. Two full Artillery Regiments: a Light Artillery Regiment (with 76-122mm guns and howitzers) and a Medium Artillery Regiment (with 122-152 howitzers). In 1939, this was a larger artillery force than that in any foreign Infantry Division equivalent. Tanks were mostly withdrawn for the new Tank Divisions being formed. The 1939 Shtat was too complex & cumbersome for the Red Army C&C and support structure: made considerably worse by the effects of Stalin's purges on the officer core. Most division used in the Winter War had around 14-15000 men. Modified after the Winter War using Shtat 04/100-118, issued on 13th June 1940. Changes included: more mortars in the Rifle Regiments, more SMGs, reducing the support units (supply, admin, etc), and attempts to fully motorise the Medium Artillery Regiment (largely a paper exercise due to truck and tractor shortages, and the mass of new Mechanised Corps having priority for these vehicles).

1941: 14,483 (manpower); **392/166** (LMG / MMG); **294** (artillery/mortars); **19** (arm.cars/tanks); **3039** (horses); **586/99** (mot vehicles/tractors.
(p. 251)

It was in the field of artillery and mortars that the new rifle divisions received the most benefit from a technological perspective. *From 1930 the Soviets embarked on modernising the large stockpile of Tsarist artillery pieces still in service.* This usually involved upgrading the existing gun/howitzer with a new longer barrel and in some cases modifying the carriage. Weapons like the 76mm M1902, 122mm M1910 and 152mm M1909 became the 76mm M1902/30, 122mm M1910/30 and the 152mm 1909/30, respectively. It wasn't until 1936 that the first true modern designs began to appear with the 76mm M1936 (F-22), the 122mm M1938 (M-30) and 152mm M1938 (M-10). However, it should be noted that even in June 1941 the large majority of divisional artillery in service was still from the pre-WWI period. *As can be seen from the above table, the Red Army's rifle divisions fielded increasing numbers of well-designed mortars.* But as with artillery, the new designs for 50-120mm mortars only started appearing after 1936. These included the 50mm M1938, 82mm M1936 and the **excellent 120mm M1938 mortars.** (p. 252)

In the area of light infantry weapons the most significant new weapon to enter service was the **7.62mm DP LMG** introduced in 1927-28. When measured by 1930 LMG standards, the **DP 1928 was an adequate weapon only and was not in any way exceptional.** The average Soviet rifleman had to continue relying on a bolt action rifle derived from a late nineteenth century design, and the very heavy Maxim 1910 MMG. The rifle was comparable to contemporary bolt action rifles in service, but the Maxim was an old design and definitely a WWI vintage weapon. **By June 1941 the average rifle divisions was reasonably well equipped with 45mm anti-tank guns.** The problem was that even the 45mm M1937 was starting to struggle against the latest Axis medium tanks, and its replacement, the 57mm M1941 was to have so many problems it didn't enter mass production until 1943. ***Thus most Soviet rifle divisions had to make do with various types of 45mm anti-tank gun until almost the end of the war.***

However, it was arguably in the field of anti-aircraft weapons that the Soviet rifle divisions were least well equipped (with the exception of all forms of transport and radios). Although the need for tactical air-defence against low flying aircraft had been recognised as early as 1935 (when an anti-aircraft battalion was first added to the divisional *Shtat*), *delays in producing suitable light to medium anti-aircraft guns meant that very few rifle divisions were ever equipped with anything except a few anti-aircraft MGs*. Even after limited production of the 37mm M1939 (61-K) anti-aircraft gun started, by 1939 they were largely reserved for the new tank and mechanised divisions (then being formed). Similarly, the few available 25mm M1940 (72-K) anti-aircraft guns went onto the PVO strategic air-defence units.

By **1st January 1939** there were **84 Rifle and 14 Mountain Rifle divisions in the regular Red Army**, although most were probably around half the strength called for in the 1937 *Shtat*.

The German-Soviet non-aggression pact (the Molotov - Ribbentrop Pact) was signed on 23 August 1939, but a week before this the Red Army had already started mobilising new rifle divisions. The official mobilisation order, bringing reservists into the rifle divisions, was issued on the 17 September 1939. The September 1939 rifle division was the largest authorised in the Red Army since the Russian Civil War, with an authorised strength of 18,906 men. Such a rifle division was much too large, complex and difficult to control for the Soviet Union to support large numbers of them. The result was that when the USSR attacked Finland in the Winter War of 1939-40, most rifle divisions facing the Finns had 14,000 to 15,000 men. Those divisions in non-active military districts were in considerably worse shape.

By **19th April 1940 there were 144 Rifle and 10 Mountain Rifle divisions** in the regular Red Army (excluding Motorised Rifle Divisions). Most of these divisions were attempting to conform to the very large September 1939 Shtat with over 18,900 men. However, in April-May 1940 the average rifle division still had around 10,160 men, with the 15 rifle divisions in the Far East averaging 12,550 men. (p. 252)

Following lessons from the Winter War, the Red Army's rifle divisions were modified with a new TOE (*Shtat*) on 13 June 1940. More sub machine guns, semi-automatic rifles, and mortars were authorised to increase small unit firepower. The division's support infrastructures were modified to reduce the number of vulnerable horses in the division from 6,208. One of the two divisional artillery regiments was supposed to be motorised, as were many of the divisional supply columns. However the motor vehicles required to fill this new TOE were simply not available in 1940 and early 1941. Apart from these minor changes the overall structure and size remained relatively unchanged. **On 5th April 1941 new TOEs (*Shtaty*) were issued which streamlined the organisation and resulted in a slightly reduced size.** These were designated *Shtat* No. 04/400 to 04/417, and dated 5 April 1941. This rifle division TOE would represent the standard Red Army rifle division structure when the Germans attacked in June 1941.

On paper, a full strength 5 April 1941 rifle division was a large and powerful combat unit, and it would represent the strongest infantry-type combat unit available to the Red Army in 1941/42. *It had 2 artillery regiments compared to a single artillery regiment in most other army's comparable infantry divisions. Also, in terms of heavy infantry weapons and anti-tank guns, the April 1941 rifle division was superior to most contemporary armies, and was certainly comparable to a typical German infantry division*. It should be pointed out, however, that not one rifle division in the Red Army was at its authorised strength on 22 June 1941, with those in the Far East coming the closest. Refer to Volume IIIA 6. for details on the actual strengths of the rifle divisions in the Red Army on 22 June 1941. (p. 253)

Apart from the (usually large) difference between actual and authorised personnel and equipment, there were also **several very significant weaknesses in the June 1941 Rifle Division's** authorised structure:
(p. 262)

- **The overall signal and communication elements of the division.**

Below battalion HQ level (e.g., in the rifle companies), communication consisted solely of a combination of runners and wiremen. A runner was assigned to each rifle platoon and company HQ, and wiremen to the MG and mortar company HQs. **At battalion level there was meant to be a battalion signal platoon.** However, this unit had only a single 7 man radio section, which was authorised **4 backpack RRU radios and 1 6-PK radio**. The remaining sections were all **wire/telephone sections**. **This meant that even at full strength, there was only a single backpack radio authorised per rifle company (with 178 men), and none were authorised for the battalion's support companies. In actuality, in June 1941 most rifle companies didn't even have this radio.** In a fixed defensive position where wire communications remained stable (i.e. they are not disrupted or cut) this was less critical. However, if the division was tasked with an offensive operation then this usually required a more flexible and portable communication net. Without an adequate communication structure, the ability to change even a small scale infantry attack to suit the changing battlefield conditions (or to even stop an ongoing attack) was very

limited. In addition, the ability to call in support from outside the battalion, such as artillery or air-support, was also automatically much more limited in a fluid battlefield situation. (p. 262)

At the regimental level the signal elements were strangely organised. The regimental artillery company (or battery) had 6 RRU radios, effectively 1 for each 76mm infantry gun; but the entire 120mm mortar company had only a wire team with a cart. At the same time the regimental signal company was authorised only a single 5-AK radio and 2 6-PK radios, in addition to 2 wire/telephone platoons. The regimental reconnaissance, anti-tank and anti-aircraft units had no dedicated signal personnel or radios at all. One can only guess how these critical units (especially the mobile reconnaissance units) communicated with the regimental HQ!

At the divisional level, *the artillery regiments and anti-aircraft battalion were authorised adequate signal units, although they usually physically lacked them*. Therefore, although the rifle division was authorised 2 artillery regiments, *this potentially massive amount of firepower was usually mitigated by an inadequate communication net.* The same issues also often limited the artillery to pre-planned and/or direct line of sight fire.[79] The divisional anti-tank and engineer battalions contained no signal assets at all.

On top of this, the divisional reconnaissance battalion, one of the most critical units in the division in terms of communication, only had radios in 4 of its armoured cars and up to 3 radio trucks. Almost all the rifle division's tankettes (with the exception of those in the Far East) had already been withdrawn from the reconnaissance battalions by June 1941 to form the new mechanised corps, and the tankette company wasn't authorised a signal section anyway. Lastly, the entire signal battalion was authorised only 1 radio platoon (with 3 receivers and 3 transceivers) and an armoured car section with 3 armoured cars (presumably with radios). A total of 6 to 9 receivers and transceivers is not a lot of radio communication equipment in a signal battalion which was meant to support a division with over 14,480 men.

In summary the entire rifle division's tactical communication net, already weak on paper, was wretched for lack of radios (even if they possessed the authorised number, which few did). The ability of the division to coordinate its subordinate units and for these units to call for any support (such as effective indirect artillery fire) was severely compromised. *This was less critical in fixed defensive positions, but often proved catastrophic in the more mobile battles imposed on the Red Army in the summer of 1941.* (p. 262)

- **The logistical support structures.**

The September 1939 rifle division *Shtat* called for 18,906 men, 746 vehicles and 6,208 horses. However war experience in Finland soon showed that **these divisions would be too difficult for the Red Army's command and control infrastructure to use them effectively**. They were also so large that it also became apparent that the USSR could not support a large number of them. **By April 1941 the rifle division's authorised personnel had been reduced by 23% (to 14,483)**, the number of vehicles reduced by **21%** (to 586), and the number of horses reduced by a huge **51%** (to 3,039). But, as the Red Army was reluctant to reduce the overall firepower of these divisions, almost all the reductions came from the divisional support structures. This also (apparently) fitted in with the aim of reducing the rifle division's overall reliance on horse drawn transport. (pp. 262-63)

The first to go were the large ammunition supply columns which were normally integrated into the individual artillery batteries (each with 4 gun/howitzers). *Without these columns, the individual artillery battery's tactical flexibility was considerably reduced* (i.e. they could not operate individually for long), as well as reducing the

[79] **Note:** The above is **one of the main reasons why the Soviet divisions were so poor at initiating and controlling indirect artillery fire during 1941-42**. In fact the Red Army never came close to achieving the same level of indirect fire capability as the Western Allied armies did in 1944-45 (or for that matter the German Army achieved from 1940-43). Even late in the war the Soviets generally preferred to concentrate massive amounts of artillery (including rocket artillery) into artillery 'divisions (or equivalent), and then saturate the target area with pre-planned fire missions.

overall ability to supply to the entire artillery regiment. The artillery regiments now relied on transport platoons in the battalion and regimental trains to supply the batteries. The number of personnel in the two artillery regiments was subsequently reduced by **28%** (from 3,201 to 2,319). Another example is the reconnaissance battalion where the only maintenance element was a 5 man section in a single truck. This was meant to support a battalion with 26 armoured vehicles and 28 motor vehicles! Similarly, the entire anti-tank battalion had a single transport platoon (with 8 men and 4 trucks) as its ammunition/supply element. (p. 263)

The large majority of division's motorised supply and transport elements, including those normally distributed through a division's subunits, were concentrated in the divisional motor transport (truck) battalion. This battalion was authorised 255 men and 141 trucks, **but it had only a single radio**. With this, the transport battalion was supposed to coordinate its activities across the entire division: supplying ammunition, food, fodder, and petroleum products to a disparate range of unit types. *Similarly to communications, this might have just worked in a static defensive situation,* but soon fell apart in any attack situation were the division's subunits move ordered to move independently, or even when the division was forced to fight in a more flexible (mobile) defence mode.

As an aside, **it is revealing to compare the divisional service vehicles in the German 1st Wave Infantry Division and the Soviet April 1941 Rifle Division**. The German division had **255 horse teams**, 221 trucks and 53 light transports (many of which were, arguably, really small trucks). The Soviet division had **22 horse teams**, 212 trucks and 7 cars. Apart from the fact that the **German trucks had a significantly heavier average lift capacity**, we can see that the German division had more trucks and over 11 times as much horse-drawn lift capacity integrated into the **divisional support services**. It is apparent that the rifle division relied almost totally on its motorised elements (which were already significantly less capable than those in the German infantry division) for logistical supply at the divisional level.

One of the most serious problems for rifle divisions in June 1941 **was that they were acutely short of all forms of motorised transport**. To make matters even worse, in June 1941 a great many Red Army rifle divisions were also **well below even their authorised horse strength.** As they also often had only few horse teams to fall back on, *this meant that these rifle divisions were effectively immobilised, as well as having a very weak divisional supply infrastructure.*

- **The degree of overall motorisation (overall motorised lift capacity)**

In terms of trucks, the June 1941 rifle division was **authorised** around 109% of the number in a German first wave infantry division of similar size (564 vs. 516). **However, the typical truck in a German infantry division had a lift capacity of around 2.49 tonnes while the typical truck in a rifle division in June 1941 had a lift capacity of around 1.89 tonnes.**

In addition, the 5 April 1941 rifle division TOE called for only **22 light transports (cars or equivalent**) and **16** motorcycles, while a German first wave infantry division called for **237** light transports and over **490** motorcycles (of which approximately 190 were heavy machines with sidecars). Thus the rifle division had only 9% of the light transports and only 3% of the motorcycles of a German first wave infantry division, and many of the German 'light transports' were military vehicles with the capabilities of a light truck. The most damaging thing of all was that in June 1941 the German infantry divisions actually had most of their authorised motor vehicles, while most **rifle divisions had only a small proportion of their authorised motorised transport.** (p. 263)

b. Rifle Divisions (July 1941)

Following the disastrous border battles in June and July 1941, the Soviet General Staff **realised that the big pre-war authorisation tables could not be sustained.** Existing rifle divisions were rapidly being reduced to a fraction

of their pre-war strength and newly mobilised divisions, which had no hope of ever reaching the pre-war TOE levels, needed to be combat ready as soon as possible. In other words, if the actual strength could never reach the TOE then the TOE had to be reduced to a more realistic level. (p. 264)

In addition, the pre-war rifle divisions were still relatively large and complex organisations, **which could only achieve their full potential if there were sufficient numbers of well-trained officers (of all ranks) and NCOs to manage and control them effectively**. Not least because the Stalinist purges of the late 1930s had stripped the Red Army of many of its best officers, the USSR simply did not have the trained reservists to meet this demand. **Consequently, all newly mobilised Red Army rifle divisions (and, in fact, all division types) would have to be smaller and easier to control formations.** This also went some way to reducing the problem of 'lack of signals and communication equipment' (and the associated trained signals personnel) in the average Soviet division.

The result was a new set of rifle division TOEs issued on the 29 July 1941; specifically *Shtat* No. 04/600 to 04/616. **This rifle division TOE would represent the standard for all newly mobilised rifle divisions until December 1941.** The combat, signal, transport and supply elements of a July 1941 Soviet rifle division are summarised in table Sov Rifle Div, Summary, July 1941. The structure of the rifle division's various companies, battalions and regiments are detailed down to platoon level in tables Sov Rifle Div 1, July 1941 to Sov Rifle Div 3, July 1941.

The overall personnel strength reduction in these **reduced rifle divisions was 25%**, while personnel in the individual rifle regiments were reduced by **15%.**[80] On face value, this reduction doesn't appear to be too bad. **However, the reduction in weapons, equipment and transport was far more severe than the personnel reductions as shown below.**

TOE Rifle Division Weapon and Transport Strength Changes from April to July 1941

a. Pre-War Division:

LMG: **392**
MMG: **166**
50mm mortar: **84**
82mm mortar: **54**
122mm mortar: **12**
45mm AT gun: **54**
76mm Inf Gun: **18**
76mm Gun: **16**
122mm How: **32**
152mm How: **12**
Trucks: **564**
Tractors: **99**

b. July 1941 Division:

LMG: **162**
MMG: **108**
50mm mortar: **54**
82mm mortar: **54**
122mm mortar: **6**
45mm AT gun: **18**

[80] **Note:** The personnel reduction was **14,483 to 10,790** for the rifle division, and 3,182 to 2,695 for each rifle regiment.

76mm Inf Gun: **12**
76mm Gun: **16**
122mm How: **8**
152mm How: **0**
Trucks: **196**
Tractors: **5**
(p. 264)

The most significant changes (reductions) to the pre-war rifle division's combat elements were as follows.

● At the platoon level **each rifle platoon was authorised only 2 LMGs (as opposed to 4)**, reflecting the shortage of these weapons. In addition, the LMGs in all supporting units (mainly the artillery regiments) were eliminated.

● The pre-war rifle platoon's 50mm mortar section was dropped, and at the company level a mortar section was added (with 2 mortars) to support the rifle company.

● **The pre-war rifle company's MMG platoon was abandoned**. Thus, although the **new rifle company** still had 90% of the personnel in the pre-war rifle company, it had only **6 LMGs** and **2 mortars** compared to the previous **12 LMGs**, **3** mortars and **2** MMGs. This means that in terms of available firepower from LMG, MMGs and mortars, **the newly mobilised rifle companies only had approximately 49% of the firepower of the pre-war rifle companies.** (p. 269)

● At the battalion level, the supporting mortar company was initially only a mortar platoon (with 2 82mm mortars for divisions formed in July 1941), but was expanded to a full company (with 6 82mm mortars) in August 1941. **The pre-war rifle battalion's anti-tank platoon** (equipped with 2 45mm anti-tank guns) **was dropped**, and the battalion's support units were reduced.

● At the regimental level, the **numbers of 120mm mortars, 76mm infantry guns and AAMGs were all reduced**. Although **6 new anti-tanks (AT) rifles** were authorised in each new rifle regiment, **these were only issued in November 1941 because ammunition for them was not in production until late in 1941.** The regimental trains were also reduced, including the elimination of a supply platoon in the supply company (along with its 20 wagons).

● **The most dramatic downsizing in the new rifle divisions was in the anti-tank and artillery units at the divisional level**. The divisional anti-tank battalion was completely dropped **leaving only the 18 45mm anti-tank guns in the rifle regiments to defend the whole division**. This represented a reduction of **67%** in anti-tank guns from the pre-war rifle divisions, and was the direct result of low (new) anti-tank gun production and the lack of pre-war stockpiles. **Whatever the causes, the July 1941 rifle divisions were severely handicapped in their ability to halt (or even slow down) enemy attacks supported by armour.**

● **The number of artillery regiments was halved** while the number of artillery batteries was reduced from 15 (with **60 artillery pieces**) to only 6 (with **24 artillery pieces**). To make matters worse, the new 'small' artillery regiment had only two battalions with 16 76mm guns and 8 122mm howitzers. **This was a massive reduction in firepower from the 16 76mm guns, 32 122mm howitzers and 12 152mm howitzers in a pre-war rifle division**.

● Not only was the number and size of the artillery pieces reduced, **but the number of radios per artillery battalion also fell from** 12 (3 per battery and 3 in the battalion HQ) to 7 (2 per battery plus 1 in the battalion HQ). In addition the pre-war divisional artillery HQ (with the artillery commander and staff) was eliminated along with all the associated signal equipment. **Thus the newly mobilised rifle divisions had even less responsive artillery, and they were even less capable of indirect fire operations than the pre-war divisions.**

• **The divisional reconnaissance battalion was reduced dramatically**: it was now a motorised rifle company and all armoured reconnaissance vehicles were eliminated. The company had a 7 man HQ (without vehicles), and the **entire company had only a single RB radio**. Exactly how this unit was expected to conduct reconnaissance for an entire division is a mystery.

• The bridging column and 'blocking' company with MMGs were eliminated from the engineer battalion. In addition, the flame thrower units were reduced to a single flame-thrower platoon (although the number of flame-throwers in the division remained at 30).

• The anti-aircraft battalion's light anti-aircraft companies were authorised 3 37mm anti-aircraft guns (vs. 4), but **all the anti-aircraft battalion's radios and their crews were deleted** (i.e. all the signal assets).

Apart from weapon reductions across the board (particularly LMGs, anti-tank guns and artillery), the next most dramatic reduction in the July 1941 rifle division's combat capability **was the level of authorised motorisation.** This was achieved by reducing the vital divisional motor transport battalion to a truck company, and **by simply eliminating many divisional support units**, including, the artillery maintenance section, the veterinary hospital and the traffic regulation platoon. The authorised transport was reduced from 564 trucks and 22 light transports to 196 trucks and 4 light transports (a 65% reduction in trucks). As the pre-war rifle divisions already had a relatively weak support infrastructure, the newly mobilised division's support structures can only be described as nominal (at best). (pp. 269-70)

Some WWII commentators, authors and simulation designers **dramatically underestimate the impact of divisional support structures on combat operations**. Although a poorly supported division might perform well in certain situations for a few days, such as defending a static and well stocked position, without adequate support structures it is unable to sustain itself in combat conditions for long. Historically, in many such cases the division literally disintegrated after intense and prolonged combat. (p. 270)

An example of this is the combat performance of the many newly mobilised rifle divisions in the Vyazma-Bryansk pocket in October 1941. In this offensive over **657,000 Red Army soldiers were captured only 2-3 weeks after the German offensive operation started**. The Vyazma-Bryansk pocket remains the second largest POW 'pocket' in history (**after the Kiev pocket**), **and was the first major battle in which the majority of the Red Army's divisions were newly mobilised July 1941 rifle divisions**. Even though most of these divisions were cut off from supply before surrendering, the speed with which they disintegrated and then surrendered, and their inability to stop or hinder the initial penetration attacks, indicates the true 'combat strength' and 'operational durability' of these units. This catastrophe occurred despite the fact that the Kalinin, Western, Reserve and (to a less extent) Briansk Fronts had had almost two months (from early August to 30th September) to prepare their defenses; and while Army Group Center's panzer and motorised divisions (its main offensive strength) were sent northwards and southwards.[81]

[81] **Note:** Many of the rifle divisions which surrendered had only been 'cut-off' from supply for a matter of days. In his various works, Glantz attributes the weaknesses of these divisions to a series of very costly Soviet counter-offensives carried out against Army Group Centre's defending infantry divisions during this period. **This argument has merit**. However, when examining the total Soviet casualties and equipment losses from these offensives, we find that it represented a relatively small fraction of the total strength of the Kalinin, Western and Reserve Fronts on 30 September 1941 (even if only considering the combat elements only). In addition, when examining the individual divisions involved, we find that a great many of the newly mobilised rifle divisions in these Fronts were fresh formations which had not yet seen any significant combat. They had therefore suffered almost no casualties and were still very close to their original mobilised strength.

So, how can we estimate, with reasonable accuracy, what the overall reduction in combat strength per rifle division was using the July 1941 TOEs? . . . In other words, at full strength the **pre-war rifle divisions were close to being twice as strong as the newly mobilised rifle divisions.**

Having said this, **the smaller and weaker structure of the new divisions did enable the amazing number of 222 rifle divisions based on the 29 July 1941 TOEs** (*Shtaty*) to be Mobilised and Deployed (MD) before 31 December 1941. This includes **43 militia rifle divisions**, many of which were very loosely based on the July TOE when they were initially formed. These 'militia rifle divisions' were soon given a Red Army divisional number, and redesignated as rifle divisions using the July 1941 TOEs.

There is no doubt that the **July 1941 rifle divisions were numerically the most important units mobilised by the USSR during 1941.** More than any other unit type, it was these divisions (along with the pre-war rifle divisions) which *enabled the Red Army and USSR to survive the Axis onslaught in 1941.* The sheer number of newly mobilised rifle 'divisions' is often quoted as the reason the *Wehrmacht* could not have succeeded in inflicting fatal damage to the USSR in 1941. **Unfortunately this is a simplistic view based on an incorrect (or at least very inaccurate) premise, and does not stand up to scrutiny. Just some of the factors this view fails to consider are**: (p. 271)

• The Red Army started with 198 rifle and mountain rifle divisions which were each around twice as powerful as a July 1941 rifle division. (*This is especially apparent after the actual strengths are factored in versus simply the authorised TOE strengths*).

• The large majority of the pre-war divisions (including the 92 pre-war tank and mechanised divisions) had ceased to exist, or were mere skeleton formations, by late October 1941.

• *The actual equipment in the newly mobilised divisions was well below* even the reduced July TOE strengths (many were actually brigade strength units when they first entered combat).

• Around 40% of the newly mobilised divisions were effectively wiped out in 1941.

• The *training and experience* of the personnel in the new divisions was, on average, *considerably less* than that of the pre-war divisions.

When factoring in these realities, it quickly becomes apparent that the Wehrmacht came much closer to inflicting defeat on the USSR in 1941 than is often perceived.[82]

c. Rifle Divisions (December 1941)

Apart from shortages of equipment for the huge numbers of newly mobilised divisions, the Red Army, unsurprisingly, *also found itself acutely short of officers and NCOs with even basic training to fill its ranks*. The Soviets' rather desperate and massive mobilisation effort from June to October 1941 *meant that the large majority of officers and men received, at best, rudimentary and cursory training*. The enlisted men were initially drawn from a large pool of reservists that had completed some form of compulsory military service. Although their military experience was limited, most at least knew how to handle a rifle so the cursory to non-existent training

[82] **Note:** This is one of Nigel's primary premises—that the Germans (as he said) came much closer to final victory than is often perceived.

was less critical. However, **the token training given to officers, particularly at the platoon, company and battalion levels, was far more serious.**[83]

One of the outcomes of the t**rained officer and NCO shortage** was that many Red Army units could not efficiently integrate direct and indirect fire weapons on the battlefield. In response to this, **on 12 October 1941 the People's Commissariat for Defence ordered all 50mm and 82mm mortars to be withdrawn from the rifle battalions and concentrated in a single regimental mortar battalion**. This was a retrograde step in terms of responsiveness and flexibility in supporting infantry attacks, because the mortar battalion had only a single radio and relied primarily on land lines. It did however enable the rifle regiment to concentrate its mortars to support a particular battalion. (p. 271)

At the same time, all 120mm mortars in the rifle regiments were to be concentrated in a divisional mortar battalion. This latter step also served to strengthen the weak artillery capability of the new rifle divisions, and may be when the Red Army began to regard the 120mm mortar as an artillery weapon and not an infantry weapon. **However, the divisional mortar battalion initially didn't have a single radio, or any motorised vehicles to move its 120mm mortars.** (p. 272)

On 6th December 1941 a new set of rifle division TOEs was issued; specifically *Shtat* No. 04/750 to 04/769. **This rifle division TOE would represent the standard for all newly mobilised rifle divisions until 18th March 1942**. . . The overall personnel number was increased by around **8%**, while personnel in the individual rifle regiments were increased by **10%**.[84] The changes in weapons, equipment and transport is shown in the table below.

TOE Rifle Division Weapon and Transport Strength Changes from July to December 1941

a. July '41 Division

LMG: **162**
MMG: **108**
50mm mortar: **54**
82mm mortar: **54**
122mm mortar: **6**
45mm AT gun: **18**
AT Rifles: **18**
76mm Inf Gun: **12**
76mm Gun: **16**
122mm How: **8**
152mm How: **0**
Trucks: **196**
Tractors: **5**

b. Dec '41 Division

LMG: **244**

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[83] **Note:** The lack of trained NCOs and officers in the newly mobilized divisions also had a strong influence on these divisions' combat performance compared to the (on average) better trained personnel in the pre-war rifle divisions. **In addition, the extreme speed of mobilisation was such that many of the new rifle divisions also lacked a significant cadre (core) of experienced pre-war personnel**: as in most armies of the time, in the Red Army it was standard practice to use an experienced 'cadre' of personnel around which a new division was formed.

[84] **Note:** The personnel increase was from **10,790 to around 11,700** for the Rifle Division, and **2,695 to 2,957** for each Rifle Regiment.

MMG: **108**
50mm mortar: **72**
82mm mortar: **72**
122mm mortar: **18**
45mm AT gun: **30**
AT Rifles: **81**
76mm Inf Gun: **12**
76mm Gun: **16**
122mm How: **8**
Trucks: **195**
Tractors: **0**
(p. 272)

The most significant changes to the July 1941 rifle division's combat elements were as follows (p. 278):

● At the platoon level each rifle platoon was authorised **3 LMGs** (as opposed to 2), reflecting the increase in the availability of these weapons. However, LMGs were still not added to the divisional support units.

● **The biggest change to the division's organisation (and equipment) was in the mortar units**. The December 1941 organisation now conformed to the 12 October 1941 edict (described above). **All the 50-82mm mortars were withdrawn from the rifle battalions and concentrated into a single regimental mortar battalion**, and the number of authorised mortars was increased by **33%**. *This severally decreased the firepower of the individual rifle companies and battalions, but made it much easier for the rifle regiment to concentrate its mortars to support a particular battalion if required.* This was beneficial if you knew where the enemy was going to attack, and good in supporting a narrow front attack at the battalion level. It was, however, not a good idea in most other situations; e.g., if the division was defending a large front sector, most of the division's companies and battalions were considerably more vulnerable as they had no effective (if any) mortar support.

● At the regimental level, other changes included the **addition of a new SMG rifle company (with 100 SMGs)**, and the anti-tank platoon was increased to an anti-tank company (with 27 anti-tank rifles). By November the ammunition for the anti-tank rifles was finally in production. On the downside, **the rifle regiment's signal assets were reduced even further:** they now consisted of a single radio in each battalion HQ, a radio in the regimental signal company and a radio in the 76mm infantry gun platoon/battery.

● At the divisional level, all the 122mm mortars were removed from the rifle regiments and **concentrated in a divisional mortar battalion** (also as per the 12 October 1941 order). The number of 122mm mortars was increased to 18 and was now fully motorised if possible.

● **A divisional anti-tank unit was also reintroduced.** It was a company sized unit which was optimistically authorised **12 57mm M1941** anti-tank guns (which were usually towed by small tractors). It was hoped the 57mm M1941 would be in series production by December 1941, but this was not to be. **Technical and production problems continued to plague this gun and only 320 were produced before production stopped in the summer of 1941**. . . The standard **45mm M1937** anti-tank gun was issued in its place (towed by trucks), and this at least increased the number of anti-tank guns in the division from 18 to 30.

On balance the December 1941 rifle division had very similar overall combat and staying power to the July 1941 rifle division. Using the 'size' equation we find that a full strength December 1941 rifle division's TOE **was only 69% of the size of a pre-war rifle division's TOE**. The December 1941 rifle division was still only 93% of the Minimum Divisional Size (MDS) value, compared to 135% for the pre-war rifle division. Apart from adding an LMG to each rifle platoon and increasing the number of mortars, most of the other changes were the equivalent of

'tweaking' the 29th July TOE. **The fundamental weaknesses in communications, support infrastructures and artillery remained**. In the event **36 rifle divisions with the 6th December 1941 Shtat** were mobilised before the end of 1941, but only 3 partially mobilised divisions were Deployed (D) before the end of the year. (p. 278)

d. Rifle Brigades (June 1941)

On 22 June 1941 there were only **5 separate rifle brigades** deployed in the Red Army. These were:

- The 3rd Motorised Rifle Brigade on the Baltic islands of Saaremaa (Osel) and Hiiumaa (Dago).
- The 8th Rifle Brigade on the Hanko Peninsula in Finland.
- The 1st, 4th and 5th Rifle Brigades in the 1st Red Banner Army, Far Eastern Front.

These rifle brigades **were not common or standard organisations within the Red Army, and they were created for special assignments such as coastal garrison duties**. They usually performed these duties alongside other smaller support units such as coastal artillery battalions, anti-aircraft defence units, and separate engineer and rifle battalions. The rifle brigade organisations varied depending on their mission, but they usually included 2 rifle regiments, a light artillery regiment, an anti-tank battalion, an anti-aircraft battalion (or company), an engineer battalion, a signal battalion (or company) and brigade support units. The rifle regiments had similar elements to those in the April 1941 rifle division, except the brigade's regiments generally had additional heavy weapons. (p. 279)

e. Rifle Brigades (October 1941)

Within five months of the launch of Operation Barbarossa, **Soviet mobilisation orders had called up over 5,500,000 Soviet reservists into active service**. In addition, **by the end of the year another 4,000,000 personnel had 'volunteered' for militia or other 'volunteer units'**, and around half of these eventually ended up in the people's militia and later the regular Red Army. Most of the 'volunteers' were without any military training whatsoever, while *most of the reservists had only minimal military experience*. Despite providing the human resources required to fill the huge holes left by losses in surviving Red Army units, as well as the resources needed to form all the newly mobilised rifle divisions (described above), there were still several million available personnel remaining. (p. 282)

The question faced by the Soviet High Command was, how do we get these men into combat in the shortest possible time? *The addendum to this question, 'and with a reasonable chance of survival against the most combat proficient army in the world?' does not appear to have been seriously considered in the minds of the hierarchy in the Soviet regime.* **The problem facing the Red Army was that the new rifle divisions were still taking too long to create from scratch**: even these reduced strength units (using the July *Shtat*), with less than one month's formation and training, were seemingly taking too long! Furthermore, the officers capable of handling even the simplest rifle division were in very short supply, while the availability of staff officers able to supply, command and control large organisations was even more limited.

The apparent solution was to form smaller 'self-contained' combat units in the form of rifle brigades. These could be formed quickly from similar sized training units and would be much easier to control in a rapidly changing combat situation. **Essentially, a rifle brigade was a third of a rifle division** with around 3 rifle battalions, a light artillery battalion and support units. The initial establishment of these formations **began in September 1941**. The early TOEs for rifle brigades varied considerably, and the only standard TOE seems to have been issued on 15 October 1941; specifically Shtat No. 04/730 to 04/744.

It should be understood that rifle brigades were an emergency measure to get troops to the front line ASAP, so there was a large variation in the organisations used despite the official 15 October TOE (*Shtat*). . . The biggest

problems with the October 1941 rifle brigades were that they had very limited combined arms capability (even if they had had the appropriate training), and *their supporting structures were so weak that they were unable to sustain themselves in combat conditions for long.* These rifle brigades had no regimental organisation, no indirect fire artillery, and very rudimentary signal and supply-support capacity. . . Therefore, in terms of size, t**he October 1941 rifle brigades were equivalent to a third of a small WWII rifle-infantry division**, and in terms of overall combat power they were equivalent to even less than this. This was largely because the rifle divisions had (relatively) superior supporting infrastructures and combined arms capabilities. (p. 282)

Most of the 1941 *rifle brigades that were actually fielded in 1941 were essentially a collection of rifle battalions and some heavy weapons*. Many of these units were formed directly from training units, with many 'training brigades' simply being redesignated as full Red Army field brigades. This conversion and 'training' usually took *no more than a few weeks*. This became so common in late 1941 that Germans intelligence initially thought the official designation for these units was ***Kursantskii Brigaden*** (Student Brigades). Although this expedient system got large numbers of recruits into the front line, their effective contribution to the Red Army's overall strength during 1941-42 remains dubious. **Lacking in both training and heavy support weapons, these brigades suffered horrendous casualties; frequently melting away after a week or less in combat.**

When tallying the total number of 'divisions' or 'division equivalents' mobilised in the USSR in 1941, many authors (and thus many military simulation designers) have **drastically overestimated both the combat-power and number of Soviet rifle brigades mobilised and fielded.** In terms of realistic combat power, 3 to 4 Soviet October 1941 rifle brigades were the approximate equivalent to a newly mobilised rifle division.

In terms of size, an **October 1941 rifle brigade** was not much better than this: it only had **4,356 men at full TOE** strength while a single June 1941 rifle regiment had 3,182 men (i.e. the entire brigade was only 1.4 times larger than a rifle regiment). This is before we even consider the actual equipment present or factor in the divisional heavy weapons: by any stretch of the imagination, 2 October 1941 brigades were nowhere near the equivalent of a rifle division. Presumably this '2 brigades equals 1 division dictum' stems from the modern western conception of a brigade. **Whatever the reason, the large majority of current literature on Operation Barbarossa grossly overestimates the overall combat power of almost all Soviet brigade types mobilised in 1941.** (p. 283)

We now come to the number of rifle brigades actually mobilised and fielded in 1941. The Soviets actually mobilised **134** rifle (using the October *Shtat*), 28 naval rifle, 16 naval infantry and **88 tank brigades** from June to 31 December 1941. Thus a total of **266 'brigades' were mobilised**, which is presumably where the superficial and misleading 133 'division equivalents' figure comes from.[85] However, the **average Soviet tank brigade fielded in 1941 was even smaller than the average rifle brigade.** However, the Soviet 'brigade story' gets considerably worse than this. Analysis of each brigade's history shows that **only 55 rifle, 21 naval rifle, 11 naval infantry and 62 tank brigades were actually Mobilised and Deployed (MD) in 1941.** These units were never at full strength, and even if they had been it only represented the realistic equivalent of around 43 divisions.

Finally, it is worth pointing out that the misconceptions and general ignorance regarding Soviet 1941 brigades also extends to most current Operation Barbarossa simulations. They also often use the totally incorrect '2 1941 Soviet brigades equals 1 division' idea, **and at the same time grossly overestimate the number and power of Soviet brigades mobilised and fielded in 1941**.

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[85] **Note:** D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, p. 17. **Glantz claims a grand total of 821 divisional sized formations were fielded by the Soviets in 1941**, including all pre-war divisions. There are numerous misleading statements in this section, titled 'Actual Force Generation and Mobilisation', which need to be placed in proper context. A far more accurate and realistic assessment of all these forces is carried out in Volume IIIB 2. 'Soviet Mobilisation after 22 June 1941: The Actual Strength of all Soviet Land Combat Units Mobilised from 22 June to 31 December 1941'. This chapter also differentiates between those units Mobilised and Deployed (MD) and those Mobilised and Not Deployed (MND), which remained unassigned units (often only partially formed in rear areas in 1941, or/and those which remained in 'training' until disbanded).

f. Ski Battalions (1941)

Given the nature of the geography and climate in Russia, and the history of the Russian Army, it would seem self-evident that the Red Army would have been prepared for winter warfare in heavy snow conditions. **Even before the Napoleonic Wars the Russian Army had developed specialised winter clothing and equipment**. For example, they had *developed special winter horse shoes for the cavalry* for ice and crusty snow conditions, and *light artillery was often towed on especially made sledges*. In the Russian Civil War the newly formed Red Army had fought for extended periods across Siberia in winter conditions, and had also battled several Western powers' 'intervention forces' as far north as the Arkhangelsk region (in winter). (p. 286)

However, the **Winter War with Finland in the winter of 1939-40 clearly demonstrated that the Red Army was in fact woefully unprepared for combat in severe winter conditions**. It is not too surprising (given their rapid rate of expansion) that the relatively modern tank and artillery arms were unprepared for sustained combat in the sub-arctic winter conditions. What is surprising is that the arms of service that were traditionally winter capable, namely the cavalry and rifle units, were also inadequately trained and equipped for winter combat. This is particularly surprising since the Red Army had had a **light 'Karelian' brigade** stationed in the Leningrad Military District during the 1930s, and had no lack of units stationed in Leningrad, Siberia, the Urals and the Far East, which should have been trained and equipped for the harshest winter conditions.

Arguably the most dramatic failure of the Red Army leading up to, and during, the Winter War with Finland, was its **lack of success in creating and training specialised ski combat units**. The highly mobile Finnish ski battalions inflicted enormous and often fatal damage on the much larger Soviet units, which were almost immobilised in the heavy snow and freezing conditions. . . Learning from their experiences in Finland, the **Red Army formed several ski regiments as training units in 1940**. These training units were mostly stationed in the Archangelsk, Siberian and Urals Military Districts. **Nevertheless, there were still no dedicated combat capable ski units in the Red Army in June 1941.** This time it was due to the massive expansion of the Red Army through 1940-41, which simply did not have the spare resources for lower priority and purely seasonal units. **From late October to November 1941 the Red Army started to form its first regular ski battalions**. This time the Red Army should have had a better reserve of ski troops to call on. Unfortunately, due to the enormous losses sustained during the summer and autumn of 1941, most of the personnel earmarked for dedicated winter units had already been committed in the desperate scramble to mobilise new divisions and brigades.

Consequently, most of the ski battalions formed in 1941 were created by simply pulling out every man in an existing unit who had possible ski experience, and throwing together the resultant personnel into a 'ski battalion'. **The first ski battalions were therefore, again, mostly improvised units;** many of which were quickly formed by local army or even rifle division HQs using their own personnel and equipment resources. Most of these units had no time to train for combat before being committed to the Soviet counter offensive in December 1941. Having rudimentary skiing skills is not equivalent to having a trained and experienced combat unit which can move and fight on skies in bad weather and conditions. In addition, these ski battalions had little in the way of specially trained or equipped supply and support structures: they were still largely dependent on horse-drawn or pack-horses columns which were suited to milder conditions. **The overall result was that the relative combat proficiency of the Soviet 1941 ski battalions was not much better than the Red Army's regular rifle troops.** (p. 286)

Table Ski Bat [not shown] shows the organisation for a typical Soviet ski battalion in the winter of 1941-42. The **most apparent thing from this TOE is the lack of heavy weapons, which were difficult to move using skis**. **This is why the ski battalion was best used as a mobile harassing force (preferably attacking supply lines) rather than attempting to slug it out with German infantry.** The precise number and timing of improvised ski battalions put together by the Red Army during the 1941-42 winter is unknown. However, it is estimated that on 1 February 1942 there were **145 'ski battalions'** in the Red Army with around **101 at the front** facing the Axis forces. (p. 287)

The only ‘ski brigade’ to see any action in 1941 was the 1st Ski Brigade. This unit also demonstrates the improvised nature of these units, because the 1st Ski Brigade was simply the renamed 2nd Light Rifle Brigade. This brigade had originally been formed in the 7th Army in September 1941 from mountain training units, so a large proportion of its personnel would likely have had skiing experience. In October 1941 it was deployed north of Lake Onega as part of the *Medvezhegorskaya Operations Group* in the **Karelia Front**. When the winter snows came in earnest in December 1941, the 2nd Light Rifle Brigade was redesignated the 1st Ski Brigade. How much training and equipment the brigade received (if any) to enable it to fulfil its new role is unknown, but it is unlikely to have been much more than a limited number of skis.

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3B. Red Army Armoured, Mechanised and Motorised Units

a. A Brief History of Soviet Pre-War Mechanised Forces

Soviet military thinkers and armoured theorists such as **Frunze, Svechin, Triandafillov and Tukachevsky** are **generally credited with the first coherent strategic doctrine for using large armoured/mechanised forces**. In its simplest form, they envisaged using concentrated armour and artillery to achieve a breakthrough in the enemy line, widening the breach with engineers and other support units, and exploiting into the enemy's deep rear with highly mobile mechanised and cavalry forces. **This formed part of the 'deep battle' concept** which viewed any strategic victory as an accumulation of operational successes, each flowing from the ability to link individual battles to a common strategic aim. *This advanced theorising occurred in the late 1920s and early 1930s, and long before the Germans developed their deep penetration armoured tactics*. With this in mind, the Soviets structured their forces accordingly and produced tank types which fit this overall strategy. Thus tankettes were primarily for reconnaissance, T-26s, T-28s and T-35s were to be used for breakthrough and support operations, while BT tanks were to focus on the exploitation phase. This is why BT tanks were also referred to as 'fast' or 'cavalry' tanks. (p. 288)

The first large Soviet armoured force was **formed in Moscow in 1930** and called the 1st Mechanised Brigade. Experiments with this unit led to orders on **11 March 1932 to form 2 mechanised corps. The resultant 11 and 45 Mechanised Corps were the first division sized armoured formations in the world; over three years before the first panzer divisions were formed (in October 1935).**

The mechanised corps were meant for independent deep penetration operations, while the Red Army as a whole also started to get tanks. **Between 1930 and 1934 the Soviets also formed 6 independent mechanised brigades**, 14 mechanised regiments and 5 mechanised battalions (for cavalry units), 23 tankette battalions and 37 tank companies (for rifle divisions). As early as 1934, mechanised forces formed over 9% of the Red Army. In 1935 the mechanised corps were reorganised with BT tanks largely replacing the T-26 tanks, while support units had predominantly T-26s. **In 1936 the Red Army issued PU-36, a field service regulation that defined how mass armour should be employed for assault and exploitation in 'deep operations**'. Meanwhile the 1938-42 five year industrial plan was gearing up to produce the tanks for the world's largest tank park, and subsequently enable the realization of the 'deep battle' and 'deep operations' theories.

However at about this time things started to go terribly wrong; specifically in the form of Stalin and his henchmen. Commencing in 1937, Stalin and the NKVD started 'purging' the Soviet military **with the effect that the innovators and thinkers that had created the conditions for the world's most modern armoured force were largely eliminated,** just when their ideas were starting to become reality. Being 'purged' meant anything from being shot or jailed, to being removed from office and personally censored (if you were lucky). The huge numbers purged (ultimately from **40-55 000 officers**) meant that the majority of staff officers, regimental commanders and divisional commanders in place in June 1941 were relatively inexperienced.[86] In addition, most surviving senior and junior officers became too terrified of the Stalinist regime to exhibit any 'dangerous to their health' initiatives or creativity. **The ongoing purges continued even into 1941, ensuring that this stifling fear still infected the Red Army's officer ranks during the summer of 1941**. **An example of the detrimental impact of the purges on the Red Army's armoured forces is demonstrated by the fact that the Armoured Force Academy lost all its instructors three times from 1937 to 1939, while the PU-36 field regulation manual was inexplicably banned.**

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[86] **Note:** D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, p. 31. **The number of Soviet officers purged is unknown with any accuracy**. Voroshilov is recorded as saying the number was 40,000. More recent assessments, based on the records of the USSR Supreme Court and associated military tribunals, place the figure at **54,714 from 1937 to 1941.**

While all this was happening, the massive tank production programme continued as per the latest five year plan. At this point 4 tank corps (the name was changed from mechanised corps), 21 independent tank brigades, 3 independent armoured brigades and 11 tank training regiments were envisaged. Thus, when Germany invaded Poland in September 1939 the Red Army actually had **4 large tank corps, 4 heavy tank brigades (for breaking through strong fortifications), and 24 tank brigades** to assist armies breaking through the enemy front and reinforce any mechanised or cavalry exploitation forces. (p. 288)

Prior to this, **when the Spanish Civil War started, Stalin shipped 347 tanks, 60 armoured cars and approximately 3,000 'volunteers' in support of the Spanish Republican Forces.** With guidance from Soviet officers the Republicans formed an armoured brigade and its commander was none other than **General D.G. Pavlov.** After experiencing large scale tank combat in Spain, Pavlov returned to the USSR as their most experienced tank expert and *became head of the Directorate of Armoured Forces (ABTU).* At this point (1939) *Pavlov asserted that massed armoured attacks were ineffective and recommended breaking down the large armoured forces in to smaller tank support units*. (p. 289)

When the USSR invaded Poland on 1**7 September 1939 the performance of the Red Army's mechanised forces was less than inspiring.** *Large tank formations got lost or simply broke down, became intermingled on the march, fired at each other and their German 'allies', and generally did as much damage to themselves as the Polish Army did*.[87] Traditionally this performance has been attributed to the effects of the purges and the resultant lack of experienced officers. However, this does not fully explain the large number of breakdowns or operational losses from a simple eight day operation against an already defeated opponent. One has to wonder if there was a basic weakness in the tanks themselves, and it raises questions about the adequacy of the support structures in the tank corps' and brigades.

The combined results of Pavlov's recommendations and the experience in Poland was that, **at a meeting of the Main Military Council in November 1939, the decision was made to disband the tank corps and concentrate on smaller armoured forces (primarily focused on supporting the other arms; mainly the rifle divisions)**. This was a far reaching and undoubtedly *retrograde step*, and for the first time the Red Army fell behind the other European armies in terms of development of armoured forces. *This was particularly unfortunate because an example of the successful use of a mobile armoured force by the Red Army was effectively ignored. This occurred in August-September 1939 in Mongolia against Japanese forces.* On 20 August 1939, 2 armoured groups (with **498 tanks and 385** other armoured vehicles) attacked the north and south flanks of the Japanese 6th Army on the banks of the **Khalkin-Gol River**.[88] By 23 August a large proportion of the Japanese force was surrounded, and was subsequently defeated. **At the battle of Khalkin-Gol the principles of deep strike operations were successfully applied and demonstrated**.[89]

In late November 1939 the USSR (specifically Stalin) decided to invade Finland. **In the resultant Winter War the Red Army's Northwestern Front sent 2 heavy tank brigades and 6 light tank brigades in to very poor tank country** between 30 November 1939 and 13 March 1940. The resultant debacle is estimated to have cost the Red Army approximately 127,000 irrecoverable losses, 265,000 sick and wounded, and around **3,500 tanks** damaged or destroyed.[90] *The results simply served to reinforce the prevailing view (in the Red Army) that large tank and mechanised forces were doomed to failure.* However the analysts failed to take onto account certain

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[87] **Note:** The casualties sustained in this operation amounted to **3,522, including 1,139 killed.** *Soviet Casualties and Combat Losses in the Twentieth Century*, Col. General G.F. Krivosheev (ed.), et al, English Translation of the Russian General Staff 1993 Study, Greenhill Books, London, 1997. p. 79, Table 55.

[88] **Note:** T**he mobile forces at Khalkin-Gol consisted of** the 6th and 11th Tank Brigades, the 5th Motorised Rifle MG Brigade, the 7th, 8th and 9th Armoured Car Brigades, the 36th Motorised Rifle Division, and the 5th, 6th and 8th Mongolian Cavalry Divisions (each with a single armoured battalion).

[89] **Note:** Incredibly, the Soviet Main Military Council also **ignored the obvious success of the large German armoured units in Poland** from 1 September to 6 October 1939. A clearer demonstration of the use of large armoured forces (along with combined arms) to achieve a rapid breakthrough and then exploitation phase is difficult to imagine.

critical factors such as the vulnerability of the T-26 and BT tanks to even light anti-tank guns, and that no tank force can operate effectively in terrible terrain and without adequate support. (p. 289)

The most important lesson not yet learned was that mass tank attacks could only work effectively as part of a combined operation with artillery, infantry and good logistical support. If air support and other arms could be used as well, then so much the better. Unfortunately the ongoing officer purges ensured that this type of 'combined arms operation' was exactly the type of operation the Red Army would be least likely to practise and perfect. Such operations required creative initiative and flexibility of command; characteristics stifled by the paralysing fear of being 'purged' for showing these very same characteristics. (p. 290)

Following the Winter War the Red Army's high command did not abandon the idea or deep (penetration) operations completely. They now envisaged this role as being carried out by large cavalry mechanised groups. To enable this, the formation of 15 mechanised divisions was proposed, each built around a BT equipped tank brigade. These divisions were supposed to operate with a cavalry corps by providing mobile infantry and tank support to the horsemen.

The summer of 1940 suddenly and permanently changed the way everyone around the world perceived large tank formations. In 1939-40 the French Army was viewed as one of the world's oldest, largest and most well established armies. It was considered to be at the forefront of armoured warfare development with large numbers of powerful tanks, and generally to be one of the best trained and equipped armies in the world. **The rapid defeat of the French Army and the British Expeditionary Force, largely at the hands of the panzer divisions, caused every major army to rethink its strategy regarding large armoured forces, and the Red Army was no exception.**

The Soviet high command belatedly decided to reverse their previous decision to disband the Red Army's tank divisions. The Soviets decided to create their own 'panzer division' equivalents as well as new and very large mechanised corps. At this time (June 1940) the Germans had 10 panzer divisions so the Soviets promptly decided to form 18 tank divisions and 8 mechanised corps. Each mechanised corps was to have 2 tank divisions, a mechanised division, a motorcycle regiment, a motorised engineer battalion, a signal battalion and support units. **The mechanised corps were huge formations:** at full TOE strength each mechanised corps was authorised 36,140 men, **1,031 tanks**, 256 armoured cars, 4,941 vehicles (nearly all trucks), 328 tractors, 178 artillery pieces (including anti-tank and anti-aircraft guns), 210 mortars and 1,364 motorcycles.

The plan to rapidly create 8 of these corps was extremely ambitious given the overall state of motorisation in the USSR in 1940-41. The large number of tanks available in the Soviet tank park meant that they had sufficient tanks to equip the new mechanised corps with T-26 and BT tanks. However there was no way the Soviets in 1940 were going to find around 40,000 trucks or the other heavy equipment required, without stripping existing combat units and parts of the civilian economy. 40,000 trucks would have used approximately 25% of the motor vehicles in the entire Red Army in July 1940. This would be happening when the Red Army was simultaneously attempting to motorize large elements of its rifle divisions, the entire non-divisional (corps) artillery pool, and its corps engineers and supply units.

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[90] **Note:** *Soviet Casualties and Combat Losses in the Twentieth Century*, Col. General G.F. Krivosheev (ed.), et al, English Translation of the Russian General Staff 1993 Study, Greenhill Books, London, 1997, p. 79, Table 55. Exact figures are 126,875 irrecoverable losses, and 264,908 sick and wounded. It appears a very large proportion of the 3,500 tanks were also recoverable losses (i.e., 80-85% were damaged, broken-down, etc). Krivosheev, apparently quoting Finnish sources (p. 78), gives Finnish losses as 48,243 killed and 43,000 wounded. More accurate Finnish sources quote 25,904 killed and missing, and 43,557 wounded. **Finnish sources claim the destruction or capture of 1,000-1,200 Soviet tanks in the Winter War.**

In July 1940 the new tank divisions and mechanised corps started to form, with the Soviets disbanding a large number of cavalry divisions and tank brigades to form the new units. In addition, all the tank battalions in the rifle divisions, except those in the Far East and **Transbaikal Military District**, were removed to form the new mechanised corps. By 1 October 1940 the 1 to 8 Mechanised Corps were partially formed, along with the 6 and 9 (separate) Tank Divisions. Very few tank divisions had the new T-34 or KV tanks, but most had close to the authorised 375 lighter tanks each. **The early problems with the mechanised corps did not stem from lack of tanks, but lack of almost everything else.**

Despite the difficulties in rapidly forming 8 new mechanised corps, **the Red Army still had tanks in its cavalry divisions and 20 infantry-support tank brigades**. These were mainly equipped with T-26 tanks. The high command had already decided to create 25 additional infantry-support tank brigades, to be formed by June 1941. In November 1940 another mechanised corps was formed (the 9th), taking the number of 'paper' tank and mechanised divisions in the Red Army to 20 and 9, respectively. All this was going on while the Red Army was simultaneously undergoing a massive expansion in other areas: most notably attempting to form 125 new rifle divisions with almost triple the number of rifle corps. In late 1940 the Germans increased the number of panzer divisions to 19. Shortly after this, the Soviet high command really went 'overboard', **and in February 1941 the Red Army started forming no fewer than 20 additional mechanised corps!** It was as though the Soviet high command believed that as long as they had masses of tanks, all other required equipment and personnel would somehow take care of itself. (p. 290)

In attempting to form 40 additional tank divisions and 20 additional mechanised divisions, all existing tank brigades were disbanded along with 2 out of 3 armoured car brigades. In addition, all the independent motorised rifle divisions, except for the 36 and 57 Motorised Rifle Divisions in the **Transbaikal**, were dissolved. When the Germans launched Operation Barbarossa the Red Army had **29 mechanised corps, 61 tank divisions (3 separate), 31 mechanised divisions (2 separate) and 11 tank battalions, most of which were in a newly mobilising or partially mobilised state**. At this time the Red Army tank inventory contained over **23,310 tanks** (excluding obsolete T-27 tankettes). **In short, the Red Army possessed considerably more tank and mechanised divisions, and far more tanks, than the rest of the world's combined armies**. The story of how more than 80% of this force was effectively annihilated, mostly in less than three months by an invasion force with fewer than 4,450 fully tracked AFVs, is one of the most important and pivotal stories of WWII. (p. 291)

b. Tank Divisions (June 1941)

For the moment we are concerned with what the organisation of a Soviet June 1941 tank division was meant to look like (its TOE), as well as any apparent strengths and weaknesses in its authorised organisational structure. The June 1941 tank division was based around *Shtat* No. 010/10 to 010/30. These *Shtat* were originally dated 9 June 1940, and several were modified in February 1941.[91] (p. 292)

The tank division's key elements included: 2 tank regiments with 8 tank battalions, 1 motorised rifle regiment with 3 rifle battalions, a motorised howitzer regiment, an armoured reconnaissance battalion, a motorised anti-aircraft battalion, a motorised pontoon battalion, an armoured signal battalion and various support units. The total number of tanks in the TOE was 375, with 344 in the 2 tank regiments. The tanks were meant to be 63 KV heavy tanks, 210 T-34s, 26 BT-5 or/and BT-7, 22 T-26s and 54 T-26s chemical (flamethrower tanks). In June 1941 relatively few tank divisions had T-34s or KVs, and most were equipped with T-26s, BT-5s and BT-7s.

A common perception regarding the Soviet tank divisions in 1941 is that they were weak mainly because of their tank content, and because few divisions had the latest T-34 and KV tanks. Statements along the lines 'most Soviet tank divisions only had obsolescent T-26s or BT tanks' support this conception by implying that this

[91] **Note:** So, the Soviets had promulgated new TOEs for their tank divisions even before the end of *Fall Gelb*—the German victory over France.

was the primary weakness in these units.[92] This perception is then **reinforced with statements such as 'these Soviet tanks only had 45mm guns'**, which infers that German tanks somehow had bigger and more powerful guns.[93] In actuality the **T-26 and BT tanks were comparable to any of the German light tanks, and they both had a 45mm gun capable of destroying any of the German main battle tanks at normal combat ranges**. Furthermore, only **39%** of all German fully tracked AFVs committed to Barbarossa between 22 June and 4 of July 1941 were equipped with guns greater than 45mm calibre. If only German tanks and StuG III assault guns are considered, then this figure drops to only **33%**. **The Soviet 45mm L/46 tank gun** was also more powerful than the standard German Army anti-tank gun of the time; namely the 37mm PaK 36.

In addition to equivalence in 'average tank power', the Soviet June 1941 tank divisions were (organisationally) very tank heavy. For example, **the single panzer regiment in a typical 1941 panzer division was only authorised 162 Pz IIs, IIIs, IVs and command tanks in its TOE**, which is only 47% of the number of tanks authorised in the two tank regiments of a June 1941 [Soviet] tank division. . . In summary, the Soviet June 1941 tank division was a relatively large unit by contemporary standards and this was largely due to the very high number of authorised tanks. If there were major weaknesses in the TOE of a Soviet June 1941 tank division (as examined in the following sections), it was not due to low numbers of authorised tanks or the basic level of technology in the overall Soviet tank park. (p. 292)

c. Soviet Tank Division TOE vs. German Panzer Division TOE (June 1941)

As already mentioned, the tank divisions ordered in July 1940 were the Red Army's answer to the panzer division threat. It is therefore instructive to compare aspects of the June 1941 tank division's TOE to that of the 1941 panzer division. In this analysis we will consider the TOEs of both division types under the following categories: the overall proportion of tanks in the division, and infantry, artillery, signal, reconnaissance, anti-tank and engineer support. For completeness and ease of reference, table Pz Div June 1941 shows a summary of the TOE for a German panzer division in the summer of 1941.

When reviewing this comparison, the reader should always bear in mind that **in June 1941 the Soviets were attempting to field the incredible number of 61 tank divisions (each with 2 tank regiments) as well as 31 mechanised divisions** (each with a single tank regiment). This compares with only 20 panzer divisions (each with a single panzer regiment) in the *Wehrmacht*. The sheer number of divisions the Soviets were attempting to form simultaneously (including all the new rifle divisions) **was the single biggest reason why the average Red Army tank division was so understrength (compared to its TOE) in June 1941.** (p. 301)

c1. Overall Proportion of Tanks in the Division:

When factoring in the most significant elements of the respective divisions, we find **the 1941 panzer division was around 10% larger overall**. In itself, this is not particularly significant: what is significant is the proportion of tanks that made up the division. . . In other words, without its tanks a June 1941 tank division (even at full strength) became the equivalent of a small WWII motorised division, **but a panzer division without any tanks remained a much larger and more powerful formation**. Overall we find the 'tankless' 1941 panzer division was around 58% larger than a 'tankless' 1941 tank division.

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[92] **Note:** E.g., J. Erickson, *The Road to Stalingrad*, Phoenix-Orion Books Ltd, London, 1998, pp. 32-33. Also, W.S. Dunn, Jr., *Hitler's Nemesis: the Red Army, 1930-45*, Stackpole Books, Mechanicsburg, PA, 2009, p. 114.

[93] **Note:** There is no doubt that **German medium tanks had far superior Fire Control Efficiency stemming from superior turret ergonomics, and numerous other factors (including main-gun optics, turret baskets, superior all round vision devices, etc**). This, however, has little to do with the gun's HE or penetration capabilities. Refer Volume I Part II 2. 3) h. - 'Fire Control Effect (FCE)'.

At first glance the reader might not appreciate **just how important this fact was**.[94] To illustrate the point, consider that even without any tanks at all, **a 1941 panzer division was larger (and more powerful) than a full strength German 1941 motorised division** or even a full strength German 1941 1st Wave Infantry Division. Both these division types were successful in conducting offensive and defensive operations during Operation Barbarossa without any panzer units in the vicinity at all. In fact, on numerous occasions it was the panzer corps' motorised division that formed the panzer corps spearhead, and the panzer divisions in the corps lagged behind or remained on the flanks. **It should be noted that even a tankless 1941 panzer division was still considerably larger and more powerful than the large majority of divisions fielded on the East Front during the whole of World War II.**

In contrast to the 1941 panzer division, the Soviet June 1941 tank division was a very 'tank heavy' formation. To some extent this is not surprising as the Red Army was not on its own in this regard; especially as the *Shtat* was formulated in 1940. In May 1940 the French and British armoured formations were even more tank heavy than the mid-1940 panzer divisions (which were also too tank heavy), and they suffered accordingly. There are several key problems with excessively tank heavy formations, and these problems were still not well understood by most proponents of armoured/mechanised warfare in the mid-1940s. (p. 301)

Firstly, the tanks themselves operated far more effectively at the tactical level, and in almost all combat situations, with appropriate support. Even small tank formations (at the platoon level) *had far higher survival and kill rates when operating as part of a combined arms team with infantry, artillery and air-support.* Even the support from one of these arms of service usually made a significant difference (especially motorised infantry support). In most combat situations it was almost impossible to give the 'tank group' too much support, and extremely easy to give the tank group too little support (or even no support at all). **Barbarossa is littered with case histories where large Soviet tank formations were committed to the attack with almost no supporting arms at all**. The ability of the respective panzer and tank division's infantry, artillery and engineer units to support their tank formations is examined further in the following sections. (p. 303)

Secondly, WWII tanks by their nature were relatively complex weapons systems and in combat conditions their level of operational readiness would drop quickly (usually within a week or so). Consequently, tank battalions needed a strong supporting infrastructure to keep them supplied and maintained, and to recover damaged and broken down machines from the battlefield. If the tank division had large numbers of tanks, it needed a proportionally larger supporting infrastructure. **The Soviet June 1941 tank division did have suitable support units authorised.** These included a truck (supply) battalion and a maintenance (and recovery) company attached to each tank regiment. This made them compatible on paper to the German panzer regiments. In the event, the problem was that the panzer regiments actually had their supporting elements (along with the trained mechanics and staff), whereas the *large majority of Soviet tank regiments were fielded with only a small fraction of their required supply and support units (while some had none at all)*. In most cases the tank-recovery tractors in the Soviet maintenance company were completely absent. When coupled with the parlous operational readiness state of the Soviet tank park as a whole in June 1941, this became **a recipe for disaster.**

Thirdly, the historical record shows that excessively tank heavy divisions became far more fragile formations once their tanks were lost or were even temporarily out of commission (i.e. low tank readiness). This occurred in every theatre of operations during WWII. If the tank division was part of an operation where it was expected to consolidate its defensive position and its tank readiness had dropped to a low level (for example, after a breakthrough and exploitation phase), tank heavy formations were often unable to withstand enemy counterattacks without losing cohesion or/and disintegrating completely. This was largely because the division had inadequate motorised infantry, artillery and signals units to consolidate and hold an extended line against enemy

[94] **Note:** Nigel makes this vital point on more than one occasion—a panzer or tank division was much, much more (or should have been much, much more) than just the number of tanks. Which raises another question: ***We're the panzer divisions in general overrated in terms of their impact on the battlefield?***

attacks. **Soviet June 1941 tank divisions were only authorised 1 motorised rifle regiment and 1 medium sized artillery regiment, so they were already weak in this regard**.[95] When this is coupled with the fact that most Soviet tank divisions in June 1941 didn't have the motorised transport to move these units (even if they had them in any strength at all), it soon becomes apparent that the **bulk of the division's strength lay in its operational tanks**. Consequently, once the tanks were lost, broke down or even ran out of fuel and supplies, the division had no ability to withstand the shock of continued enemy attacks.[96]

These three factors explain **why so many Soviet tank divisions effectively dissolved after only a few days of combat in the summer of 1941**. In particular, it explains how Army Group South was able to destroy the numerous mechanised corps in Southwestern Front (the ex Kiev Special Military District) within only a few weeks, even though the Soviet Front had the largest concentration of armour ever fielded up to June 1941 and vastly outnumbered the attacking force (Army Group South).

Finally it is worth stating that this story also goes a long way to explaining how, in 1941, panzer divisions on the East front were still able to conduct major offensive operations, and often achieve breakthroughs of strategic significance, when they had only a handful of operational tanks available in their panzer regiments. Records show that 1941 panzer divisions with roughly 30 percent of their establishment (combat) strength, and approximately 50 operational tanks, still had enough striking power to successfully conduct major offensive operations. These figures are unmatched by any other division type fielded anywhere from 1939 to 1942, and remain **a remarkable indication of how tough and resilient 1941 panzer divisions could be**. **The tank proportions and design of the 1941 panzer division was no accident:** after the French campaign in 1940 the German high command had realised that **their panzer divisions were excessively 'tank-heavy**', while having too little artillery, infantry and logistical support. Consequently, when they started forming additional panzer divisions in late 1940 they reorganised the division to have only a single panzer regiment. However, they also *doubled the number of supporting infantry regiments, added an additional heavy artillery battalion, increased almost all the logistical support units, and added armoured infantry units* (in the world's first true APCs; the Sd.Kfz 251 and 250) as they became available. (pp. 303-04)

c2. Motorised Infantry Support:

The 1941 panzer division had 2 motorised infantry regiments, each with 2 battalions (for a total of 4 motorised infantry battalions with 108 heavy rifle squads). The panzer division's TOE called for a single motorised infantry battalion in each regiment to be armoured, i.e. half the infantry to be carried in armoured halftracks. Shortages of Sd.Kfz 251 APCs meant that **on 22 June 1941 only the 1st Panzer Division actually had 2 full armoured infantry battalions**. Some other panzer divisions had a full armoured infantry battalion, while most had only had a single armoured infantry company. The Soviet tank division called for a total of 3 motorised rifle battalions in a single motorised rifle regiment, but the individual rifle companies and platoons had around 33% more rifle/infantry squads than the equivalent German units. Thus the rifle regiment had 117 rifle squads (including 9 dedicated to reconnaissance platoons). None of the Soviet motorised infantry was armoured; it was all meant to be transported in trucks. (p. 304)

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[95] **Note:** To be fair to the Red Army theorists of the time, they envisaged the tank division as operating as part of a mechanised corps. It was envisaged that the corps' mechanised division would fulfil (or at least assist in) this role when required. Unfortunately, this didn't happen in practice. **The mechanised corps HQ rarely had the infrastructure, signals and staff to coordinate its 3 divisions properly**, the mechanised divisions were in a similar state to the tank divisions (at best), and the mechanised divisions themselves were soon struggling to defend their own front sectors within a very short space of time.

[96] **Note:** The "achilles heel" of Soviet tank divisions in 1941 was that they were *way too dependent on tanks!* Thus the lacked the vital support structure (mot.inf., mot.art., signal and logistics elements) needed for combined arms success on the battlefield.

Thus, only considering the tanks in the panzer or tank regiments, we find that the tank to infantry squad ratio in a 1941 panzer division was 1.5; compared to over 2.9 in a Soviet June 1941 tank division. This means that at full strength and with all units cooperating, the average German tank could call on over twice as much infantry support. In addition, if the APCs were available, each German tank could call on around 1.2 Sd.Kfz 251/250 armoured halftracks in support. Even if only a single armoured infantry battalion was available, each German Pz III and Pz IV medium tank could call on around 0.9 Sd.Kfz 251/250 armoured halftracks in support. As discussed in the previous section, the Germans had discovered that their panzer divisions in France in 1940 were far too 'tank heavy'. Consequently, they had reduced the 2 panzer regiments to 1 by 1941, while at the same time doubling the number of supporting infantry regiments (with as many armoured as possible). They also added an additional motorised heavy artillery battalion (see below).

Another critical factor, which is not readily apparent from the relevant TOEs, is that the German motorised infantry (Schützen) were very heavily armed.[97] Each Schützen squad had 2 MG 34 general purpose MGs, while each Red Army motorised rifle squad had only 1 less effective **DP 1928 LMG**. **Overall, a panzer division was authorised 414 MG 34 GPMGs in its TOE compared to just 197 less effective DP 1928 LMGs in the tank division. The panzer division also had 74 MMGs** compared to **54** in the tank division. When considered over the whole division, it means the **typical 1941 panzer division had over three times more infantry-based MG firepower compared to a Soviet June 1941 tank division, even if the latter was lucky enough to be at full strength.**

In terms of infantry based artillery; the 2 German Schützen infantry regiments had 20 7.5-15cm infantry guns and 12 antitank guns, compared to only 4 7.6cm infantry guns and 6 anti-tank guns in the tank division's only motorised rifle regiment. **The 15cm sIG 33 infantry guns, in particular, gave the German infantry an unmatched weapon for destroying fortified positions**.

On top of all this, most Soviet motorised rifle regiments in June-July 1941 were desperately short of any form of motorised transport, were short of their TOE strength, were short of communication equipment with which to liaise with other units, and **had never trained with the division's tank regiments** (i.e. had never been on divisional level manoeuvres). When the actual state of the motorised infantry in most Soviet tank divisions is taken into account, it means that **most Soviet tanks in the summer of 1941 went into action without any effective infantry support**. (p. 304)

c3. Artillery Support:

Another interesting comparison is the supporting artillery. A 1941 panzer division's artillery regiment TOE called for **36 105-150mm artillery pieces**, 393 motor vehicles, 45 halftrack prime movers, and **22 Sd.Kfz 253s, Sd.Kfz 254s and Sd.Kfz 250/5s** acting as mobile armoured artillery observation and control posts. The panzer artillery regiment included 228 light transports (many of which were radio vehicles) and **22 armoured command vehicles** (with medium to long-range radio transmitter/receivers), *which enabled a sophisticated communication net to be established, with protected forward artillery observation and control elements in place*.

The Soviet June 1941 tank division's artillery regiment TOE called for **24 122-152mm** artillery pieces, 166 motor vehicles and 36 tractor prime movers. The Soviets did attempt to implement modern (mobile) signalling facilities into their artillery regiment. Each battery was authorised a radio section with possibly as many as 4 short-range man-portable radios (but this is uncertain), each artillery battalion was authorised a radio section (with 2 **5-AK radios** in trucks), and the artillery HQ battery was authorised another radio section (with a single 5-AK radio in a truck). However, the ***Soviets' artillery regiment's 5 'radio vehicles' was a far cry from the over 40 such vehicles in the German panzer division's artillery regiment***. In addition, the German vehicles were often specialised armoured vehicles designed to operate in forward areas. Essentially, a sophisticated communication net, and its

[97] **Note:** After 1942 German *Schützen* (motorised infantry) were called *Panzergrenadiers*.

associated command and control elements, was lacking in the TOE of the 1941 tank division's artillery regiment. (p. 305)

In terms of **trucks** the respective artillery regiments were compatible on paper: both with 160-165 trucks in total. However the **German trucks had a significantly heavier lift capacity (something that occurred across the whole of the Eastern Front in 1941-42)**, while the panzer division's artillery regiment was authorised the huge number of 228 light transports (compared to only 6 in the Soviet artillery regiment). Thus a much higher proportion of the Soviet trucks were devoted to support functions (such as signals, maintenance, service, etc), and fewer were dedicated to the logistical supply of the artillery batteries themselves.

Lastly, only considering the tanks in the panzer or tank regiments and ignoring the marked German superiority in infantry guns, we find that the **tank to artillery ratio in a 1941 panzer division was 4.5 tanks per gun; compared to 14.3 tanks per gun in a Soviet June 1941 tank division.** This meant that at full strength and with all units cooperating, the **average German tank could call on over three times as much divisional artillery support**. Even before we consider any of the C&C and logistical factors (above), this one fact alone is very significant. If the tank units were attempting any breakthrough operation against an entrenched enemy position, especially one with dug-in anti-tank guns, this *difference in artillery support was often vital to the success or failure of the operation*. In summary, the panzer artillery regiment included: a complete radio based communication net, observation, command and control systems, and transport and logistics. **This enabled the panzer division to have responsive artillery support which could almost keep up with the advancing panzers.** Meanwhile many Soviet tank divisions were **still trying to find sufficient artillery tractors to merely move their artillery,** and even at TOE strength there was very little facility to enable a similar level of mobile artillery observation, command and control.

c4. Signals Support:

We have already mentioned the difference in the signals (communications) within the respective division's artillery regiments, and this difference in signals infrastructure was not uncommon across the division's other substructures. Here, we will mainly limit ourselves to examining the most important signal unit in the divisions; namely the respective signal battalions.

The 1941 panzer division's armoured signal battalion was authorised 76 motor vehicles (excluding motorcycles), **12 Sd.Kfz 260/261** light armoured radio cars, **8 Sd.Kfz 263** heavy cross-country armoured radio cars, and **7 *Panzerbefehlswagen* Pz III** command tanks (27 armoured vehicles, all with transmitter/receiver radios). The **Sd.Kfz 263s were particularly advanced vehicles.** These 8 wheeled armoured cars (with 5 man crews and a defensive MG), were crammed with radio communication devices and f**ormed the hub of the panzer division's forward communication net**. They were the forerunners of the modern mobile Combat Command Centres used in modern divisions. Other sophisticated vehicles included the *Funkmastkraftwagen* **Kfz. 68** (**radio antenna truck**) and similar **Kfz 61-64s**.[98] These mobile communication vehicles, coupled with the signal elements in the division's regiments and battalions, enabled a panzer division HQ to have a relatively rapid and flexible chain of command. **There is little doubt that the German motorised formations were well ahead of the rest of the world in this regard** during 1940-41, and it formed the basis for the sort of communication net used by modern armoured formations today. (pp. 305-06)

The Soviet June 1941 tank division's signal battalion was authorised 35 motor vehicles, 10 BA armoured cars and 12 command tanks. This included an armoured signal company (with most of the armoured vehicles) and a single signal company (with most of the trucks). Overall, the Soviet tank division's signal battalion was around half the

[98] **Note:** These were different models of these heavy communication vehicles. **Kfz 68s** were based on Krupp, Magirus, Opel Blitz and Einheits-Diesel. **Kfz 61-64s** were based on Mercedes-Benz, Büssing-NAG, Magirus and Einheits-Diesel. They were enclosed vehicles with 3 axles (10 wheels) and were cross-country capable.

size of that in a panzer division, but was still a respectable formation for the job in hand. **What is not known is the number (or technological level) of the radio transceivers in the Soviet battalion.** It is reasonable to assume all the tanks had a radio and probably half the armoured cars. However, only a few (if any) of the trucks were radio equipped, and it is likely most of the BA-20s were there to provide liaison and protection. It almost goes without saying that, in actuality, **the majority of Soviet tank divisions did not have the radio tanks in June 1941, and few had all their authorised radio armoured cars**. Even at full TOE strength the June 1941 tank division's signal battalion would have struggled to efficiently service the communication requirements of a mobile division of this size. This is especially true in a mobile battle where wire based communications are far less flexible and effective. (p. 306)

[The Soviet tank divisions did not have] a strong radio 'net' when one considers it was there to control a tank regiment with over 1,730 men, 172 tanks, 20 prime movers and 256 motor vehicles. **The link between the divisional HQ, the regiment HQ and the 4 tank battalions was particularly weak**. The whole communication net was made even more fragile, and far more inflexible, by the fact that **most of the individual tank companies were authorised only 1 radio command tank** (to link with the battalion), and that **most of the individual tank platoons had no radio tank at all**. When thinking about this, the reader should appreciate that **virtually every German tank had a radio in 1941!** Even the diminutive PzKpfw IIF with a 3 man crew had a FuG5 transceiver. In addition, the German command tanks of the period (the *Panzerbefehlswagen*) were fitted with at least 2 separate radio systems (usually a FuG2, FuG6, FuG7 and/or a FuG8).

c5. Reconnaissance Support:

The reconnaissance elements of a panzer division were to large extent the most sophisticated and elite units in the Panzerwaffe.[99] In this regard 1941 panzer divisions were extremely well developed. **Firstly, every panzer division had a full motorcycle infantry battalion with heavy weapons.** This was attached to the motorised infantry brigade HQ controlling the division's 2 motorised infantry regiments. The motorcycle infantry battalion had 3 motorcycle infantry companies, a motorcycle MG company and a motorised heavy company (with anti-tank guns, infantry guns and even a pionier (combat engineer) platoon). The battalion used a large proportion of the ca. **1,350 motorcycles in the panzer division**, many of which were heavy motorcycles equipped with powered wheel sidecars and detachable GPMG's. The motorcycle infantry battalion was able to scout well ahead of the main force, exploit any gaps found in the enemy defence and had sufficient heavy weapons to defend a position if required. (p. 306)

The second, and principal, reconnaissance element in the panzer division was the armoured reconnaissance battalion. The armoured reconnaissance battalion included a *whole range of dedicated armoured reconnaissance and communication vehicles*. These vehicles included 8 wheeled Sd.Kfz 231 / 232 heavy cross-country armoured cars, Sd.Kfz 260 / 261 / 223 light armoured radio cars and **8 wheeled Sd.Kfz 263 heavy cross-country radio cars. The Sd.Kfz 232 and 263 were easily the most sophisticated vehicles of their type to see service during WWII.** In addition to 36 armoured vehicles, the armoured reconnaissance battalion contained an additional motorcycle company and a motorised heavy company (with anti-tank guns, infantry guns and another pionier platoon).

All this meant that the armoured reconnaissance battalion could also exploit gaps found in the enemy defence and then defend the position if required. Furthermore, it had almost enough radio equipment to act as a backup signal battalion for the entire panzer division. During Operation Barbarossa (and in France in 1940) there are numerous

[99] **Note:** The *Wehrmacht* considered intelligence on terrain, and on the enemy's strength, location and activities, to be of vital importance, particularly in a mobile battle. With this in mind, officers and men assigned to an *Aufklärungs-Abteilung* (Reconnaissance Battalion) were considered amongst the most competent available. R. Edwards, *Scouts Out: A History of German Armored Reconnaissance Units in WWII*, Stackpole Books, Mechanicsberg, PA, 2013, is an excellent and detailed work on the organisation and history of these units, and illustrates why they proved so effective.

cases were a panzer division's reconnaissance battalion managed to successfully penetrate the enemy's front line (sometimes to considerable depth) and then hold the position against heavy enemy counter-attacks until the main force arrived.[100] [101] (p. 307)

The reconnaissance elements of a Soviet June 1941 tank division were concentrated in its armoured reconnaissance battalion. At first glance this was also potentially a powerful formation: it comprised a tank company with 17 fast BT tanks, an armoured car company with 17 armoured cars, and a light motorcycle company with 169 motorcycles (5 with sidecars).1068 The total number of armoured vehicles (37) was comparable to that in the panzer division's reconnaissance battalion (36), but unfortunately that is where the similarities ended. Firstly, the signal facilities in the Soviet battalion were far inferior: the tank company was authorised only 5 71-TK radios in its 17 tanks, the armoured car company was authorised only 4 71-TK radios in its 17 armoured cars, and the battalion HQ had 2 71-TK radios in its 2 tanks and a 5-AK radio in a truck. **This total of 12 vehicle mounted radios is a far cry from the 54 vehicle mounted radios in the panzer division's reconnaissance battalion**. In addition, many of the German radio sets were designed for longer range and with variable frequency (anti-jamming) facilities.[102]

The **second major difference** between the panzer and tank division's reconnaissance elements is that t*he Soviet units were designed for very limited contact with the enemy, and were clearly never intended to hold (defend) ground.* The 16 squads of Soviet motorcycle troops had no heavy weapons (not even LMGs), no anti-tank or infantry guns, and no supporting combat engineer elements. They were intended purely for very light reconnaissance. In comparison the German motorcycle and reconnaissance battalions could field 87 motorcycle squads (with 74 MG 34 GPMGs), 16 HMGs, 18 mortars, 6 anti-tank guns, 4 infantry-guns and 6 combat engineer squads (with 6 more MG 34s).

The mechanised corps, to which the tank division was usually attached, did have a motorcycle 'regiment' authorised. This unit was really a reinforced battalion in strength, with 4 rifle companies moved by a combination of motorcycles and trucks. It also had an anti-tank company authorised with 6 anti-tank guns. However, the **mechanised corps' motorcycle regiments were almost all acutely short of motorcycles and motorised transport in June 1941**, had fewer heavy weapons than a panzer division's motorcycle infantry battalion, and were each meant to support 3 tank/mechanised divisions (which were usually dispersed in different locations). **Thus, even at full strength, a June 1941 Soviet tank division's reconnaissance and signal capabilities fell well short of that in a contemporary panzer division**. When coupled with the depleted equipment situation in the Red Army's mechanised corps in June-July 1941, **it's hardly surprising that Soviet tank crews usually only found the enemy when they (the enemy) were shooting at them**. (pp. 307-08)

c6. Anti-Tank Support:

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[100] **Note:** The **AA** in a PzDiv (even in an inf.div.) was extremely well equipped with MGs and hvy wpns, enabling it at times to break through enemy positions and then hold this relieved.

[101] **Note:** German officers in these battalions were encouraged and trained to find weaknesses in the enemy line, and then exploit these weaknesses if the opportunity presented itself. **They were trained to do this on their own initiative**, as long as it fit in with the division's immediate primary objectives (which they were briefed on every 24-48 hours). The plethora of communication equipment enabled them to rapidly communicate any 'new' opportunity to the divisional commander, who could then adapt the overall battle plan accordingly (or halt the movement of the reconnaissance battalion, if that was the preferred option). (Note: This type of action is the next step beyond so called 'reconnaissance in force'. **Reconnaissance in force generally only refers to engagement with the enemy to elicit a response (to gauge the enemy's strength)** or to deny information to the enemy's reconnaissance units.)

[102] **Note:** For example, the **FuG11** used a 100W transmitter and had a **normal range of 200km**. It was commonly mounted in the *Panzerspähwagen* (Fu) Sd Kfz 232. The **FuG12** was also often used in this vehicle. **Typical transceivers in tanks** of this period had very limited ranges (**4-8km)**, **while most command vehicle transceivers (usually with a frame type aerial) were limited to 30-40km.** Data from, P. Chamberlain, H. Doyle, T.L. Jentz, *Encyclopedia of German Tanks of WWII*, Arms and Armour Press, London, 1994, Appendix III, p. 254.

The 1941 panzer division was authorised a full motorised anti-tank (AT) battalion, while each motorised infantry battalion had its own heavy weapon company with anti-tank guns and infantry guns. Counting the anti-tank guns in the motorcycle infantry battalion and the armoured reconnaissance battalion, **the panzer division was authorised 51 anti-tank guns, including 9 5cm Pak 38s**. **In sharp contrast, the Soviet June 1941 tank division had no anti-tank battalion in its TOE.** T*he only anti-tank guns in the entire division were **6 45mm guns** in the motorised rifle regiment*. In addition the tank division had no 76mm divisional artillery which could double as anti-tank guns as they did in the rifle divisions. **It is clear that the Soviets believed the anti-tank forces in the tank division should stem from the tanks themselves**. (p. 308)

This meant that in order for a Soviet June 1941 tank division to stop an enemy armoured attack it had no choice but to split its tank regiments and commit at least some of its tanks. In practice this (of course) led to *further dispersal of the tank force around the battlefield*; a potential disaster in any breakthrough type operation. *The panzer division on the other hand could keep its panzer regiment concentrated* and moving forward to fulfil its primary offensive mission, while knowing that the motorised infantry and support units had sufficient anti-tank weapons to stop most enemy armoured attacks (or counter-attacks) on its flanks.

It is likely that the Soviets envisaged the mechanised division in the mechanised corps as being responsible for flank protection during a breakthrough operation. Likewise, most panzer corps had a motorised division attached. **But, unlike the tank division which depended on the mechanised division for support, a panzer division could operate independently of other units in the panzer corps**, and still put up a tough infantry and anti-tank screen to protect its flanks as it advanced.[103]

c7. Combat Engineer Support:

Finally we come to ‘combat engineers’, more commonly called sappers in the West and pioniers in the *Wehrmacht*. Possibly due to the German Army’s extensive experience of *Stosstrupptakik* (shock troop tactics) during WWI, the pioniers or combat engineers were highly developed (and trained) in the German ground forces, and the pionier troops in panzer divisions were no exception. (p. 308)

Panzer divisions had a dedicated armoured combat engineer battalion with 1 armoured combat engineer company, 2 motorised combat engineer companies, 2 motorised bridge columns (type "B" and "K") and a motorised engineering supply column. **The armour came from Sd.Kfz 251/5s and 251/7s which were armoured personnel carriers adapted to the combat engineer role and fitted with assault bridges, mines etc.** In addition, **10 Pz I light tanks** were adapted for pionier demolition duties, designated *Ladungsleger auf Panzerkampfwagen* I Ausf B, and controlled by 3 Pz I or Pz II tanks. Full pionier platoons were also assigned to the panzer battalions, infantry battalions and infantry regiments, as well as the reconnaissance battalion and the motorcycle battalion. Overall, the panzer division was authorised the equivalent of 56 Pionier Squads (each with a MG 34 GPMG and an assortment of demolition equipment) and 20 Ferry Bridging Squads with pontoon and **trestle** bridge equipment.

Anyone who has been on manoeuvres with tanks can confirm how easily they can be stopped by geographical obstacles such as small rivers, or by man-made obstacles such as blown bridges and anti-tank ditches. Effective combat engineers in any tank division must be able to support the continuous movement of the armour and supporting units under heavy enemy fire if necessary. They must also be able to deal with enemy defences, such as strong bunkers and minefields, which no one else in the division can deal with. **In this regard German pionier**

[103] **Note:** The respective German and Soviet tank forces—due in part to how differently they were organized and equipped—fought quite differently in the summer of 1941: the German’s exploiting to the fullest all of the benefits that accrued from their much more extensive wpns/equipment, while the Soviets were clearly limited by their many shortcomings—e.g., lack of AT guns, lack of effective communications, lack of mot.inf. support, shortages of logistics, etc.—and thus had to fight in a manner that was often tactically disadvantageous.

troops can be considered amongst the most elite and lethal troops in the *Wehrmacht*, due to their particular training and the formidable array of close-range assault weapons they carried into action.[104] The importance of combat engineers in a mobile formation cannot be overstated, especially one attempting a deep penetration or breakthrough operation. (pp. 308-09)

Having said all this, **the Soviet June 1941 tank division had no equivalent combat engineer battalion let alone an armoured one**. It was however authorised a dedicated motorised bridging battalion in its TOE, which included 3 bridging companies and 47 trucks. This unit was authorised the equivalent of 18 Ferry Bridging Squads: close to the bridging capabilities in a panzer division. Engineer support was distributed across the division's sub-structures as follows: an engineer company in the tank regiments and the rifle regiment, a construction engineer platoon in the bridging battalion and a **chemical company** attached to the division. Overall, the June 1941 tank division was authorised the equivalent of 22 Light-Engineer Squads. **Clearly, the Soviet June 1941 tank division was authorised only a small fraction of the 'combat engineer' capability in a 1941 panzer division, although the authorised bridging capabilities were similar.**

The Soviet mechanised corps HQ was authorised a motorised engineer battalion, which could be used [to] boost the engineer capabilities of the corps' divisions. This unit contained 3 engineer companies, but was also largely focused on battlefield construction as opposed to assault combat. It had 667 men and contained the equivalent of 24 Light Engineer Squads. **Even at full strength (which it almost never was)** this unit was really only large enough to support a single mobile division: it was much too small to support the combat engineer requirements of 2 tank divisions and a mechanised division. Meanwhile, German panzer corps HQs usually had several additional (separate) motorised engineer battalions and bridging columns attached. (p. 309)

To summarise, if the Soviet June 1941 tank division was meant to be the equivalent of the 1941 panzer division, then an analysis of the respective TOEs shows that in every respect, except raw tank numbers, the panzer division was a much more developed organisation. In terms of overall combat power and resilience, the panzer division was considerably more effective than even a full strength tank division, despite the panzer division having around half the number of tanks. It is a classic example of why tank numbers (or tank operational-readiness percentages) should not be the dominating factor in evaluating the combat power of a particular division at particular point in time. **It also illustrates why the 1940 panzer division was in fact weaker than the 1941 panzer division, despite the former having 2 panzer regiments (vs. 1).** The 1940 panzer division was weaker in almost every other respect, and was a considerably less evolved, less flexible and less resilient organization. When the training, actual equipment and personnel condition of most Soviet tank and mechanised divisions are factored in, **the TOE comparison explains how a single concentrated panzer division was usually able to stop an entire mechanised corps in 1941**. It also explains how a concentrated panzer corps could, and occasionally did, annihilate even a strong mechanised corps in a few days during the summer of 1941, whilst sustaining relatively few casualties.

Finally I would like to point out that several supposedly authoritative authors still ceaselessly use tank numbers and/or tank readiness as the only significant measure of the combat strength of a particular armoured or mechanised division. These commentators seem to have little understanding of: how a balanced armoured division actually functioned during WWII (or for that matter how it works today), or the nature and vital importance of combined arms, or the power of combined arms even when tanks are excluded. **They, for example, have absolutely no idea that 1941 panzer divisions with roughly 30 percent of their establishment (combat) strength and a few dozen operational tanks still had enough striking power to conduct major offensive operations**. Similarly, these authors appear to have no idea that *even a 'tankless' 1941 panzer division (which was*

[104] **Note:** In the absence of the 88mm Flak gun or medium-heavy artillery, it often fell to German pionier troops to destroy T-34, KV I and KV II tanks by close assault in 1941. Fortunately for the pioniers, they were assisted by the inadequate all-round vision devices on these tanks, the poor crew ergonomics, and (often) by the absence of supporting Red Army infantry.

otherwise in a reasonable condition) was still considerably larger and more powerful than the large majority of divisions fielded on the East Front during the whole of WWII. (pp. 309-10)

According to the 'tank availability only interpretation', these panzer divisions should have been unfit for almost anything. **The fact that some of the most aggressive and successful German mobile divisions** on the East Front in 1941-42 (both on the offensive and in defence) **were the motorised divisions** (with no tanks at all) and the **Waffen SS motorised divisions** (with only a handful of assault guns) **seems to have completely escaped them**. **Tanks were vital during WWII and they remain so today, but the simple numbers of tanks available and operational is certainly not the beginning and end of the 'armoured division story.'**[105] (p. 310)

[**Note: One of the worst books I have read in this regard is:** D. Stahel, *Operation Barbarossa and Germany's Defeat in the East*, Cambridge University Press, New York, 2011. One of the principal pillars of Stahel's thesis is that Operation Barbarossa could not achieve its 1941 objectives because of the German tank losses in Army Group Centre. Stahel quotes selected figures to show panzer 'strengths' at selected points in time. Essentially, this data is then used to argue that the all-important panzer divisions were far weaker from late July onwards, and that due to tank losses Army Group Centre could not have conducted offensive operations in time to meet the required Barbarossa schedule. **There are numerous fatal flaws in Stahel's work, and too many to fully elucidate here. However, to briefly cover a few:**

Firstly, Stahel is guilty of all the misconceptions mentioned in this chapter (above) on how panzer divisions actually functioned. He appears to have little understanding of the power of combined arms operations (or how they work), or that many German motorised divisions conducted successful offensive operations with only a handful of operational tanks (and, often, with no tanks at all). Stahel makes no effort to examine the status of any of the panzer divisions in terms of the capability of the overall formation; he only ever focuses on the apparent tank 'strengths' in the panzer groups. He doesn't even mention (or if he does, I missed it) the presence or capabilities of the motorised divisions, or the Waffen SS motorised formations, even though they formed a large component of the panzer groups under consideration. Presumably this is because they didn't have a panzer regiment.

Secondly, and equally serious, is that Stahel continuously fails to differentiate between 'irrecoverable tank losses' (which are rarely, if ever, mentioned) and 'operational readiness loss'. The figures are generally quoted as straight 'strength' figures and not correctly as 'percentage of strength operational' figures: the two are very different and usually miles apart. For example, on page 316 the reader is told that the 2nd Panzer Group had only 286 tanks on 29th July 1941. This may have been approaching the number of operational tanks (although even this is doubtful), but the actual number of fully tracked AFVs in 2nd Panzer Group was over three times this figure! We know that by 4th July 1941 the 2nd Panzer Group had received 1,317 fully tracked AFVs, of which 1,148 were tanks (Stahel states 953 tanks, so even his basic start figure is dubious). Quoting 'strength' figures in this manner, and without the correct context, could be described as deliberately misleading. To compound matters further, assault gun (StuG) numbers are more or less ignored, even though they were more powerful AFVs than most German tanks of the period.

Thirdly, **Stahel makes no effort to examine how rapidly the panzer regiments regained their tank readiness when not conducting operations;** although this is hardly surprising if there is little differentiation between irrecoverable losses and temporary losses (leading to repaired tanks). German tank readiness actually went up and down (i.e., varied widely) depending on combat operations, rest periods and replacements. **There is no doubt that the German tank inventory in the East decreased as irrecoverable losses mounted, but this whole process was far slower than presented by Stahel**. None of this vital contextual data is presented (refer to Volume IIB pp. 359-360 for German AFV losses in 1941, relevant contextual data and total tank inventory data). Again, when viewed in this light (and with a knowledge of irrecoverable tank losses, how many were in repair at various points in time, and how many replacements were received), many of Stahel's statistics look disingenuous and his conclusions flawed. There are several other major flaws in this work, including some not related to tank numbers and several relating to logistics. If the reader wants to learn how a 1941 panzer division was able to function so effectively, even with only a few operational tanks and even after a prolonged period of combat, **I would recommend: R.H.S. Stolfi**, *German Panzers on the Offensive, Russian Front-North Africa 1941-1942*, Schiffer Publishing Ltd, Atglen, PA, 2003. Also, T. L. Jentz, *Panzer Truppen*: Volumes 1 & 2, Schiffer Military History, Atglen, PA, 1996. Also, S.H. Newton, *German Battle Tactics on the Russian Front 1941-1945*, Schiffer Publishing Ltd, Atglen, PA, 1994. Also, *S. Biddle, Military Power:*

[105] **Note:** The "Note" I have placed here (just above Section "d" below) is Nigel's f.n. #1080, which is much too long and detailed to put in a footnote here, so I've added to this text.

Explaining Victory and Defeat in Modern Battle, Princeton University Press, Princeton, New Jersey, 2006 (some relevant sections on combined arms and effective 'deployment'). (p. 310)

d. The Soviet 1941 Tank Division and its Failure in 'Deep Battle' and 'Deep Operations'

It is somewhat academic who developed the first coherent strategic doctrine for using large mechanised and armoured forces, but it is generally accepted that the Soviets were ahead in this field in the early years. By the early 1930s Soviet military theorists were already developing the deep penetration (of the enemy's front) **concept in what was termed 'deep battle' and (later) 'deep operations'**. In its simplest form, they envisaged using concentrated armour and artillery to achieve a breakthrough in the enemy line, widening the breach with engineers and other support units, and then exploiting into the enemy's deep rear with highly mobile mechanised and cavalry forces. **By the mid-1930s the Red Army hierarchy had developed a comprehensive strategic doctrine for using large armoured forces and had structured their forces accordingly**. This included the development of specific tank types to fit their envisaged role at the operational level (such as the BT series). By 1936 the **PU-36 field regulation manual** had been issued to Red Army officers detailing how mass armour should be employed and had effectively crystallized the ideas of deep battle.

Given all this, the question therefore is: how is it possible for the Red Army to have had such well-developed theories regarding deep penetration armoured tactics, and yet fail to produce a tank division structure by 1941 that would have enabled large scale and long duration deep-penetration operations against a numerically equivalent or superior enemy? Despite having had years to build tank divisions and mechanised corps, and despite having had plenty of time to experiment using large-scale and comprehensive manoeuvres, exercises and war games, the Red Army failed in this regard. Traditionally, this failure has been attributed to Stalin's ruthless purges of the Red Army officer corps.[106] **However, it is simply too easy and convenient to place the entire blame for this on Stalin's purges.** This 'explanation' fails to fully answer several important questions, fails to explain several important events and does not fit in with the historical timeline of these events. (p. 311)

The first divisional sized armoured formations were formed in the Red Army in **March 1932**, over 5 years before Stalin's purges started in 1937. By 1932 the Red Army had already formulated its initial ideas on the ideal tank division structure, and by 1937 it had had a free hand for 5 years to test the ideal tank and mechanised division structures **needed for the 'deep battle' concept to work (at the operational-strategic level).** The Red Army had also had time to test the ideal divisional structures needed to implement the more practically focused 'deep operations' approach to modern mobile warfare (at the tactical-operational level). Despite all this, **PU 36**, which was published before Stalin's purges had even started and after 4 years of development, **failed to specify an organisation anywhere near as balanced as the 1941 panzer division**[107] (or, for that matter, even the tank-heavy 1939-40 panzer division). There is no doubt that Stalin's purges had a devastating impact on the Red Army, but by mid-1940 the worst effects of these purges had already impacted the Red Army (i.e., by then the large majority of the officers involved had already been 'removed'). **In July 1940, when the tank divisions and mechanised corps were reinstated in direct response to the panzer division threat, the architects of these forces had PU-36 as a guide, as well as all the Red Army material from years of experimentation, exercises and theorising.** This

[106] **Note:** This is the most common explanation given; usually because no one can imagine they had anything except a devastating impact on every aspect of the Red Army's ability to function. **Recent assessments based on the records of the USSR Supreme Court and associated military tribunals**, place the 'purged' Red Army officer figure at **54,714** from 1937 to 1941. D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, p. 31. An unknown number of these were executed, but the likely figure is around **30,000 (or 55%)**. The remainder went to Gulags or/and were imprisoned, and **many of these officers were drafted back into the Red Army in the desperate days of 1941** [e.g., the Polish general Rokossovksy].

[107] **Note:** The Soviets deserve credit for developing these revolutionary ideas ("Deep Battle," etc.), but where they failed miserably was in the *execution* of these ideas. The Germans took these ideas, ran with them, and produced an organic organizational structure for their mechanized divisions—along with a doctrine for putting these ideas into action at the tactical/operational level. The Soviets failed in this.

mass of material and experience did not simply vanish because the most senior proponents of the 'deep-battle' concept were no longer around. Furthermore the USSR had already built many thousands of T-26 and BT tanks, which were specifically designed to fulfil the different roles envisaged within the 'deep-operations' methodology. **In addition, by mid-1940 the Red Army hierarchy would have almost certainly had a fairly accurate idea of the organisation and doctrine behind the 1940 panzer division. And yet, again, despite all these factors being in play the Red Army completely failed to specify a tank division TOE anywhere near as balanced or as sophisticated as the 1941 (or 1940) panzer division.** (p. 311)

It has been argued that the German Army had more combat experience than their enemies,[108] which gave them some sort of hindsight and enabled them to optimise their force structure. But prior to late 1939 the German Army didn't have any more combat experience in mechanised warfare than the Red Army (or for that matter the French Army or British Army). Up to that time the German Army's doctrine on mobile warfare, concentration of tank forces and the application of combined arms, had been primarily created using theory and the experience gained from pre-war maneuverers. This is effectively what the Red Army had been doing, but on an even larger scale, since 1932! In point of fact, at this time the Red Army had more relevant combat experience due to their mechanised warfare endeavours in the Spanish Civil War and successful mechanised actions against the Japanese in the Far East. The Soviets then went on to get more experience in Poland in 1939 and Finland in 1939-40, **but none of these campaigns led to any real refinement of the pre-Barbarossa tank division's TOE.**

The June 1941 tank divisions, which one would assume were the evolutionary outcome of years of experience, development and theorising, **were far too tank heavy**. Even at full TOE strength they lacked sufficient infantry, supporting arms, communications (signals), reconnaissance, engineering support and tank recovery systems. All these 'support elements' are essential to make a massed tank attack successful, and enable the tank division to remain operational and effective for extended periods. When many Soviet tank divisions lost their cohesion after being in combat (in 1941), or their tanks were decimated in piecemeal attacks, **it cannot simply be attributed to poor training or/and insufficient equipment** (i.e., the difference between actual equipment and the division's TOE). **This is supported by the fact that even full strength and relatively well established tank divisions didn't fare much better than the poorly trained and equipped ones.** (p 311)

Although the overall condition of the Soviet tank divisions in June 1941 was the principal reason for their rapid demise, I believe that there were also **fundamental weaknesses in their basic organisational structure.** The Soviet June 1941 tank division appears formidable at first glance; mainly because of the large number (**375**) of authorised tanks. *But as the comparison with the 1941 panzer division has shown it was a very fragile formation in many respects.* Almost all its strength lay 'up-front' in its armour, which was vulnerable because it wasn't properly or adequately supported, even in a full strength division. Once the armour was depleted or simply became temporarily unserviceable, the entire division was vulnerable and essentially helpless. The rest of the tank division was not structured to continue offensive action, nor was it adequately equipped with tank recovery, maintenance and repair units to rapidly bring the tank regiments back to operational readiness. **In very sharp contrast to this, we have seen that a 1941 panzer divisions with roughly a third of its establishment (combat) strength, and a few dozen tanks, still had enough striking power to be capable of conducting offensive operations.** (p. 312)

The German Army didn't develop a **whole range of 'panzer support' vehicles and specialised combat units** prior to World War II because they didn't have anything better to do. **They were desperately short of tanks due to a slow production rate**, and cannibalised or commandeered any foreign equipment (mainly from Czechoslovakia) they could get their hands on. Yet they still devoted large amounts of scarce resources to developing specialised support vehicles (many of which were armoured), and to **developing every aspect of the**

[108] **Note:** But as Nigel points out again and again, from the early 1930s through 1940 (i.e., Manchuria, China, Spain, Khalkin Gol, Poland, Finland) the Red Army had gained all kinds of real-world combat experience, only to ultimately derive the wrong lessons from it. Moreover, they failed to learn from the German use of tanks in combined-arms operations in Poland in 1939.

combined arms operation in support of a panzer offensive.[109] **Why did they do this?** Because extensive testing, manoeuvres, exercises and experience (in Spain) showed them that this was the only way a panzer division could work effectively and survive long enough to fulfil the deep penetration mission. **Large numbers of even the most capable tanks was only one part of the equation. The really interesting question is why the Soviets, who were apparently ahead in this process, never came to the same conclusion, and instead focused almost exclusively on the tanks themselves?**

It seems probable that the Soviet pre-war theorists as far back as the early 1930s, as well as the architects for the 1940-41 mechanised corps, **never really had a grasp on the detail practicalities involved in achieving a successful deep penetration operation against a numerically equivalent or superior opponent**. From the earliest days of '**deep battle' and then 'deep operations**', the Soviets never spent any significant effort in developing specialist vehicles to enable and assist in combined arms operations with tank units. In the mid to late 1930s it would have been very easy for the Soviets to divert a portion of their massive tank production program to producing these types of support vehicles. Obviously, in Soviet eyes, these types of vehicles always had a lower priority than more tanks. Similarly, the development of specialised reconnaissance, mobile communication and armoured combat engineer units was severely limited to the point of being no better than comparable units in the rifle divisions. **In practice, however, these types of specialised support units are essential for all phases of a deep penetration armoured operation, whether it be breaking through the enemy line, widening the gap or exploiting into the enemy's rear area**. (p. 312)

Further evidence that the Red Army believed that tanks alone constituted the bulk of an effective tank division, is supplied by the method they used to form their mechanised corps after July 1940. It is difficult to imagine how the Soviet high command thought they could mobilise 29 mechanised corps, 61 tank divisions and 31 mechanised divisions almost simultaneously, unless the focus was principally on the tanks required; and by mid-1940 this was the one component of the new corps that the Soviets had plenty of.

More competently and more realistically, the Red Army should have simply mobilised far fewer tank and mechanised divisions. This would have ensured that these (fewer) divisions had more support elements and were at full strength in all respects by April-May 1941. It would have been eminently sensible to have formed around 12 mechanised corps, 24 tank divisions (with around 260 tanks each) and 14 mechanised divisions in 1940, and then ensured these divisions were: fully equipped with the latest equipment (especially full motorisation), given time to conduct field manoeuvres at the divisional level, and given a TOE that ensured much more 'support' for the fewer numbers of tanks. The USSR had sufficient resources by mid-1940 to fulfil this mobilisation schedule while maintaining its other expansion programs, and by April-May 1941 they would have had a Red Army with a far more ready (and potent) armoured-mechanised force. Even this much smaller force (with around 10,000 tanks) would have been well over twice as large as the panzer forces that invaded the USSR on 22nd June 1941. The large number of remaining Soviet tanks, which would have constituted around 13,000 older model tanks, could have remained in reserve, been used for replacements, and/or been deployed in small separate tank brigades and battalions. (pp. 312-13)

Instead, the Soviet high command believed that it was far better to create a much larger armoured-mechanised force with a minimalist tank division TOE; after all, the 92 tank and mechanised divisions would have most of their tanks! If tanks represented the single most important element in a tank or mechanised division, then by

[109] **Note:** For example, for most of World War II the primary mission of the *Luftwaffe* was to win air superiority over the battlefield and then to provide ground support and ground attack (interdiction) in support of the German Army (*Heer*). Both the German Army and *Luftwaffe* spent a lot of time, effort and resources on developing air-ground communication equipment and infrastructure prior to WWII. **By 1940-41, panzer divisions had dedicated *Luftwaffe* (and Army) personnel and equipment embedded in their TOEs to coordinate close air support for a panzer offensive**. It wasn't until late 1943 and into 1944 that the US and British Armies developed this level of 'combined-arms' coordination at the tactical level.

deriving the required tank regiments from existing tank brigades and battalions, the most important part of the tank and mechanised divisions could be easily and quickly created. With the most important component then in place, the Red Army planners presumably assumed *a more leisurely approach could be taken to complete the 'far less important' ancillary support units* based around a minimalist TOE. As it turned out, this was a recipe for disaster.[110]

In the event, the immense support organisations required to operate 92 large tank and mechanised divisions could not be created in time, even with a minimalist TOE. In contrast the *Wehrmacht* only had 20 panzer divisions in June 1941, but all aspects of their organisation and equipment had been continuously evolving for over 5 years. **Ironically, it was the 1940-41 panzer divisions which were able to successfully deliver on the advanced mechanised warfare theories of the Red Army officers Frunze, Svechin, Triandafillov and Tukachevsky.** (p. 313)

e. Tank Divisions (July 1941)

By early July 1941 the Soviet high command had started to realise that the entire Red Army mechanised force was in serious trouble. **By 15 July the order was issued to disband the mechanised corps HQs with most of the mechanised divisions being converted to rifle divisions**. This was not difficult because *many mechanised divisions were already 'motorised' in name only.* Meanwhile, *the pre-war tank divisions were proving too difficult to command and control effectively in combat.* The tank divisions and the mechanised corps didn't have the staff officers, training, experience or adequate communications to control or support such large tank formations. However the Red Army still had a desperate need to get concentrations of tanks together to oppose and hopefully counterattack the German forces. **Tank divisions still appeared to be the only solution**. In addition the Soviets still had a huge number of available tanks in other military districts, and in a category 3 or 4 state of repair, that they needed to get to the front.

On 10 July 1941 new TOEs were issued for newly mobilised tank divisions with the organisational structure shown in table Sov TD July 1941. The new structure was similar to the pre-war division, **except the division was less tank heavy and the subdivisional support units were severely reduced**. The tank division now had **215 tanks in its TOE, with 196 in its 2 tank regiments**, which was still more than a typical 1941 panzer division. The tank to infantry squad ratio was now reduced to 2.3 (from 2.9) but was still well above the 1.5 ratio in panzer divisions.

The most significant changes in the new tank divisions were:

1. A reduction in light and medium tank platoon size from 5 to 3 tanks. The associated reduction in size of the tank company was from 16 to 10 tanks. The number of battalion HQ tanks was also reduced to 1.

2. The tank regiments now had **3 tank battalions each instead of 4**.

3. Smaller rifle companies using the **triangular structure** of 3 rifle platoons per company and 3 squads per platoon. This was now similar to the German motorised infantry regiment structure.

4. The 45mm anti-tank guns were moved from the rifle battalions to become a regimental anti-tank platoon. Also a 120mm mortars platoon was added to the regiment. Otherwise, most of the remaining regimental units were reduced from company to platoon size, or were eliminated altogether. The latter included the truck battalion, the anti-aircraft company and the engineering company.

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[110] **Note:** One mitigating factor in favour of the Red Army planners is that they probably assumed they had until 1942 to complete the various divisions' ancillary components. The general consensus is that Stalin was hoping that any war with Germany could be avoided until at least the summer of 1942. Even so, the smaller, better equipped and more elite armoured-mechanised force would have been a far safer approach.

5. The artillery regiment had its 152mm howitzers replaced with 76mm divisional guns. The 76mm guns could now double as anti-tank guns. The artillery regiment was now called an artillery anti-tank regiment.

6. The motorised bridging battalion was dropped, along with all its engineer support elements.

7. The average size of the divisional supply, maintenance and service support units were all reduced, with a dramatic drop in the number of authorised supply trucks and light transports. (p. 313)

A total of **11 new tank divisions were formed after June 1941** and before the end of the year, but only 8 were ever Mobilised and Deployed (MD) in varying states of readiness. Of the MND tank divisions, 2 were partially formed and remained in the Far East and another remained in the **Transbaikal Military District**.

Using the 'size' equation defined for the FILARM model, we find that a Soviet July 1941 tank division's TOE was 117% of the Minimum Divisional Size (MDS) value, so these divisions were still large combat units and truly divisional sized. However, as with the pre-war tank divisions, **this size was still primarily due to the large number of authorised tanks, and all the inherent weaknesses in the structure of the pre-war tank divisions remained.** For example, without its tanks (but otherwise at full strength) the July 1941 tank was only 71% of the MDS value. I.e., without its tanks it was really the equivalent of a large rifle brigade and most of the division's strength was 'upfront' in its armour. *Clearly the July 1941 tank division's organisation was not an evolutionary improvement on that of the June 1941 tank division, but was merely an attempt to field a tank division with a much more realistic TOE.* (p. 314)

Unsurprisingly the ultimate fate of the newly mobilised tank divisions was similar to that of the pre-war tank divisions. *This occurred despite having actual personnel and equipment closer to their TOE.* By mid-August 1941 the Soviet tank divisions were effectively gone: the ones that still existed at the front had the real strength of brigades or less. After August 1941 several Soviet armies formed these units into 'tank groups' which were essentially a collection of surviving tanks and motorised forces under the highest ranking armour officer available. These battalion or small regiment sized units didn't last more than a few weeks. **By October 1941 only 3 tank divisions remained, and by May 1942 only 2 1941 tank divisions had survived in the Red Army. Both these remained in the Transbaikal area, well away from the *Wehrmacht*.**

f. Tank Brigades (1941)

The first Soviet tank brigades were generated as battlefield improvisations using whatever resources were left from the dissolving tank and mechanised divisions, or from tanks repaired in local factories and whatever crews could be found. In late August 1941 the Soviets officially started forming tank brigades because they took advantage of several realities in the Red Army at the time. These included:

- The tank brigade was small enough for inexperienced Soviet tank officers to handle in combat.
- The small size of the tank brigade meant that its subordinate elements were much easier to coordinate. It was easier to ensure that tanks in the brigade received at least a minimum level of combined arms support from the brigade (mainly in the form of infantry).
- Tank brigades did not require large and sophisticated command and control functions to concentrate for an attack.
- Tank brigades could be rapidly formed from scratch or, more commonly, by using existing surviving tank battalions and cadre.
- The numbers formed meant that more combat units across the Red Army had at least some tank support. (p. 316)

Tank Brigades (August 1941)

On 23 August 1941 the first official TOEs were issued for tank brigades, specifically *Shtat* No. 010/75 to 010/83, shown in table Sov TB Aug 1941. Personnel requirements in the tank brigade were kept to a minimum with tank companies made up of just the tank crews. The only technical or recovery support for the brigade's tanks consisted of a maintenance section in each tank battalion, and another maintenance section in the tank regiment's trains. The entire tank regiment had only 542 men, 12 tractors and 61 trucks. It was, however, **authorised 93 tanks**, although most brigades actually had around **50 tanks on strength**. This was just as well because it is unlikely the brigade's support infrastructure could have sustained 93 tanks for any length of time in combat conditions. As an example of this, **consider that the truck to tank ratio** in the pre-war tank division's tank regiment was 1.4, the same ratio in the July 1941 tank division had dropped to 0.9, and the same ratio in the August 1941 tank brigade was below 0.7. This drop in truck to tank ratio is a fairly good measure of the drop in overall supply and maintenance support the tanks themselves received in their respective formations. Having only around 50 tanks on strength didn't solve the problem however, **because most 1941 tank brigades only ever had (on average) around half of their authorised trucks.** (p. 316)

The tank brigade's infantry support consisted of a single rifle battalion utilising a triangular organisation. It contained conventional mortar and anti-tank components, as well as a rather unusual anti-tank company comprising infantry armed with improvised anti-tank weapons such as **Molotov cocktails**, hand grenades and flamethrowers. The rifle companies in the brigade's rifle battalion had no organic transport, and relied on a battalion transport and trains company (with 52 trucks) to move and supply the rifle companies. One of the greatest weaknesses in the August 1941 tank brigade was the **complete absence of any artillery**; with the brigade relying on the single rifle battalion's mortar company for any form of fire support. . . the brigade was only authorised **1,943 men**. The reason for this is that the August 1941 tank brigade was still authorised the high number of 93 tanks, which further illustrates that its strength was all 'up front'. **It is clear that the Red Army had still not learned the lessons of overly tank-heavy formations**, *i.e., the brigade's tank support infrastructure bordered on non-existent and the supporting arms were relatively weak.*

For example, the **tank to infantry squad ratio was 2.3; still as bad as the July 1941 tank division (at 2.3) and still much higher than the 1941 panzer division (at 1.5)**. The tanks in the August 1941 tank brigade also had no artillery support to speak of. It must also be borne in mind that *very few tank brigades ever actually reached their full TOE*, with the average August 1941 tank brigade actually having around half their authorised tanks and transport strength.

Despite their shortcomings, the 1941 tank brigades were still much more successful than the rifle brigades formed in 1941. There were several key reasons for this:

● Firstly, the personnel making up the tank brigades were either veterans from dissolved tank or mechanised divisions who had survived severe 'on the job training' at the hands or the *Wehrmacht*, or they were the cream of the newly mobilised manpower reserves with prior military experience.

● Secondly, tank brigades represented the only effective way the Red Army could concentrate its mechanised forces for an attack in late 1941. As such, they had high priority in regards to weapons, radios, heavy equipment, tractors and motorised vehicles (so they could get closer to their TOEs). (Note: this was still only relative because most tank brigades in 1941 remained below their authorised tank and transport strength.) . . .

● Fourthly, **the 1941 tank brigades usually had 20-30 T-34 and KV tanks on strength**. These tanks were the most powerful general issue AFVs in the world at this time and the *Wehrmacht* (especially the infantry divisions) experienced difficulty destroying them.[111] (p. 318)

During late August 1941 and the first half of September 1941, **a total of 21 tank brigades** were Mobilised and Deployed (MD) using the August Shtat.

Tank Brigades (September 1941)

Experience with forming the August 1941 tank brigades quickly led to the modification of *Shtat* No. 010/75 - 010/83. These modifications officially came into effect on **13 Sep 41**, and the new organisation is shown in table Sov TB Sep 1941. The tank regiment HQ was seen as redundant and it was dropped along with one of the light tank battalions. **The result was a reduction in overall tank numbers from 93 to 67** (a reduction of 26 light tanks) and some minor reductions in the supporting infrastructure (minimal as it already was) for the brigade's tanks. Apparently 6 light tanks were shifted to the reconnaissance company, but this is uncertain. **The tank to infantry squad ratio was now a good 1.6**, which includes the rifle squads in the 'special' close-in anti-tank company (and was finally comparable to that in a German panzer division).

The reduction in authorised tank numbers was due to the shortage of available tanks for the newly mobilised tank brigades (most of the earlier brigades, formed in August-September, averaged around 50 tanks each). **It is apparent that the Red Army had finally started to run out of tanks from its massive pre-war tank park**, and new production was nowhere near meeting the demand. However, the reduction in authorised tank numbers was also an acknowledgement that the brigade's support systems were realistically unable to support more than around 50 tanks anyway. In other respects the September 1941 tank brigade remained the same as the August brigade. **As such, it retained the earlier brigades biggest weaknesses; namely the complete absence of any artillery and almost non-existent engineer (sapper) support units.**

From mid-September to early December 1941 a total of **59 tank brigades** were mobilised using the 13 September Shtat. However, of these, **only 39 were actually able to be Mobilised and Deployed (MD) in 1941,** while another 20 remained in a Mobilised and Not Deployed (MND) state. Nevertheless, these numbers mean that most of the Soviet tank brigades fielded in 1941 started with the 13 September Shtat. (p. 318)

Tank Brigades (December 1941)

In early December 1941 it was decided that *new tank brigades would be even smaller and would use a completely new Shtat*. Accordingly, on 9th December 1941 a whole set of new tank brigade TOE were issued, specifically Shtat No. 010/345 to 010/352, shown in table Sov TB Dec 1941. (p. 320)

The overall tank strength was **reduced to only 46 tanks** (including 16 light tanks) due to **continued tank shortages.** The Soviet tank brigade now had the tank strength of a Western army's tank battalion so the term 'brigade' is completely misleading; especially when one considers the size of a 'tank brigade' of the British Army in North Africa in 1941. The tanks were organised into 2 identical tank battalions, and **they now had a mixture of T-34s, KVs and light tanks.** The latter were usually the **new T-60 light tank** which had started production in November 1941. Another change was the elimination of all the battalion HQ command tanks. The overall radio (communications) situation in these tank formations *continued to be desperate*: only the platoon leaders and company command tanks were authorised radios in the medium and heavy tank companies, while none of the light tanks normally had a radio.

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[111] **Note:** The only German general issue 'anti-tank weapon' capable of destroying T-34 and KV tanks at over 1,000 metres range in 1941 was the 88mm FlaK using AP ammunition.

Overall, the December 1941 tank brigade was the least powerful of the 3 tank brigade types formed in 1941, with the least firepower, support and staying power. In many publications a Soviet 1941 tank brigade is used as 'half a division' when tallying up the number of Soviet 'division equivalents' mobilised in 1941. *Like the rifle brigade, this is a gross and misleading exaggeration of the Soviet 1941 tank brigade's combat strength*, and may be the result of the West's conception of what their WWII tank brigades looked like. In actuality, the overall combat power of a reasonably well equipped Soviet 1941 tank division (e.g. a July 1941 tank division) was **4 to 6 times stronger than a typical Soviet 1941 tank brigade**. During December 1941, a total of **8 tank brigades** were mobilised using the 9 December *Shtat*. However, of these, **only 2 were actually able to be Mobilised and Deployed** (MD) in 1941, while another 6 remained in a Mobilised and Not Deployed (MND) state.

On balance the Soviet 1941 tank brigades were successful, especially when compared to any other armoured formations fielded by the Red Army during 1941. A total of **88 new tank brigades were formed in 1941**, and these provided the Red Army with the tank units required for the Soviet winter counteroffensive of 1941-42 (**62** of t hese brigades were Mobilised and Deployed (MD)). Tank battalions in the tank brigades also had at least limited infantry support due to the attached rifle battalion and the fact that it was relatively easy to coordinate their activities. This also enabled experience to be gained at all levels which was essential to form larger tank units later in 1942. On the downside, the tanks in the 1941 tank brigades generally operated without any effective artillery support. The biggest disadvantage of the tank brigades was that they did not last long in combat and were incapable of sustaining themselves without external support units. All the tanks in the 1941 tank brigades often became non-operational after only a few days of sustained combat operations; with the tanks either destroyed, broken down, needing recovery, needing critical maintenance or/and needing replenishment. **This was because the tanks in the tank brigades had very little in the way of recovery, repair, maintenance and supply services to support them.**

Clearly it was almost impossible for these small tank brigades to fulfil the deep penetration operations that the Red Army envisaged to win the war, and for these reasons **new divisional size armoured formations (the tank corps) were ordered to be reformed on 31st March 1942**. (p. 320)

g. Mechanized Divisions (June 1941)

Alongside the 2 tank divisions in each 1940-41 mechanised corps there was also a mechanised division. The mechanised division's role was to assist the tank divisions in the envisaged mechanised corps' deep strike mission. The mechanised division was seen as part of the mechanised-cavalry forces that would assist in holding open the breach in the enemy front and then exploit into the enemy's rear area. **To fulfil this role it had much stronger infantry forces compared to the tank divisions**, so it was better able to hold ground against enemy infiltration and counter-attacks, while **its single tank regiment** was supposed to contain only fast BT tanks to enable rapid exploitation. (p. 322)

The mechanised division's key elements included 1 tank regiment with 4 tank battalions, **2 motorised rifle regiments each with 3 battalions**, a motorised artillery regiment, a motorised anti-aircraft battalion, a motorised anti-tank battalion, an engineer battalion, an armoured reconnaissance battalion, an armoured signal battalion and various support units. The total number of tanks and tankettes in the TOE was 275, with **250 BT tanks in the tank regiment**. The 2 rifle regiments were unusually large because each of the rifle battalions contained 5 companies as
opposed to the more common 3 companies. This gave the June 1941 mechanised division a very high tank to infantry-squad ratio of 0.9; as opposed to 2.9 in the tank divisions and 1.5 in panzer divisions.

On paper the June 1941 mechanised division was a powerful and well balanced formation with considerably more staying power than its companion tank divisions. Its artillery regiment had 1.5 times as many artillery pieces, it had a divisional anti-tank battalion giving it 4 times as many anti-tank guns, and it had 2.2 times as many rifle squads. At the same time it had 73% of the tanks and tankettes in the June 1941 tank division, although the

latter was authorised the far superior T-34 and KV tanks. It is worth noting that the **mechanised division's tank regiment was authorised 88 more tanks than a typical panzer division's panzer regiment**, while German motorised divisions, which were designed for a similar role to the mechanised divisions, didn't have any tanks at all. **All in all, the Soviet pre-war mechanised division at full strength represented the strongest and most durable all-round division in the Red Army in June 1941.**

As usual with the Red Army's 1941 mechanised forces, the reality fell far short of the expectation. The problems started with the fact that the mechanised divisions were formed from early 1940, just when the Red Army
as a whole was attempting a massive expansion and motorisation program. Later, the mechanised divisions were attempting to form simultaneously with the many new tank divisions under the auspices of any given mechanised corps HQ; **and the tank divisions in the corps were generally given much higher priority to receive any available tanks and trucks. By June 1941 many mechanised divisions had not yet received any tanks, had received hardly any trucks and had received few heavy weapons.** For these divisions any training as a unit was still far in the future. *Most of these divisions were rapidly converted to 'newly mobilised' rifle divisions from July 1941 (if they survived the border battles) by adding a third rifle regiment and horse transport to the non-existent motorised transport.*

In the more established mechanised corps some mechanised divisions did have a full complement of tanks and a reasonable level of motorisation. But the actual tanks were rarely all BTs and consisted of the usual ad hoc mixture of BTs, T-26s and tankettes found in most tank divisions. Coupled with the overall lack of personnel and equipment, the *mechanised divisions were plagued with the same absence of specialist signals, reconnaissance, engineer and support units as the tank divisions were*. Furthermore those mechanised divisions that did manage to attain a reasonable state of formation rarely had time to train as a unit, let alone train in conjunction with their associated tank divisions. **The unfortunate result of all this was that in June-July 1941 the average mechanised division didn't even last as long as the average tank division.**

On **15 July 1941 the order disbanding the mechanised corps HQs also ordered surviving mechanised divisions to be converted to rifle divisions**. Most of these conversions occurred through August and September 1941. The surviving tanks and tank crews were used to form small improvised tank brigades prior to the formation of official tank brigades, or were used as replacements for other tank units. (p. 322)

h. Motorised Rifle Divisions (June 1941)

On 22 June 1941 there were o**nly 2 motorised rifle divisions in the Red Army**. These were the **36 and 57 Motorised Rifle Divisions**, and both were deployed in the Transbaikal Military District. It is unclear why the Red Army created these 'special' units and did not simply create 2 more independent mechanised divisions in the Transbaikal. Possible explanations include: they wanted a highly mobile (lighter) force more suited to the local terrain than the mechanised divisions, they needed motorised units to cover the large expanses in the Far East but did not require a large tank component to counter the Japanese threat, they required a lighter division which would be easier to supply and maintain in remote regions, and they needed to utilise local assets already deployed in the **Transbaikal** (in 1939-1940) if possible. (p. 330)

The 36 Rifle Division had formed in **June 1922** at Chita in the Transbaikal. It underwent conversion to an early type 'motorised division' in the mid-1930s and gained combat experience in the battle of Khalkin-Gol in Mongolia in 1939. It was fully (and officially) formed as a motorised rifle division in January-February 1939. The 57 Rifle Divisions was formed in the **Urals in 1921** (from the 24 Rifle Division) and **also gained combat experience in the Khalkin-Gol battles**. It was converted to a motorised rifle division in July 1940 while still deployed in the Transbaikal in the 17 Army.

Both the 36 and 57 Motorised Rifle Divisions were at 70-74% of their authorised TOE strength in June 1941. In addition, both divisions were assigned a separate light tank battalion with T-26 tanks.1109 Both divisions remained in the 17 Army in the Transbaikal Military District, more or less in their original form, until August 1945 when they were involved in the Red Army's advance into Manchuria. (p. 330)

i. The Mechanised Corps (June 1941)

The various support units that went into a typical Red Army 'corps' are treated later in this chapter. However as the 1940-41 tank and mechanised divisions were always intended to operate as a part of a controlling mechanised corps, it is fitting to cover the structure of the various support units that went into the 1941 mechanised corps here, and to examine the corps as a whole. **The 1941 mechanised corps comprised 2 tank divisions, a mechanised division, a motorcycle regiment, an engineer battalion, an armoured signal battalion, an aviation squadron and various ancillary units.** (p. 335)

Motorcycle Regiments / Mechanised Corps (June 1941):

Each of the 29 mechanised corps deployed on 22 June 1941 **had an attached motorcycle regiment.** These were the only large motorcycle units fielded by the Red Army in 1941, and there primary purpose was to provide an additional degree of reconnaissance for the divisions in the mechanised corps. There is relatively little detailed information relating to the authorised organisation of this unit. However, from different sources and post-war reports we can piece together enough to build a reasonably accurate picture. The results of this are shown in table Sov Mtcy Reg, which shows the TOE for the combat, signal, transport and supply elements of a Soviet June 1941 Motorcycle Regiment (based on a February 1941 *Shtat)*.

The motorcycle regiment essentially consisted of 4 motorcycle rifle companies, an anti-tank company (or battery), an armoured car company, a company HQ and support elements. Each motorcycle company had 258 men and included 3 motorcycle platoons, a MG platoon, a mortar platoon, a flamethrower section and company HQ (with at least one RB radio). It is apparent from the TOE that there were i**nsufficient motorcycles** in the motorcycle company to move all its personnel and equipment, which was likely in **recognition of the general motorcycle shortage in the USSR.**

Unfortunately, like many of the divisions in the mechanised corps in June 1941, **most of the motorcycle regiments existed only on paper.** In fact it is probable that of all the components in the mechanised corps in June 1941, the **motorcycle 'regiments' were (on average) the furthest from their TOE in terms of actual strength**. The primary reasons for this were: the **chronic shortage of suitable motorcycles**, the shortage of other types of motor vehicles, and the lower priority for personnel and equipment attributed to these units (especially compared to the divisions in the corps). On 22 June 1941 there were only around **33,400 motorcycles in the Soviet armed forces.**

In June 1941 the two principal medium to heavy motorcycle types in Red Army use were the **TIZ-AM-600** and the **PMZ-A-750**. Both these designs were in very short supply, with only around **15,670** machines produced in total. **Both these designs were already outdated in terms of military grade motorcycles, and their performance during the 1939-40 Winter War with Finland can be described as mediocre** (at best). In 1940 the Soviets negotiated a licence to produce the **BMW R71** and this machine was designated the M-72 in Soviet production. Limited production of the M-72 only started in January 1941 at the MMZ factory in Moscow, and only around **850** machines had been produced prior to Operation Barbarossa. (pp. 335-36)

To understand just how short the Red Army was in motorcycles consider that an entire June 1941 mechanised corps (with three divisions and all its support units) **was only authorised 1,364 motorcycles.** Far worse than this, however, is that on 22 June 1941 the **20 Mechanised Corps** in the Western Military Districts a**veraged only 288 motorcycles each!** The strongest in this regards was the 4th Mechanised Corps with 1,050 motorcycles and the weakest was the 24th Mechanised Corps with only **5 motorcycles**. For comparison, a German 1941 1st Wave

Infantry Division was authorised over **490 motorcycles** (more than an entire Soviet motorcycle regiment), while a typical panzer division was authorised (and actually had) over **1,350 motorcycles**. In addition the German machines were, on average, considerably superior and more powerful. (p. 337)

Engineering (Construction) Battalion / Mechanised Corps (June 1941):

Each mechanised corps was also authorised a motorised engineer battalion with the organisation shown in the table below.[112] This battalion's title would be more accurate if it was termed a 'construction' or 'engineer-construction' battalion, because its organisation, equipment and purpose were **primarily focused on battlefield construction.** In this context 'battlefield construction' includes: laying and clearing minefields, construction and removal of defensive features (such as fortified structures, barbed wire and anti-tank obstacles), road construction, bridge construction, rail repair and other similar functions. It was therefore similar to the German Army's construction battalion (*Bau-Bataillon*), **and had very little resemblance to a German Army's combat-engineer battalion (***Pionier-Bataillon***)** (p. 338)

The battalion was organised in the traditional way with 3 engineer companies, several support and technical units, and a HQ platoon. The engineer companies were relatively small and were lightly armed; they had no LMGs, flamethrowers or other heavy weapons for close assault. Their primary purpose was apparently to supply labour as required. The most important company in the battalion was the construction company, which had all the battalion's tractors as well as 24 graders and bulldozers. This company also contained the squads dedicated to minelaying and removal. It was backed up by a technical platoon with sawmills and mobile generators. The rest of the battalion was dedicated to supply, transport and liaison.

Noticeably absent from the battalion was any form of pontoon or bridging equipment. The mechanised corps therefore had to rely on the bridging elements within the engineer battalions of the tank and mechanised divisions, if it needed to cross any significant river obstacles. **As usual, very few mechanised corps had an engineer battalion close its TOE on 22 June 1941**. Most did have an engineering-construction unit present, but in most cases it was more akin to a company in strength. Most often most of the tractors, heavy construction machinery and even the trucks were missing. (p. 338)

Armoured Signal Battalion / Mechanised Corps (June 1941):

Each mechanised corps was authorised an armoured signal battalion with the organisation shown below. It consisted of an armoured signal company with 6 radio tanks and 4 light radio-cars, a motorised signal company with 10 armoured cars (all authorised a radio), and various battalion support units. I**n total, the battalion was authorised 20 radios in its TOE**; a generous number for a unit of this size by 1941 Red Army standards. However there was no backup telephone/wire company in the battalion (which was not unreasonable, given this unit's envisaged role), and the only communication backup came in the form of a small motorcycle messenger platoon in the motorised signal company.

The battalion's vital function was to provide the flexible communication link between the mechanised corps HQ and its 3 subordinate divisions and corps support elements. The signal battalion also had to provide the link between the mechanised corps HQ and any controlling army and front HQs, as well as liaison communications with any adjacent corps under the same army HQ. When the workload of this unit is laid out, and any redundancy is built in, it quickly becomes apparent that 20 relatively short range radios was not an extravagant number. As far as is known all the mechanised corps deployed on 22 June 1941 had a separate signal unit attached, **but very few (if any) had a full strength signal battalion**. In many cases the signal 'battalion' was approaching a company in actual strength with around half the authorised radios. In addition, the radios were often mounted in soft skinned vehicles (i.e. in trucks or light transports) as opposed to AFVs. (p. 339)

[112] **Note:** Obviously, data from the tables are either being shown only in part, or not at all.

Aviation Squadron / Mechanised Corps (June 1941):

Attached to the mechanised corps HQ was meant to be an aviation squadron with the organisation shown in the table below. The squadron's primary functions included providing the mechanised corps with local aerial reconnaissance information in regards to terrain and enemy deployments, and providing liason and courier aircraft for the senior commanders. The aviation squadron was authorised all the infrastructure needed to perform these functions well. This included: a photographic platoon with a photo laboratory truck and 4 dark-room trucks, a fully equipped workshop platoon to maintain the aircraft and equipment, a dedicated weather section, a medical section and a full transport (truck) park. (p. 340)

Unfortunately the useful aviation squadron remained largely a 'theoretical' unit in the 1941 mechanised corps. On 22 June 1941 it appears only a small number of mechanised corps (usually those established in 1940) had more than a few aircraft assigned. In addition the bulk of the authorised equipment in the aviation squadrons, especially the motorised transport, was usually missing.[113]

Total Personnel and Equipment in the Mechanised Corps (June 1941):

From the relevant sections in this chapter we can now ascertain the total personnel and equipment authorised in the Red Army's 1941 mechanised corps, and this is presented in table Sov Mech Cps. We can see that it was meant to be a large formation with over **36,330** men. The authorised equipment included: **1,031 tanks**, 256 armoured cars, 1,096 MGs (of which 900 were LMGs), **39 Quad MMGs** and 12 AAMGs (HMGs), 210 mortars and 178 artillery pieces (including anti-aircraft and anti-tank guns), **4,941** motor vehicles, **328 tractors** (prime-movers) and 1,364 motorcycles. (p. 341)

These Red Army mechanised corps had only started to form in June 1940, and 20 of them had only started to form as late as February 1941; only four months before Operation Barbarossa. It is hard to imagine how the Soviets thought they could create 29 such massive formations simultaneously (even without several other simultaneous Red Army expansion programmes). **The only logical explanation is that the Soviet high command assumed they had at least 2-3 years in hand, and not the year they actually had.**[114] On 22 June 1941 there were 29 mechanised corps HQs in the Red Army of which 20 were in the Western Military Districts and 5 were in reserves of the Stavka GK. *As the mechanised corps represented the most powerful offensive component of the Red Army*, it is obvious from this deployment where the Stavka perceived the main invasion threat to be. It has also led to some fairly wild speculation in regards to Stalin's intentions and a possible Soviet invasion of Western Europe in the summer of 1941.[115] (pp. 341-42)

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[113] **Note:** Generally air-support for ground forces in WWII was requested at a lower command level than corps (i.e. at a divisional level or below). At the corps level air-units might be assigned, but would not be controlled tactically (i.e. within an hourly based timeframe). **In the German Army in 1941, Luftwaffe and army air-liaison personnel were usually embedded at a relatively low command level (often even battalion level**, especially in panzer and motorised units); and these small 'teams' had the signals infrastructure to communicate directly with the allocated air-support, or/and to a higher command level with communication to the air-support. This organisation was vital for true 'close air-support'. This combined arms cooperation was viewed as critical even when Guderian first stared building the panzer force. **From 1939 to 1942 the *Wehrmacht* remained well ahead of the rest of the world's armed forces in regards to coordinating close air-support and directed interdiction air-strikes** (this includes the British and US forces), and this is one of the main reasons why the Luftwaffe evolved as a very 'tactical' air force. It is unclear to what degree the mechanised corps' aviation squadron participated in coordinating VVS air support, but it is likely it was involved at a very high (corps) command level only.

[114] **Note:** This is a terrific observation, and just another example of how the Soviets *never* could have been ready to launch an attack in July 1941.

[115] **Note:** E.g., V. Suvorov, *Icebreaker: Who Started the Second World War?*, Hammish-Hamilton, London, 1990. Despite Suvorov's assertions, it becomes obvious from a study of the Red Army's states of readiness that any invasion of Western

Even though only a few mechanised corps ever got close to their establishment strength (above), it still represented a massive formation to command, control, maintain and supply. **In the year they existed, only one mechanised corps managed to actually complete any divisional level exercises**. Given the overall state of the command, control and logistical infrastructure in the Red Army in June 1941, the fate of the new, untried and untested mechanised corps was already preordained. (p. 342)

In the battles during the summer of 1941 all the problems relating to rifle corps HQs were applicable to the mechanised corps HQs, except in the latter they were magnified even further. **Most mechanised corps were much newer and more inexperienced than the rifle corps, were short of almost everything**, and their HQs were trying to control a much more complex military formation. (pp. 342-43)

When coupled with the desperate state of some of the tank and mechanised divisions, the result can only be described as a disaster. **In terms of Relative Overall Combat Proficiency (ROCP), the average mechanised corps was considerably worse than the average rifle corps**. The Stavka soon realised that the mechanised corps were failing even faster than the rifle corps, and on **15 July 1941 the order was issued to disband the mechanised corps HQs and convert the mechanised divisions to rifle divisions**.[116] In other words, in a little over three weeks of combat the basic Red Army armoured formations had failed completely. The surviving tank divisions now reported directly to their army and front HQs, although most of these tank divisions didn't survive much longer than the mechanised corps HQs to which they were originally assigned. (pp. 343)

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Europe was very unlikely, and not planned for, in 1941.

[116] **Note:** In other words, the establishment of the MCs was little more than a huge "boondoggle" for the Red Army! They failed miserably at start of Barbarossa.

3C. Red Army Cavalry & Mountain Units[117]

The pre-Soviet era Russian Army had a **long cavalry tradition going back to the Dragoons of Peter the Great in the early 18th century**. Even as far back as this, these horse-borne forces had elements of 20th century cavalry units, such as integrated horse drawn artillery and the ability to fight dismounted. The Russian cavalry tradition continued through the Napoleonic wars and **by 1914 the Russian Army's mounted cavalry constituted the largest cavalry force in the world.** (p. 344)

The cavalry arm proved to be of very limited value during WWI, but then became a vital force in the subsequent Russian Civil War, where mobility and the ability to traverse large distances became paramount. The most famous unit in the Red Army at this time was probably the **First Cavalry Army.** At the end of the Russian Civil War the new Red Army had 12 cavalry divisions, and by 1929 this had grown to 14 divisions and 7 cavalry brigades. As the Red Army modernised and expanded in the 1930s, so did the cavalry arm. By this time the cavalry divisions in the Red Army would be more accurately described as **cavalry mechanised divisions, because they contained mechanised elements as well as the traditional mounted cavalry regiments.** The first true cavalry mechanised divisions were formed in the USSR from April **1936**, and included 4 horse cavalry regiments and a mechanised regiment with tanks and armoured cars.

By January 1938 the Red Army contained 7 cavalry corps HQs controlling 27 cavalry mechanised divisions, 5 mountain cavalry divisions and 2 cavalry brigades. This represented approximately **15% of the total forces in the Red Army.** Interestingly, these 27 cavalry mechanised divisions contained more tanks than the entire German panzer force in 1938. However it was around this point in time that the Soviet high command started forming its large armoured force, and this force was seen as superseding the cavalry force in the mobile exploitation role. **The result was that within a year, 8 of the cavalry mechanised divisions and the 2 cavalry brigades were disbanded.**

After Germany invaded Poland in 1939, the increased mobilisation of the Red Army resulted in an increase in cavalry numbers. Consequently by April 1940 there were 18 cavalry divisions, 5 mountain cavalry divisions, 2 cavalry brigades and 6 reserve cavalry regiments in the Red Army. These cavalry divisions averaged 6,300 men each, while the mountain cavalry 'divisions' averaged only 2,950 men each. **The noticeable thing about these numbers is that they indicate that the Red Army's cavalry forces were at a much higher state of readiness than its rifle forces during 1940.** While rifle divisions were averaging 33% to 60% of their TOE strength, the cavalry divisions were averaging around 85% of their TOE strength.

After the fall of France demonstrated to the world the true nature of future warfare, the **Soviets attempted to form no fewer than 61 tank divisions from mid-1940 to February 1941 (with 58 of them for their 29 new mechanised corps**). To help find additional cadres, personnel and equipment to form this massive force, in early 1941 **2 cavalry corps HQs, 11 cavalry divisions, 1 mountain cavalry division and 1 cavalry brigade were disbanded**. This represented well over half the cavalry mechanised forces in the entire Red Army in late 1940. In February-March 1941, and almost certainly as part of the overall '**cavalry reduction program**', the number of cavalry squadrons per cavalry regiment also appears to have been reduced from 5 (in the cavalry division's original 1939 Shtat) to 4.

By 22 June 1941 there were still 4 cavalry corps HQs, 9 cavalry (or cavalry mechanised) divisions and 4 mountain cavalry divisions in the Red Army force structure. **Although much smaller than the Red Army cavalry force that existed from 1938 to 1940, this still represented the largest mounted cavalry force in the world in June 1941.** (p. 344)

[117] **Note:** I believe I accidentally combined these two separate types of units into one section.

Cavalry Divisions (June 1941):

Unfortunately there appears to be *no definitive Shtat series* readily available which precisely shows the official organisation of the June 1941 cavalry divisions. There was an **official Shtat in 1939**, and it appears that by 1940-41 this was modified slightly to become the similar June 1941 cavalry division. Consequently the tables shown here have been compiled using the best available material, and incorporating these modifications. **The cavalry division's principal elements included**: 4 cavalry regiments each with 4 cavalry 'sabre' squadrons, a mechanised regiment with an armoured car company and a tank battalion, a horse drawn artillery battalion, a motorised anti-aircraft battalion and other smaller support units. The 1939 Cavalry Division (upon which the 1941 TOE was based) was authorised 5 cavalry squadrons per cavalry regiment, and the cavalry regiment's machine gun squadron had 5 MG Platoons (each with 4 MMGs). Some incomplete secondary sources indicate that the 1941 cavalry division still had 5 cavalry squadrons per cavalry regiment. However, it appears that the manpower and equipment limitations during 1940-41 also affected the cavalry division's organisation, although not as severely as the rifle divisions. Consequently **the dramatic 'cavalry reduction program' in early 1941** (due to the need for resources for the massive number of new mechanised corps being formed) resulted in slightly smaller cavalry regiments, so that by June 1941 the pre-war cavalry regiments resembled the structure shown in table Sov Cav Div 1, June 1941.[118] (p. 345)

The total number of armoured vehicles in the TOE was **64 tanks and 18 armoured cars**, which were all in the mechanised regiment. The tank battalion was authorised **64 BT cavalry tanks**, but due to other demands for BT tanks the 8th and 24th Cavalry divisions used **T-26 tanks** instead. In addition, there is evidence that **T-37, T-38 and T-40 Tankettes were used to make up numbers in some divisions (especially after June 1941)**. One interesting feature of the pre-war cavalry division was that they were relatively well protected against air-attack; at least on paper. The division was authorised a total of 20 medium to heavy anti-aircraft guns (37-76mm) and 43 AAMG mountings, of which **15 were quad MG mountings**. Unfortunately only the 76mm anti-aircraft guns tended to be present at full strength. The AAMGs (12.7mm DShK HMGs) were in very short supply. In addition severe shortages of the 37mm M1939 (61-K) anti-aircraft guns meant that very few, if any, June 1941 cavalry divisions actually had any of these weapons. **This meant the Red Army's cavalry divisions remained vulnerable to low level air-attacks during 1941-42, and mounted cavalry was particularly vulnerable to this type of attack.**

In terms of artillery and anti-tank forces, the June 1941 cavalry division was a well-balanced formation. It was authorised 16 45mm anti-tank guns and 32 artillery pieces, of which 8 were 122mm calibre. This was not a huge artillery force but was appropriate for a mobile force of around 9,200 men. **Most importantly, the cavalry divisions fielded on 22 June 1941 actually had most of these weapons** as well as the means to move them (albeit using mainly horses).

By international standards the Soviet pre-war cavalry divisions were still relatively small formations: using the 'size' equation we find that a full strength pre-war cavalry division's TOE was only 92% of the Minimum Divisional Size (MDS) value, even including a full complement of 64 tanks. **The division was generally not able to stand toe-to-toe in the line against German infantry or motorised divisions, but it still packed a considerable punch and remained a highly mobile and effective flanking and exploitation force**. (pp. 345-46)

When the Axis forces invaded the USSR in June 1941, **the Soviet cavalry force probably represented the most combat ready mobile force available to the Red Army**. The 9 available cavalry-mechanised divisions were at a

[118] **Note:** Nigel's sources include: C.C. Sharp, *Soviet Order of Battle World War II*, Volume V, George F. Nafziger, West Chester, OH, 1995, p. 100, shows a summary of the cavalry division in June 1941. Unfortunately, Sharp's summary is not definitive and contains several errors. S. J. Zaloga, L. S. Ness, *Red Army Handbook 1939-1945*, Sutton Publishing Ltd, Stroud, 1998,

higher state of readiness than any of the tank or mechanised divisions. These cavalry divisions had been formed years previously, had had plenty of opportunity to train as complete formations, and their officers were more experienced than in most other Red Army units. The cavalry arm was traditionally a prestigious arm of the Red Army; mostly because of the cavalry's importance in the Russian Civil War and in Russia's history generally. **The cavalry arm was also Stalin's favourite, and a place where he tended to place his 'favourite' officers. These factors resulted in the cavalry force suffering least from Stalin's purges from 1937 onwards**. Furthermore, in June 1941 the cavalry divisions were generally closer to their TOE strength compared to the average rifle division. This was because the cavalry division's authorised peacetime strength was around **7,400 men**, or around 80% of its full wartime establishment. Consequently on 22 June 1941 the average cavalry division actually had 6,030 men, or around 65% of its full wartime establishment strength. *The main reason for this was because it took a relatively long time to train cavalry units*, and in recognition of this fact their reduced peacetime strength was closer to their wartime TOE strength. The cavalry divisions relied less on the Soviets' war mobilisation plans to fill the division's personnel requirements in the days and weeks after hostilities commenced. (p. 350)

The problems faced by the cavalry units during Operation Barbarossa stemmed more from the current state of technology than any organisational deficiencies. Essentially, horses were not AFVs, and **cavalry divisions were lightly armed in terms of artillery and anti-tank weapons (in order to preserve their mobility).** Cavalry could not rely on heavy weapons to compensate for the vulnerability of being reliant on horse transport. Against German infantry equipped with automatic weapons and infantry guns, a mounted attack needed to be a complete surprise or a massacre usually resulted. Alternatively a large amount of combined arms support from artillery and tanks might enable a mounted unit to cover the 'deadly ground' and remain intact, but this type of operation required careful command, control and timing. This was not exactly a strong point of the Red Army leadership in 1941 (even experienced cavalry officers) and it was a very rare occurrence.

On top of this, cavalry mechanised divisions were designed for the fast moving exploitation role, so they never had sufficient armour to enable them to launch large scale tank-cavalry attacks. Certainly they could not face any serious panzer force in a tank vs. tank action. **Cavalry divisions also proved to be very susceptible to air attack in 1941-42, especially when attempting to move in daylight.** Even strafing fighters could prove highly effective. As mentioned previously, the cavalry divisions had almost no light flak and were acutely short of any AAMGs to defend against low level air attacks.

Fortunately the Red Army's cavalry was traditionally equipped, organised and trained to fight as dismounted infantry as well as mounted cavalry. Dismounted cavalry proved to be as effective as rifle infantry with the bonus of being far more mobile. The problem here was that during 1941 dismounted cavalry were sometimes used to defend a front sector and hold ground just like a rifle division. But cavalry divisions lacked the heavy weapons, such as mortars, artillery and anti-tank guns, which were required to do this job successfully. It is noticeable that those cavalry divisions that were ordered to hold and defend a front sector, instead of utilising their mobility to stay out of harm's way, **were quickly wiped out in the Soviet OOB**. On balance, however, **most Soviet pre-war cavalry divisions were able to survive far longer than any rifle, tank or mechanised divisions during 1941 and into 1942**. Even though these divisions rapidly diminished in size during June and July 1941, they were still able to manoeuvre, engage in limited offensive operations and sustain themselves in relatively hostile terrain, when most other Soviet divisions could do little more than stand in one place and fight until they were annihilated or forced to surrender. (p. 350)

Red Army Mountain Cavalry Units (June 1941):

On 22 June 1941, 4 of the 13 cavalry divisions in the Red Army were mountain cavalry divisions. As their name implies, these units were supposed to operate as cavalry in mountainous terrain and they were all deployed well away from the Western Military Districts in June 1941. The 17 Mountain Cavalry Division was in the Trans-caucasus Military District, while the 18th, 20th and 21st Mountain Cavalry Divisions were all in the Central Asia

Military District. All 4 pre-war mountain cavalry divisions transferred west in 1941 and saw action against German forces. In addition, 2 new mountain cavalry divisions were mobilised in July 1941. (p. 351)

The information available on the detailed organisation of the pre-war mountain cavalry division is very limited. The mountain cavalry division was considerably smaller than the pre-war cavalry mechanised division. Its key elements comprised: 3 mountain cavalry regiments each with 4 cavalry 'sabre' squadrons, a light tank/armoured car battalion, a small horse drawn artillery battalion, an anti-aircraft company (squadron), an engineer company (squadron), a chemical defence company (squadron) and various support units. The tank battalion was a small unit which was authorised **1 company with 16 BT tanks, and 1 company with 16 BA armoured cars.** The exception to this structure was the 17 Mountain Cavalry Division. This division had 4 cavalry regiments (the 13th, 45th, 91st and 128th), along with 20 T-26 tanks and 16 armoured cars in its 22nd Tank Battalion. . .

Overall, the Soviet June 1941 mountain cavalry divisions were very small to be classified as 'divisions' and were **more akin to brigades in size**. Using the 'size' equation we find that a full strength mountain cavalry division's TOE was only 61% of the Minimum Divisional Size (MDS) value. **These divisions were authorised only 7,281 personnel, were relatively lightly armed**, and were only around half way to being reasonably called divisional sized combat units in 1941.

Furthermore, although the 'mountain' title implies special training and equipment to deal with mountainous terrain, it doesn't appear that the mountain cavalry divisions ever received any specialised training or equipment which would have enabled them to move in mountains better than conventional cavalry. The title 'mountain cavalry' appears be a reflection of the ethnic background of these divisions and the mountainous areas from which they originated. The 17th came from the **Caucasus,** the 18th was originally a **Tadzhik unit**, and the 20th and 21st were originally **Turkestan units**. All the pre-war mountain cavalry divisions were transferred west during 1941, and they were all then employed as conventional mounted cavalry. Those units not destroyed eventually converted to the TOE organisation for the standard July 1941 cavalry division, described in the next section. (p. 351)

Cavalry Divisions (July 1941):

Despite the shortcomings of cavalry in modern war, **by July 1941 it was becoming obvious to the Soviets that mounted cavalry was the only mobile force that they could mobilise in the short term with any hope of fulfilling a deep strike mission**. This was very important to the Soviet command **whose entire pre-war doctrine was based around attacking the enemy into 'the depth of his defences'**. By mid-July the mechanised corps had proved a disaster and the new tank brigades would not have the size, structure, support and technical expertise to keep operating in a deep strike environment. In addition to this the Soviets possessed large numbers of trained cavalrymen in reserves. This was a result of two factors. Firstly, there was a lot of cavalry trained manpower available due to the large number of disbanded cavalry divisions going back to 1938. Secondly, there was a large amount of manpower available who were already used to horses and a mounted way of life. *These were nationalities from the Urals, Central Asia and the Caucasus.*

In order to get as much of this manpower into new mobile units as soon as possible the Soviets essentially abandoned the cavalry mechanised concept, and on 6 July 1941 t**hey released a new set of TOEs** (*Shtat* 07/4) for much smaller cavalry divisions. (p. 355)

The cavalry division's main elements included: 3 cavalry regiments each with 4 cavalry squadrons, a light tank battalion, a horse drawn mortar/artillery battalion and various small support units. The total number of armoured vehicles in the TOE was 31 tanks or tankettes. *Although the division was authorised a tank battalion this proved to be a phantom unit as the large majority of available tanks were reserved for the new tank brigades*. Few July 1941 cavalry divisions received any tanks during 1941. In recognition of this reality, in December 1941 the tank

battalion was reduced to a tank company with 10 tanks or an armoured car company with 10 armoured cars. (p. 357)

It is important to understand that the **new July 1941 cavalry divisions were far smaller and weaker combat units than the pre-war cavalry mechanised divisions**. The July 1941 cavalry divisions were authorised 46% of the personnel, 75% of the MMGs and 50mm mortars, 83% of the 76mm guns, 38% of the anti-tank guns, 27% of the trucks, 28% of the horse teams, 21% of the AAMGs, 48% of the tanks, 0% of the (8) 122mm howitzers, 0% of the (12) 37-76mm AA guns, and 0% of the (18) armoured cars in the pre-war cavalry divisions. In addition, **shortages meant that the pre-war divisions had mostly BT cavalry tanks while the average July 1941 cavalry division was lucky to have a handful of tankettes.**

In other words the July 1941 cavalry divisions were designated 'divisions' in name only: it is likely they were designated as divisions for morale and propaganda purposes. To reinforce this point it is noteworthy that the **Red Army's October 1941 rifle brigade was authorised 4,356 men**, which was more than the July 1941 cavalry 'division' with 4,239 men. *Unfortunately it appears the original Soviet propaganda has proved misleading enough for much post-war literature (and many simulation designers) to still rate the July 1941 cavalry divisions as genuine divisional sized units.*[119] In fact a July 1941 cavalry division at full strength only had, at most, 40% of the overall size and combat power of a typical pre-war cavalry mechanised division (and considerably less resilience during periods of prolonged combat).

The combination of large cavalry reserves and very small units meant that from 6 July to the end of 1941, no fewer than **85 July 1941 cavalry 'divisions' were fully or partially mobilised**. However, only 50 of the newly mobilised cavalry divisions were actually Mobilised and Deployed (MD); at most the equivalent of 20 pre-war cavalry mechanised divisions. (p. 358)

Red Army Mountain Units:

In the early years of the Red Army the creation of specialised units with honorific titles tended to be discouraged on ideological grounds (i.e., it did not fit in with the general philosophy behind the **RKKA** – The Workers' and Peasants' Red Army). Nonetheless it was also appreciated that mountain warfare is a specialised form of military conflict that requires specialised training and equipment. Therefore, despite its reservations, the Red Army high command decided to organise specialised mountain divisions for combat operations in this type of terrain, and the best place to recruit and form mountain units was obviously in the mountainous regions of the Soviet regime. (p. 360)

In the USSR these turned out to be in the **Transcaucasus and Central Asia districts**. However *during the first few years of the Soviet regime these regions were not easily pacified.* They had a long history of independence and fighting against the Imperial Russian Army. The Transcaucasus remained an active military organisation as the Separate Red Banner Caucasus Army as late as May 1935, when it became the Transcaucasus Military District. Similarly, the Asian nationalities east of the Caspian Sea maintained a rebel like stance until the mid-1930s. The result was that mountain units originating from these districts also tended to be 'nationalist' units.

Therefore even though the Red Army had officially abandoned honorific military titles, nationalist mountain units were still given nationalist titles, even after their incorporation into the Red Army. This was an attempt to enhance the cohesion and morale of these units by giving them an identity specific to their nationality, and not some vague

[119] **Note:** Even very authoritative authors seem confused by this. For example, D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, p. 17. **Glantz states there were 101 cavalry divisions fielded by the Soviets in 1941, and states these were 'divisional sized units**'. Glantz's 101 figure includes 13 pre-war divisions and 2 new mountain cavalry divisions. Glantz also uses the 101 cavalry divisions figure in his text to count the 'divisional equivalents' fielded by the USSR in 1941.

identity within the amorphous mass of the Red Army. The first mountain units formed therefore had titles such as **Azerbaidzhani, Armenians, Georgians, Turkomens and Uzbeks. In 1921 there was already a Turkestan Division** which became the 1 Turkestan Mountain Rifle Division in 1929. Soon after the Russian Civil War ended in 1922, there were 3 nationalist units formed in the Transcaucasus. These were the **Azerbaidzhanian, Armenian and Georgian Rifle Divisions, which were all designated as nationalist mountain rifle divisions in the late 1920s.**

By **1936 there were 10 nationalist mountain rifle divisions in existence** and the Soviet command felt confident enough to rename them with numbers in sequence with the rest of the Red Army's normal rifle divisions; although they still retained their nationalist titles. Thus the Armenian Mountain Division became the 76th Armenian Mountain Rifle Division, and the Azerbaidzhanian Mountain Division became the 77th Azerbaidzhani Mountain Rifle Division. **In March 1938 the nationalist titles were removed and the mountain divisions were given simple Red Army number designations.** Thus the 76th Armenian Mountain Rifle Division became the 76th Mountain Rifle Division.

These divisions remained in the Transcaucasus and Central Asia until after WWII started (in September 1939), and as they were not facing any perceived threat from Germany or Japan they were kept at a relatively low peacetime strength. Thus, from 1937 to 1939 the mountain rifle divisions only averaged around 4,000 men each. At this point it is also *necessary to state that these mountain rifle divisions appear to have received very little in the form of specialised training or equipment that would have significantly enhanced their ability to operate in mountainous terrain*. Probably the most significant difference was that the 'mountain' divisions had a higher proportion of **supply trains equipped with pack horses and mules**. **In this regard, the Red Army's mountain divisions cannot be considered the equivalent of the *Wehrmacht's* elite *Gebirgstruppen* (Mountain Forces).**[120]

When the Germans struck on 22 June 1941 **there were 19 mountain rifle divisions in the Red Army**. Of these, **6 were in the Kiev Special Military District**, 1 was in the Odessa Military District and the rest were in distant interior military districts. The 7 mountain rifle divisions in the west were all recently converted rifle divisions which were still reforming and *with little to no specialised mountain training or equipment*. In addition they were all still at a reduced 'peacetime level' of manning and equipment. (p. 360)

Mountain Rifle Divisions (June 1941):

The original wartime TOEs for mountain rifle divisions were drafted on 15th August 1940 and then subject to amendments, although no major changes were made during 1940-41. . . **A full strength June 1941 mountain rifle division was a large combat unit, similar in size to a pre-war rifle division.** Applying the 'size' equation we find that the mountain rifle division's TOE has a MDS value of 114% compared to a 135% for the pre-war rifle division's TOE. However, the mountain rifle division was rather unique in that **it did not use the traditional triangular divisional structur**e and had no mountain rifle battalions. It included 4 mountain rifle regiments, each with 5 rifle companies and each in turn with 3 rifle platoons. There were no battalion HQs between the mountain rifle regiment HQs and the rifle companies. Presumably the **architects of this TOE** assumed that the 20 rifle companies in the division would be operating relatively independently in mountainous terrain, so the rifle companies reported directly to their regimental HQs, which then directly coordinated any regimental and divisional artillery support. To assist in this, the regimental signal company was well equipped with 12 radios and the telephone-wire platoons **also had shuttering lights for flashing messages**. (p. 361)

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[120] **Note:** By 1941 the *Wehrmacht's* 6 mountain (Gebirgs) divisions represented the most highly trained and combat experienced, and best equipped, mountain-warfare force anywhere. **This was only challenged in 1943 by the advent of the US 10th Mountain Division**. The US only produced one mountain division in WWII, while the Commonwealth forces didn't produce any. Interestingly, the Hungarian & Rumanian mountain brigades were also among their most capable combat units.

Like the pre-war rifle division, the mountain rifle division had a light and medium artillery regiment; but the artillery in these regiments was considerably lighter than in the former. The light artillery regiment included 12 **heavy mountain mortars** in place of 8 122mm howitzers, and had **76mm mountain guns** in place of the heavier 76mm divisional guns. The mountain guns were usually 76.2mm M1938 Mountain Guns, but sometimes 76.2mm M1927/39 Regimental Guns were used. The medium artillery regiment retained the same number of 122mm howitzers but had no heavy 150mm howitzers.

In the anti-tank gun area the mountain rifle division was particularly weak. This was presumably because it was assumed these units would be operating in mountainous terrain which is generally very poor tank country. *As a result the entire mountain rifle division fielded only a single anti-tank company with 8 45mm anti-tank guns as opposed to the 54 45mm anti-tank guns authorised in a normal rifle division.* In addition all the 76mm guns in the division were short barrelled mountain or infantry guns. This dearth of anti-tank capable guns placed mountain rifle divisions at a severe disadvantage if they were caught in terrain where panzers could operate.

In the desperate battles of 1941 the mountain rifle divisions fared at least as badly as most of the pre-war rifle divisions. *In June and July 1941 the mountain rifle divisions in the Western Military Districts were forced to go into battle under strength, with little training, and (worst of all) in relatively open terrain against enemy armour and heavily armed infantry.* In this situation the lighter mountain equipment, lack of anti-tank weapons and limited mobility proved to be hugely disadvantageous. Despite this, all 7 mountain rifle divisions initially deployed in the west *survived the initial frontier battles and were able to withdraw eastwards. This was more due to their initial location in the 12th and 26th Armies, opposite Hungarian and Rumanian forces* and well south of the initial panzer thrusts by Army Group South, than to any inherent ability in the mountain divisions. **However, 5 of these 7 mountain rifle divisions were soon destroyed in the Uman pocket, and 1 was redesignated a rifle division in August 1941.** By the end of 1941 there were only 8 mountain rifle divisions left in the Red Army, the other 12 being either destroyed or redesignated as rifle divisions.

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3D. Red Army Airborne Units

The Red Army first experimented with using a rifle company as an 'air assault force' in 1928 in the Leningrad Military District. These experiments were conducted under the auspices of the **visionary M.N. Tukachevsky**, who was also one of the principal proponents of 'deep battle'. Sadly, Tukachevsky also became one of the first victims of Stalin's purge of the military in 1937. **The earliest recorded Soviet airborne operation took place in 1929 when a squad of 15 men was airlifted to relieve the town of Garm in Central Asia, which had been surrounded by anti-communist guerrillas.** By 1931 the VVS (*Voyenno-Vozdushnye Sily* - Military Air Force) had become involved on a larger scale and trials of larger scale airdrops were conducted. This led to the experimental Aviation Motorised Landing Detachment in the Leningrad Military District in March 1931. . . By January 1934 the Soviet airborne forces had expanded to include the 3rd Special Purpose Air Landing Brigade, 29 separate airlanding battalions, 4 detachments and several company sized units. The 3rd Special Purpose Airlanding Brigade included an air group with 2 squadrons of TB-3 bombers modified to carry 32 paratroopers or 50 airlanding riflemen, and a squadron of R-5 reconnaissance aircraft. (p. 368)

In parallel to this the *Komsomol* (Communist Union of Youth) and the ***Osoaviakhim*** **(a communist version of the boy scouts, which was essentially an early learning centre for the armed services**) promoted both glider and parachute training. Soon parachute training was a popular civilian activity and by 1935 the Osoaviakhim had over **2,000 glider schools in the USSR**. Meanwhile the airborne forces continued to expand in size and capability. This was dramatically demonstrated by manoeuvres near Moscow in September 1936, when 5,700 men were dropped by parachute in ten minutes and the 84 Rifle Division was air landed on the 'captured' airfield. There is **no doubt that in terms of size, development and training the Soviets airborne forces were ahead of the rest of the world at this time**.

By the end of 1936 the Soviet airborne forces contained 3 airborne brigades, 3 airborne regiments, 3 special purpose airborne battalions and 3 special purpose parachute regiments. In early 1938 the airborne forces consolidated and expanded to include 6 airborne brigades, and in early 1939 the special purpose regiments were formed into **airlanding regiments**. On the eve of WWII in September 1939, the Soviet Union had a total 6 airborne brigades and 3 airlanding regiments. These were designated the 201st, 202nd, 204th, 211th, 212th and 214th Airborne Brigades, and the 1st, 2nd and 3rd Airlanding Regiments.

The 211 and 212 Airborne Brigades **participated in the fighting at Khalkhin Gol** against the Japanese in 1939, while the 201, 204 and 214 Airborne Brigades **took part in the Soviet occupation of Bessarabia in June 1940.** The latter operation involved the 201 and 204 brigades making parachute drops ahead of the main force, but in the event there was no resistance from the Rumanians. The brigades were carried into action by 4 regiments of **TB-3 heavy bombers** and this constituted the first operational use of the airborne brigades which made use of their airborne capability. At this time the airborne brigades averaged around 3,000 men each and included separate parachute, glider and airlanding groups. **By the end of 1940 the Soviets possessed the largest airborne force in the world with over 18,000 men**. The *Wehrmacht* still had fewer than 10,000 trained paratroopers and airlanding infantry (although, by now with a great deal more combat experience), while Britain, the USA, France, Japan and Italy had nothing larger than an independent company or small regiment.

In early April 1941, after studying the successful German airborne operations in Norway, the Low Countries and France during 1940, t**he Soviet high command decided to drastically expand their airborne forces through the formation of 5 new airborne corps**. Never ones to let quality get in the way of quantity, the Soviet NKO decreed that each new airborne corps would have 3 airborne brigades, an additional separate light tank battalion and a large supporting corps HQ structure. To fulfil this tripling in size of the airborne forces, 5 of the airborne brigades were ordered expanded into airborne corps with only the 202 Airborne Brigade in the Far East remaining a brigade. At the same time **new April 1941 TOEs were issued for the airborne brigades**, which abolished the distinction between parachute and airlanding (or glider) troops within the airborne brigades, so they now only had parachute battalions. (p. 368)

From April to June 1941 it appears that most of the trainees for the 10 new airborne brigades and support units came from existing Red Army units with little to no experience in airborne operations. **Therefore in less than three months the Soviet airborne forces had gone from around 18,000 men trained in airborne operations and most with combat experience, to around 54,000 men of which around 66% had virtually no experience or training in airborne operations and very little training as a unit.**[121] To make matters worse, all the airborne brigades now had to line up for equipment, especially motorised equipment, along with the massively expanding tank and mechanised forces. **This was a very severe dilution of the elite nature of the Soviet 1940 airborne forces.** When coupled with the severe shortage of transport aircraft, it had, temporarily at least, turned the Red Army's airborne forces into a lightly armed ground force. When the Germans struck on 22 June 1941 the Red Army had 5 airborne corps (HQs) and 16 airborne brigades in its order of battle. (pp. 368-69)

Soviet Airborne Brigades (April 1941):

The TOE for the combat, signal, transport and supply elements of a Soviet April 1941 airborne brigade are shown in table Sov AB June 1941. The brigade's principal elements included 4 airborne rifle battalions each with 3 airborne rifle companies, and various company and platoon sized support units. **It should be noted that the tanks or tankettes were normally attached to the airborne corps HQ**,[122] which had 1 tank battalion with 3 tank companies. As it was common practise for the airborne corps to allocate 1 tank company to each of its airborne brigades, the tank company is shown in table Sov AB June 1941, although the personnel shown in this table does not include the attached tank company. (p. 369)

The first thing that is apparent from table Sov AB June 1941 is that the **term 'brigade' is misleading** because the entire April 1941 airborne brigade was authorised only 83% of the personnel in a typical pre-war rifle regiment (authorised 3,182 men). In addition a full strength airborne brigade had only 30% of the MMGs, 89% of the 50mm mortars, 33% of the 82mm mortars, the same number of 76mm infantry guns and the same number of anti-tank guns as a full strength rifle regiment. On top of this the brigade's supply and support structures were extremely lean and not designed for sustained ground operations. **In other words, an entire airborne 'corps' (with 3 airborne 'brigades') actually had similar overall combat power to the 3 rifle regiments in a reasonably well equipped April 1941 rifle division.** But the 3 rifle regiments in a rifle division also had 2 supporting artillery regiments, an anti-tank battalion, an anti-aircraft battalion, an engineer battalion and a whole host of supporting elements which the airborne corps did not have. . . **Obviously the Soviet 1941 airborne corps was deliberately designed to be small and very light for airborne operations**, and this was fine if the corps was used tactically and operationally in its designed role. But if the airborne brigade or corps was asked to operate as a ground based rifle unit, facing enemy armour or heavily armed infantry and supporting artillery, it was a disaster waiting to happen.

In the first month of Operation Barbarossa none of the airborne brigades had a chance to fight as paratroopers . . . There were several reasons for this. Firstly, air transport in each airborne corps was supposed to be provided by 2 assault-landing bomber aviation regiments equipped with TB-3s. But none of these units had been formed by June 1941 and overall the VVS was chronically short of transport aircraft. Secondly, in order to facilitate an air drop, at least air parity is needed (at least temporarily) over the drop or landing zone. After the disastrous air battles in June 1941, it was very difficult for the VVS to establish this air parity anywhere that German fighters were operating (even in moderate strength). . . (p. 369)

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[121] **Note:** This is an excellent example of the massive (mindless?) expansion of Soviet armed forces in the months before June 1941. The mechanized corps is of course be another example.

[122] **Note:** I am getting the impression that there existed virtually no type of Soviet formation that didn't included a certain number of tanks in its OOB!

The result was the **5 airborne corps and 15 associated airborne brigades Deployed (D) on the 22nd June 1941** were used as mobile infantry and their fate was sealed. **The 1 and 2 Airborne Corps were effectively wiped out in the Kiev pocket**. The 3 Airborne Corps was severely damaged and was as cadre to reform the newly mobilised second 87 Rifle Division after the original 87 Rifle Division was destroyed in the Kiev pocket. T**he 4 Airborne Corps was effectively destroyed by September 1941 after fighting in Byelorussia,** and was officially disbanded by December. **The 5 Airborne Corps was almost destroyed in Northwestern Front** and was withdrawn into reserve by July 1941 to be rebuilt. It went into action again in October and survived 1941 serving as regular infantry.[123]

Soviet Airborne Brigades (September 1941):

Due to the large training base of parachutists established by the various civilian groups in the USSR, and the desire of the Soviet high command to have an operational airborne option, **it was decided to expand the airborne forces in September 1941**. In September 1941 new airborne brigade TOEs were issued which modified the April 1941 structure mainly in detail. This new organisation is shown in table Sov AB Sept 1941. The original April 1941 airborne brigades called for around 2,630 men, while the **September 1941 brigades were somewhat smaller**. The biggest differences were that the new airborne brigades had no tanks or tankettes, no anti-tank guns at all, reduced motorisation for transport and support, and far fewer LMGs. *The latter was due to the LMG shortage (in the USSR) due to the huge numbers needed to even partially equip the many new rifle divisions*. As a consequence only 1 out of 3 rifle squads in the airborne rifle platoon had a LMG. Overall the September 1941 airborne brigade had only 39% of the LMGs authorised in the April 1941 airborne brigade. On the plus side, the new brigades were authorised 33% more light and medium mortars, and their bicycle mounted reconnaissance companies were authorised SMGs. (p. 371)

In terms of size and overall combat power, at least 5 of the Soviet September 1941 airborne brigades can be considered the equivalent of a newly mobilised July 1941 rifle division, despite their (apparently) more elite status. Although these units were probably more trained and motivated than ordinary Red Army riflemen, **it is obvious that the airborne brigades suffered from a complete lack of heavy weapons and support systems**. This is exemplified by the fact that the September 1941 airborne brigade had no anti-tank guns and its entire artillery component consisted of 6 old fashioned 76mm infantry guns. The fact that these brigades were so lightly armed provides strong evidence that they were intended for airborne operations when they were formed in late 1941; i.e., they were not just 'airborne' in name only. The first new airborne brigades and airborne corps started their formation in late September or October 1941. Before the end of 1941, **9 new airborne corps HQs and no fewer than 31 new airborne or manoeuvre-airborne 'brigades**' were formed. (Note: However, that in real and practical terms this was approximately equivalent to only six reasonably well equipped July 1941 rifle divisions, and not the equivalent of 15-16 'divisions' that some current works imply. (pp. 371-72)

The vast majority of airborne brigades mobilised after June 1941 never performed in any airborne (or any other) operations during 1941, **and most ended up being reorganised as rifle regiments in new rifle divisions in 1942.** The 2/204th Airborne Brigade (2/204th meaning the 2nd or replacement for the pre-war 204th Airborne Brigade) took part in several small airborne operations from January to March 1942. Similarly, the 2/214th Airborne Brigade participated in several airborne operations between December 1941 and February 1942, supporting the winter offensive west of Moscow. **These operations involved battalion or smaller sized parachute assaults.** (p. 372)

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[123] **Note:** All 5 airborne corps in Red Army essentially destroyed by end of summer 1941.

3E. Soviet Naval Ground Combat Units

Geographically and historically Russia was essentially a land power, and in most cases Russian sea power was therefore designed to augment the overall Russian land power capability. In the USSR this principle remained unchanged and the Red Army was still very much the senior service. With this in mind, control of the Baltic and Black Sea, and a strong naval defence force in the Barents Sea and Sea of Japan, were still seen as military necessities. Therefore during the five year plans of the 1920s and 1930s, significant industrial resources were allocated to building up the Soviet fleet. This included efforts to gain Italian, French, US and German shipbuilding expertise to support the naval expansion programme. The result was the construction of some large and significant capital ships, a large destroyer force and, remarkably, the largest submarine force in the world at the start of WWII.[124] (p. 373)

On 22 June 1941 the Soviet Navy (*Voyenno-Morskoy Flot* SSSR (VMF), Military Maritime Fleet of the USSR) had **911 military ships of all types** including small cutters (small patrol craft). 1177 The most significant vessels included 3 old battleships, 3 heavy cruisers, 4 light cruisers, 54 destroyers of all types, 22 guard ships, 98 minelayers and minesweepers, and **210 submarines**. In addition to these, 5 capital ships, 9 cruisers, 4 flotilla leaders (large destroyers), 26 destroyers, 88 submarines, 21 guard ships, 45 minesweepers and 10 river monitors had been laid down. This colossal building programme, large navy and large supporting (land based) naval air arm called for a large number of personnel, which were duly recruited or planned for.

However things started to go wrong for the Soviet Navy in WWII as early as the Winter War. Despite being around ten times stronger than the Finnish Navy, the Northern and Baltic Red Banner Fleets were unable to influence the course of the conflict. The Soviet Navy was in general not prepared for combat in the severe winter conditions. **In addition the poor training programmes, and the officer purges of the late 1930s, meant the seaman-ship and naval officers were of a relatively low standard**. Unfortunately the Winter War proved to be the forerunner of things to come, and **during the initial months of Operation Barbarossa the Baltic fleet was decimated.** The events and reasons which led to this are covered elsewhere: suffice to say that the Soviet surface units, which were superior to the Axis naval units committed in support of Barbarossa (especially in the Black Sea), were unable to show their strength.

After suffering heavy losses conducting withdrawals and evacuations in the summer of 1941, mainly to enemy naval mines and aircraft, the Soviets were not willing to risk their surviving major surface units. **In the Baltic most Soviet surface ships larger than patrol craft were effectively blockaded in Leningrad. In the Black Sea they were similarly kept in small Caucasian harbours**; although why the Soviet Black Sea Fleet did not exert more control of the Black Sea during 1941 remains something of a mystery. Obviously the huge naval construction programme was also cancelled as most of the workforce and steel were diverted to much higher priority programmes.

The result of all this was that **a large surplus of manpower became available from ship's crews, shore support personnel and naval training schools, just when the Red Army desperately needed large numbers of military trained personnel.** In fact, by far the largest contribution made by the Soviet Navy to the Soviet war effort during WWII was the provision of land troops for the army. In the second half of 1941, 146,899 men were released from the Soviet Navy for the formation of ground forces. Another 188,976 were released during 1942, and by wars end the total figure was close to 500,000. (p. 373)

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[124] **Note:** This is a little known fact. On 1 January 1939 the Soviet navy had **164 submarines**. At the start of WWII in September 1939 the German, British, and French navies had 57, 57, and 77 submarines, respectively. When Italy entered the war in June 1940 the Italian Navy had 115 submarines. In December 1941 the US and Japanese navies had 112 and 63 submarines, respectively. Data from Conway's All The Worlds Fighting Ships 1922-1946, Conway Maritime Press, London, 1980, pp. 4 and 321. Also, J. Ellis, WWII A Statistical Survey, Facts on File Inc, New York, NY, 1993, p. 245 Table 47.

Soviet Naval Infantry Brigades (June 1941):

In general the Red Army adopted the term rifle (*strelkovaya*) to describe organisations of foot soldiers, while similar units organised by the VMF were termed naval (or marine) infantry (morskaya pekhota). Accordingly units organised by the Red Army with naval personnel were termed naval rifle (morskaya strelkovy). The term 'morskaya' is usually translated as 'marine' in the West, but it must be stressed that Soviet WWII naval infantry and naval rifle units were not at all compatible to marine units in the Western sense. Specifically, the US Marine Corps and the Royal Marines were relatively elite units with far more training, equipment, organisation and support structures, and were capable of complex amphibious operations. (p. 374)

Prior to June 1941 there was only 1 brigade sized unit of naval infantry in the Soviet forces; namely the 1st Naval Infantry Brigade. This unit was originally formed by the Red Banner Baltic Fleet as the Separate Special Brigade of Naval Infantry in July 1939. It gained some amphibious assault experience during the Winter War, and in June 1940 it was designated the Separate Special Rifle Brigade. By 22 June 1941 it was mostly deployed at Tallinin with the numerical designation above. **There were also at least 11 separate naval infantry battalions, which were usually assigned security type duties** around major ports and naval installations. A total of 7 of these battalions were deployed in the Baltic Special Military District and another 4 were deployed in the Odessa Military District on 22 June 1941. Soon after the war with Germany started, improvised groups of naval personnel started defending **fleet bases such as Liepaja, Tallinin and Odessa**. These ad hoc groups had no fixed structure and utilised a variety of weapons. By late 1941 most of these units had been amalgamated into naval infantry brigades, although the degree of cooperation between the brigade's various battalions and companies was very limited. The naval infantry brigades were formed using a TOE (*Shtat*) from the Soviet Navy and consequently do not appear in the Red Army's Shtaty document.

Several naval infantry brigades were also **reported as having some tanks** during late 1941-42. However in every case this has been determined to be the result of a local 'battlegroup' situation; whereby the tanks were assigned by a local area commander because they were immediately on hand. For example, some naval infantry battalions around the Leningrad area received KV tanks directly from the Kirov factory (in Leningrad) before it was evacuated in October 1941.

By the end of 1941, 16 naval infantry brigades were mobilised of which 11 were Mobilised and Deployed (MD); that is to say, mobilised and assigned to an active Front or Army HQ in the USSR.

Soviet Naval Rifle Brigades (October 1941):

Around September-October 1941 the Red Army started receiving large numbers of the available naval personnel who were not assigned to any units. In order to get these personnel into the front line as soon as possible, the Red Army used many of them as replacements for existing combat units and simultaneously organised them into naval rifle brigades. A special Red Army TOE for these units was issued on 18 October 1941, and it was (understandably) similar to the TOE used for the standard Red Army October 1941 rifle brigades (which was issued on 15 October 1941).

Although the recruits in the naval rifle brigades had higher morale than their typical Red Army counterparts during 1941, **the naval rifle brigade suffered all the same organisational and equipment shortcomings**. In terms of equipment they had even fewer artillery pieces and less indirect fire capability than the already weak October 1941 rifle brigades, and they were barely more trained in infantry tactics. The only significant equipment advantages were more LMGs in the naval rifle platoons and a higher degree of motorisation. **Like the army's rifle brigades, the naval rifle brigades took very heavy casualties in late 1941 and into 1942**, and were unable to sustain themselves in combat conditions for an extended period. The naval rifle brigades did, however, succeed in getting the large number of available naval personnel fed into the 'meat grinder' which was the Eastern Front. By the end

of 1941, **28 naval rifle brigades were mobilised**, of which 21 were ‘fit for combat’ and Mobilised and Deployed (MD). In realistic and practical terms, **this equates to around 6 newly mobilised July 1941 rifle divisions** (i.e., 21 / 3-4). (p. 374)

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3F. NKVD, the Overall Organisation and Combat Capable NKVD Units

The Soviet NKVD (*Narodnyy Komissariat Vnutrennikh Del* or People's Commissariat for Internal Affairs) was the primary 'enforcer' organisation in what was a centralised totalitarian (Stalinist) state. Its lineage traces back to the Russian Revolution of 1917 and the creation of a new Bolshevik regime: the Russian Soviet Federative Socialist Republic (RSFSR). At this time the then Ministry of Internal Affairs (MVD) was turned into the People's Commissariat of Internal Affairs (**NKVD**). In December 1917 the Council of People's Commissars of the RSFSR created **a secret political police** called the 'All Russian Extraordinary Commission for Combating Counter Revolution and Sabotage', commonly known to the Russians by the abbreviation *Vecheka* or **Cheka**. The Cheka was headed by one **Felix Dzerzhinsky**, under the control of the NKVD, and it had the power to conduct quick non-judicial 'trials' and execute people it deemed 'enemies of the state'. Thus the pattern was set very early on, and the NKVD's extraordinary power and subsequent murderous reputation started in the very earliest days of the USSR. (p. 378)

I**n early 1922 the Cheka became the State Political Directorate (the GPU, still within the NKVD)**. **When the USSR was officially formed in December 1922**, the GPU became the Joint State Political Directorate (the OGPU of the USSR) and was separated from the NKVD (of the still existing RSFSR). **In 1934 the NKVD became the all-union security force (of the USSR)**, and the OGPU was incorporated into the NKVD as the Main Directorate for State Security (GUGB). The GUGB became the branch of the NKVD responsible for Soviet intelligence, espionage, internal counter espionage and secret police operations from July 1934 to April 1943. (Note: The other main directorate responsible for espionage and intelligence gathering was the Main Intelligence Directorate (*Glavnoye Razvedyvatel'noye Upravleniye* - **GRU). The GRU reported to the Red Army General Staff**, and as the armed force's military intelligence organisation it remained mostly independent of the NKVD throughout its history.

By 1934 the NKVD had also become responsible for regular police functions, detention facilities and corrective (forced) labour camps (GULags). Very soon the responsibility for the USSR's border protection forces and internal guard forces were added to the list. This is the reason why the USSR's NKVD, in its modern monolith form, is usually said to have been formed in 1934. From 1934 the NKVD underwent numerous organisational changes, depending mostly on the political machinations of the period, and its ability to terrorise and coerce the USSR's population only increased. Arguably, it was during Stalin's 'Great Purge' or 'Great Terror' from 1936 to 1938 that the NKVD reached its full potential in this regard. During this period the NKVD was headed by **Nikolai Yezhov**[125] (from September 1936), and then **Lavrentiy Beria (from August 1938**). A significant organisational change occurred in February 1941 when the GUGB (responsible for espionage abroad, intelligence and counter intelligence) was separated from the NKVD and redesignated the People's Commissariat for State Security (NKGB). Remarkably, at least part of the new NKGB was now meant to report directly to the Red Army and Navy high commands. However, this was very short lived because on 20 July 1941 (in the ensuing chaos after Barbarossa had commenced) the NKGB reverted back to NKVD control. The military counter intelligence sections (CI) of the NKGB only reverted back to NKVD control in January 1942.

By June 1941 the NKVD had become a massive and complex organisation **with its tentacles reaching into every aspect of civilian, military and political life in the USSR**. Diagram NKVD Org. shows the overall reporting structure for the principal NKVD Directorates just prior to the Axis invasion. The precise number of personnel in the NKVD in June 1941 (or during WWII in general) has never been firmly established. **This is due to most NKVD archives having never been opened to scholars**, the complexity of the organisation and the grey area concerning those officially in the NKVD. In the latter case there were proper NKVD personnel (with an official and formal rank), civilians who were employed by the NKVD, and NKVD 'prisoners' working for the NKVD as prison guards (mainly within the GULag Directorate). (p. 378)

[125] **Note:** Nikolai Yezhov was head of the NKVD while it was responsible for the worst excesses of Stalin's Great Purge.

However, the number of personnel in certain NKVD Directorates in June 1941 is reasonably well established. These include the **Chief Directorates of: Frontier Guards (GUPV), NKVD Railroad Troops (GUZhV), Troops for Guarding Industry (GUVOVPGD), Convoy Troops (GUKV) and Operational Forces (GUOV).** The border, security and guard units in these directories were **organised along the lines of battalions and regiments**, and, along with the **Kremlin Garrison (a regimental sized unit),** they represented the only NKVD troops which could be considered even remotely capable of front-line combat with a significant enemy military force. These Directorates and the Kremlin Garrison are highlighted in light orange in diagram NKVD Org. (p. 380)

It should be stressed that the term 'combat capable' is used very liberally here. **The NKVD units concerned were organised, trained and equipped as security units, and were never designed to be front-line combat units. The NKVD border, security and guard command structures were not integrated with that of the Red Army, nor were NKVD officers trained or equipped to function as part of an army on a large battlefield.** As we shall see later in this chapter, NKVD battalions and regiments often reported to a 'local' brigade or divisional HQ, but these performed primarily an administrative function. **NKVD units generally had few heavy weapons (which would have been pointless in most of these unit types), had little in the way of supply or communication (signals) support**, and the NKVD officers remained untrained in the staff work required for combined-arms operations.

The NKVD border, security and guard units were designed so they could operate in relatively small groups (down to company level) which could operate a large distance from a supervising HQ. Hence most of the limited supply and support infrastructure was usually concentrated at the battalion or regimental level. For example, **an NKVD Rail Security Division HQ** usually had its assigned regiments and battalions dispersed in locations hundreds of kilometres apart. The division was expected to provide security across thousands of square kilometres against possible attack by small groups of saboteurs or insurgents. **It was never intended to absorb a concentrated attack by an enemy military-grade ground force**. The most combat ready mobile forces in the NKVD in June 1941 were those in the **Chief Directorate of Operational (Mobile) Forces** with around **65,100** personnel. However, even the purpose of these units remained purely internal and repressive (in the literal sense of the word). The initial intent of this Directorate was to provide mobile security forces which could be quickly assembled and moved to troubled areas to bolster local NKVD forces as needed. From Diagram NKVD Org. we can see that around **388,800 troops in the NKVD in June 1941 are considered combat capable**.

The number of personnel in other NKVD Directorates in June 1941 is not quite so clear. . . The much larger **GULag Directorate** was responsible for administering and manning the huge network of forced labour camps (many of which were not much better than concentration camps) around the USSR. Interestingly, it was the Chief Directorate of Convoy (Escort) Troops which was responsible for escorting 'prisoners' to these camps by road or/and rail. The number of prisoners in these camps has never been firmly established, but widely published NKVD documents claim around **1,930,000** in early January 1941.[126] (p. 380)

To administer and guard these prisoners in June 1941, it is estimated that the GULag Directorate had approximately 48,400 NKVD personnel, 108,000 employees, and 38,000 'prisoners' working as guards within the camps. The latter were very often 'convicted' NKVD personnel who were working as guards to get back into the NKVD hierarchy. Taking into account all the NKVD Directorates, we can see that the total number of personnel in the NKVD in June 1941 was around 472,000, **of which around 82% were in Directorates fielding units capable of limited front-line combat duty.** If we include the NKGB this figure rises to around 490 000 (with 79% combat capable). If we include the civilian employees and 'prisoners' elevated to GULAG guard status as part of the NKVD, the total figure rises to around **636,000**. (p. 381)

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[126] **Note:** A. Applebaum, *Gulag: A History*, Penguin Books, London, 2004, pp. 515-517. The author states that most scholars who have worked in the NKVD archives (at least those that have ever been opened) agree that the NKVD figures are at least based on genuine compilations of data provided to the NKVD by the camps. On 1 January of each year from 1938 to 1943, inclusive, the figures are: 1,881,570, 1,672,438, 1,659,992, 1,929,729, 1,777,043 and 1,484,182.

However, the number of prisoners in the GULAGs only dropped by some 446,000 from 1941 to 1943, **despite almost a million GULAG detainees joining the Red Army during WWII.** Thus the overall size and activity of the GULag Directorate did not change much from 1941 to 1943. Furthermore, personnel in the NKGB (GUGB) were generally too valuable to 'waste' as front-line rifleman, and this also probably applied to most personnel in the GUInzhV Directorate. In addition, the large majority of the many NKVD border, security and guard units stationed in regions such as the Trans Caucuses, Central Asia, Transbaikal and Far East remained there (fulfilling their needed security function) for the duration of WWII. **Thus in late June 1941 the total number of NKVD personnel immediately available to join the fight against the Axis invaders was around 280,000**. Of these, around **131,000** were already Deployed (D) in 'combat units' in the Western Special Military Districts on 22 June 1941.

The greatest single contribution to the Soviet war effort made by the NKVD in 1941 was the **dispatch of around 114,000 trained NKVD personnel to help the Red Army form 15 new rifle divisions between 22 June and late July 1941**.[127] Most of these personnel came from the Chief Directorate of Frontier Guards (Border Troops). **Border guard troops were particularly sought after because they were relatively well trained as riflemen.** Prior to the war, **border guards** were drafted for three years in to the NKVD as opposed to two years for soldiers in the Red Army, and they were **trained in basic infantry tactics** with LMGs, MMGs and light mortars. These new Red Army rifle divisions conformed to the new July 1941 *Shtat* and were authorised 10,790 men each. The NKVD therefore contributed around 70% of the personnel authorised in these divisions. More importantly, it enabled these divisions to be mobilised very quickly and for at least the rifle elements in these divisions to be relatively well trained. The divisions concerned were the 243, 244, 246, 247, 249, 250, 251, 252, 254, 256, 257, 262, 265, 266 and 268 Rifle Divisions. . . Altogether, some **379,000 NKVD personnel** were therefore Deployed (D) in the Western Special Military Districts on 22 June 1941, were used to form 15 new rifle divisions for the Red Army in June and July 1941, or were used to mobilise a plethora of new NKVD units (mainly security units) from June to December 1941. (p. 381)

As a final note on the NKVD's personnel mobilisation during 1941, **it is necessary to mention a sinister and rarely publicised element of this process.** This concerns the number of corrective (forced) labour camp and guard personnel that became available. **As we have seen, one of the primary missions of the NKVD in peacetime, which continued during the war, was to provide security for the Soviet system of punitive labour camps (the GULAGS). In the event of war their instructions were to either move the prison labourers or exterminate them. All indications are that when these NKVD forces were summoned to the front, many of them they did the latter.** (p. 382)

NKVD Border Guard Forces:

The NKVD Chief Directorate of Frontier Guards (Border Troops) (GUPV) contained ca. 167,000 personnel in June 1941. The forces fielded on 22 June 1941 comprised 18 border district HQs, **94** border guard detachments (units), **3** remount cavalry regiments, **12** NKVD naval detachments and **11** NKVD air squadrons. Of these forces, 8 border district HQs, **48 border guard detachments**, 7 NKVD naval detachments and 4 NKVD air squadrons were Deployed (D) in the Western Special Military Districts.

NKVD Border Guard Detachments (Units) (June 1941):

On 22 June 1941 border guard detachments (or 'units', depending on source) were stationed on all the borders of the USSR. They were light security forces that were equipped and trained to patrol the border, detain illegal border crossers, counter enemy reconnaissance, **and serve as a 'trip wire'** to raise the alarm and/or delay any invading

[127] **Note:** C. C. Sharp, '*Red Death', Soviet Mountain, Naval, NKVD and Allied Divisions and Brigades 1941 to 1945*: Soviet Order of Battle WWII, Volume VII.

forces. **However, border guard units were not generally trained or equipped to engage in combat with an enemy's regular armed forces. . .** (p. 383)

The **94 border guard detachments** fielded across the USSR in June 1941 contained around **126,800** men, which equates to around 1,349 men for each detachment.1215 Note, all these figures include the 99th Border Guard Detachment on the Hanko Peninsula in Finland with 1,403 men in June 1941. The **48 border guard detachments** deployed on the borders with Finland, East Prussia, German occupied territories, Hungary, and Rumania (i.e. in the **Western Special Military Districts**) contained around 70,630 men, which averages around **1,471 men for each detachment**. The largest being the 97 Border Guard Detachment with 2,998 men at **Chernivtsi in the Ukraine**.

These NKVD troops were amongst the first to face the German Army on Sunday 22 June 1941, and, although many were promptly obliterated, a surprising number survived to fall back behind the regular army in the first few days of the war. However this didn't mean they lasted very long because, not being particularly mobile, many detachments were caught in the large pockets formed in the ensuing weeks and months of 1941. On 25 June 1941 the NKVD border guard detachments were r**edesignated NKVD border regiments**, and instructed to cover the rear areas of the Red Army and the rapidly shrinking 'state border'.

The number of original NKVD border guard detachments that survived the first few months of war can be judged from the number used to form NKVD border regiments. Out of the original 48 NKVD border guard detachments in the western USSR, only 26 survived with sufficient cadre to be redesignated as border guard regiments. Most of these survived because they were initially deployed in the Leningrad Military Distinct on the border with Finland, or on the left flank of the Kiev Special Military District and the Odessa Military District on the border with Hungary and Rumania.

NKVD Border Regiments (post 22 June 1941):

Using the designation 'border' is somewhat a misnomer in describing border regiments because these units no longer controlled borders in the normal sense. After Operation Barbarossa started the Soviet 'state border' in the west now corresponded to the rear edge of the front, or the furthest to the rear that combat support elements were located. Thus border regiments now usually operated between 10 and 30km behind the front line. **The role of border regiments was now rear area control and security.** This included capturing deserters, traffic control, anti-sabotage, countering enemy deep reconnaissance and, **most notoriously, retreat blocking. Retreat blocking is a nice way of describing operations where NKVD troops fired on any Red Army units (or individuals) which were attempting to retreat**. (p. 385)

The border regiment was authorised around **1,600 men** in total and was thus *smaller than the earlier border detachments*. **Although called a 'regiment', the NKVD border regiment had far fewer personnel and a fraction of the heavy infantry weapons in a July 1941 rifle division's rifle regiment.** In many Barbarossa simulations, NKVD border units and regiments are given the same overall combat power as regular Red Army rifle regiments. In reality the 1941 border regiment had only 59% of the personnel, 25% of the MMGs, 33% of the 82mm mortars and 66% of the anti-tank guns compared to a newly mobilized rifle regiment in a July 1941 rifle division.

In addition the NKVD border regiments **had no 50mm mortars, no 120mm mortars, no 76mm infantry guns and considerably fewer combat support elements**. In actuality, over 2 full-strength NKVD border regiments would have had similar overall combat power to typical 1941 rifle division's rifle regiment. Like the border detachments, the border regiments were simply not equipped or trained to engage in sustained combat with regular enemy forces. From June to December 1941 a total of **43 NKVD border regiments were mobilised.** Of these, 17 were newly mobilised from NKVD reserves and/or used new NKVD conscripts, and 26 were redesignated or

reformed from Deployed (D) border detachments (refer above). Around 26,400 NKVD reserve and new-conscript personnel were used in the formation of these units. (p. 385)

NKVD Remount Cavalry Regiments, June 1941:

The NKVD cavalry regiment was a rare unit which was assigned to border regions where the terrain and local conditions (including the local culture) suited a mounted security force. There were only 3 of these units in existence in June 1941: in the North Caucuses, Siberia and Central Asia Military Districts. Not much is known about these units, apart from their overall strengths and that they remained as mounted security units in the Caucuses or Eastern USSR for the duration of the war. (p. 387)

NKVD Rail Security Forces:

The NKVD internal guard forces included rail security troops **guarding virtually every major rail transportation facility in the USSR**. The Chief Directorate of NKVD Railroad Troops (GUZhV) contained ca. 63,800 personnel in June 1941. The forces reporting to the Directorate on 22 June 1941 comprised 9 rail security division HQs, 5 rail security brigade HQs, **34 rail security regiments, 14 rail security battalions and 33 armoured security trains**. Of these forces, 5 rail security division HQs, 19 rail security regiments and 18 armoured security trains were Deployed (D) in the Western Special Military Districts.

The NKVD rail security regiment comprised 3 lightly armed battalions, a reserve company, a signal company, an administrative regimental HQ and limited support services. In addition the NKVD's armoured security trains were usually assigned to a particular security regiment, with a regiment HQ typically controlling 1 to 2 of these units. The typical NKVD rail security regiment maintained a peacetime strength in the region 1,500 - 1,900 men, while in
wartime the number was most commonly in the region **1,800 - 2,200** men (it largely depended on the number of battalions assigned). (p. 389)

The rail security regiment was **designed to guard a large area in a dispersed mode**; protecting against sabotage, enemy rear area incursions and any possible guerrilla forces. Rail security regiments and battalions were also involved in controlling and guarding transportation convoys, and garrisoning key strategic facilities such as bridges. **The regiment had no weapons heavier than MMGs**, and was not trained or equipped to consolidate as one unit and fight enemy regular forces.

On 22 June 1941, around **27,900 NKVD personnel** were Deployed (D) in rail security units in the Western Special Military Districts (assigned to the 2, 3, 4, 9 and 10 Rail Security Division HQs). This represented around 44% of the total personnel in the GUZhV Directorate. Despite being designed for rear area security duties, **this did not prevent the 9 and 10 Rail Security Divisions from being all but wiped out in 1941, and the 5 Rail Security Division taking very heavy losses.** The 9th's regiments were mostly destroyed in the Baltic states and Belorussia (although they were rebuilt), the 10 Rail Security Division was destroyed in the Kiev pocket, while the 5 Rail Security Division was largely destroyed in the Kiev pocket and while defending Kharkov. **Approximately 23,100 NKVD railroad security troops are estimated to have been lost in 1941; most from the 5, 9, and 10 Divisions**. (p. 390)

NKVD Armoured Security Trains (1941):

The TOE of NKVD armoured security trains are covered in Volume IIIA, 3. 11) b. titled 'Armoured Trains and Armoured Train Battalions'. NKVD armoured trains were normally assigned to a rail security regiment HQ and usually carried the same number designation. For example, the 52 NKVD Armoured Security Train was assigned to the 52 Rail Security Regiment HQ at Petrozavodsk on 22 June 1941. Some rail security regiments were also

assigned (what is best described as) an 'armoured transport security train company', which was essentially an armoured train which could transport a rail security company or/and transport supplies. It is unclear if these trains included dedicated armoured locomotives or if they comprised rolling stock only. There were a total of **33 NKVD Armoured Security Train extant in June 1941**, of which 18 were in the Western Special military Districts. Of these, 10 were transport security trains, with 5 in the Western Special military Districts. It is unknown how many (if any) additional NKVD armoured security trains were mobilised from June to December 1941.

NKVD Motorised Rifle Division for Special Purpose (June 1941):

The NKVD Motorised Rifle Division for Special Purpose was the most prestigious unit in the NKVD, with the exception of the Special Purpose Regiment (assigned to the Kremlin Garrison HQ). It was a the only true 'division' fielded by the NKVD on 22 June 1941; whereby the divisional HQ was more than an administrative unit controlling dispersed elements, **and the division possessed the type of supporting arms one would expect in a combat-division**. However, the reader should note 'prestige' and 'combat capable' are not the same thing, and that in this case most of the division's personnel did not come for the experienced border guard reserves. The origins of the NKVD's Motorised Rifle Division for Special Purpose go as far back as the earliest days of the NKVD. In 1918 a transport and bodyguard unit was set up for the Russian Central Executive Committee (VtsIK) and the Council of People's Commissars (Sovnarkom). Between 1919 and 1921 this unit, with around 400 men, was transferred to the Cheka and designated the 1st Armoured Car Detachment. In April 1921 the 1st Armoured Car Detachment, 3 rifle companies and a cavalry squadron were merged to become the OSNAZ battalion (now with around 1,100 men) within the Cheka. (p. 397)

The NKVD Motorised Rifle Division for Special Purpose remained intact in the Moscow area during the whole period June to December 1941. The division spent its time patrolling the streets and guarding government facilities around Moscow. **One can only assume that Stalin and/or the Stavka saw the division as a sort of 'praetorian guard': a fanatically loyal and strong unit used to safeguard the capital and government against any possible coup**. It should be remembered that Stalin, as ever, remained very distrustful of his generals (and everyone else inside the USSR). It appears portions of the division did man defences on the outskirts of Moscow in late November - December 1941, but its greatest claims remains its 'achievements' as an **internal security unit. It was a major unit in the morale boosting Moscow parade of 7 November 1941, and the division apparently rounded up no fewer than 485 'enemy agents', 69,753 deserters, and over 320,000 civilian citizens during the war.** The figures speak for themselves: the OMSDON division's true 'special purpose' during World War II is clear, and it can consider itself fortunate that it was not caught in the open by the German Army during 1941-42. (p. 399)

NKVD Rifle Divisions (post 22 June 1941):

The NKVD **mobilised 3 rifle divisions between June and December 1941.** It would be a lot more accurate to say 'organised' 3 rifle divisions because the majority of the resources and personnel used to form these divisions came from existing NKVD formations.

These included: The **4 NKVD Rifle Division**, formed from 23 to 27 August (also called the 4 NKVD Crimea Division). It used the already Mobilised and Deployed (MD) 23, 24 and 25 Border Guard Regiments (themselves formed from the 23, 24 and 25 Border Guard Detachments). To this was added around 3,000 new militia personnel. **The understrength division (it does not appear to have had any artillery) went to the front in October and was evacuated from the Crimea in November 1941**.[128] (p. 405)

NKVD Kremlin Garrison, Separate Motorised Rifle Regiment:

[128] **Note:** I wonder if this NKVD unit took part in the Feodosia (sp?) massacre of German troops?

The last significant ‘combat unit’ fielded by the NKVD during 1941 was the Kremlin Garrison. Obviously this was a very prestigious unit and **was the last line of defence should any enemy forces, or any home-grown insurgent forces, attempt to seize control of the Soviet government**. Although the barracks and headquarters were in the Kremlin, the Kremlin Garrison also provided the bodyguard and escort forces for the most senior members of the Soviet government; specifically the Political Bureau of the Central Committee of the Communist Party of the Soviet Union (the Politburo). As one might expect, the Kremlin Garrison reported directly to People's Commissar L.P. Beria (the head of the NKVD).

The Kremlin Garrison regiment comprised 3 rifle battalions (which provided the security forces for the Kremlin and internal government buildings), an armoured car platoon (mainly for escort purposes), an anti-aircraft platoon, a chemical defence platoon, a signal company and regimental support elements. The regiment also incorporated a training academy, presumably for the instruction of selected NKVD officers. The garrison was also assigned a special purpose motorised rifle battalion (which likely provided the bodyguard and escort forces for senior officials, including Stalin), a fire-fighting company (assigned to protect the Kremlin itself) and a transport-supply company. The combat, signal, transport and supply elements of the **NKVD Kremlin Garrison** forces are shown in the table below. In the event the Kremlin Garrison forces never saw combat in 1941. **This is the NKVD force the *Wehrmacht* would have had to finally eliminate if it had captured Moscow in 1941**, particularly if any significant elements of the Soviet government had remained in Moscow (which would have been very likely). (p. 406)

(**Footnote 1250:** Even the best NKVD ‘combat-units’ fielded in 1941-42 struggled to perform as well as the better Red Army units. **German Army reports from the Operation Barbarossa period do not indicate they had any particular difficulty when dealing with NKVD units.** Generally, these reports don’t even differentiate between NKVD internal guard forces and those from ‘better’ combat-units, like the NKVD motorised regiments in the GUOV Directorate.)

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3G. Soviet Militia Units

Although the Russian People's Militia (***Narodnoe Opolcheniye***) had a **history dating back to Peter the Great**, it *had been neglected as a military force in the USSR immediately prior to WWII.* This was possibly because Soviet military doctrine in the 1930s emphasised carrying the war to the enemy in an offensive war. The idea that the Soviet population would need to be mobilised to defend their homeland, farms and factories was in contradiction to this doctrine and would likely be viewed as defeatist (probably a 'terminal condition' in Stalin's USSR). After the Axis invasion and the initial disasters in the Western Military Districts in June and July 1941, it became obvious to all that the USSR was in a fight for its life. **Militia units were suddenly no longer a defeatist concept, but were seen as an essential part of the massive mobilisation effort.** (p. 412)

As early as 24 June 1941 the Soviet Defence Committee ordered local Soviet citizens to form 'fighter battalions' for local defence and security. On 25 June the militia reserves were called up at the same time as the regular army reservists. The call up was initiated in all the Western Military Districts as well as in the Moscow, Arkhangelsk, Orel, Kharkov, North Caucasus and Urals Districts. Soon the Transcaucasus and the Siberian Military District were also mobilising militia units. **By the end of July 1941 mobilisation orders had called up over 5,500,000 regular reservists, and by the end of the year at least another 4,000,000 personnel had 'volunteered' for militia or similar 'volunteer' units.** However, it is noteworthy that the *Wehrmacht* moved so rapidly eastwards that approximately 500,000 of the regular reservists who had been called up were captured before being taken on strength.[129]

The main difference between the regular reservists and militia was that the latter were essentially untrained with no significant military experience. **It should be noted here that the term 'volunteer' should be not be taken too literally** *because the Soviet state had an immense amount of coercive power which they didn't hesitate to use.* Via direct recruitment or by the redesignation of militia units as Red Army units, **around 2,000,000 of the People's Militia became part of the Red Army during 1941.**[130]

There were four main areas into which the 1941 people's militia went:

1. **Militia Divisions.** Most of the militia personnel that ended up in the Red Army went into **militia rifle divisions and regiments. The number of militia divisions formed is commonly estimated at around 60**. This number needs to be carefully qualified because many militia divisions were only partially formed before being wholly incorporated into another militia division, or were quickly disbanded after starting their formation with their personnel going into other militia units. Approximately **another 200 militia rifle regiments and smaller units were also formed**. Most of the militia regiments were ultimately formed into divisional sized militia units (and later redesignated as Red Army divisions) or were incorporated directly into Red Army divisions.

2. **Militia Fighter Battalions**. By July-August 1941 local 'Party and Ministry of the Interior' (including NKVD) officials had formed **1,755 'fighter' or 'destroyer' battalions** (*Istrebitelnyi)*. These were small units with an

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[129] **Note:** This is also indicative of why it was essential for the Red Army to prevent the *Wehrmacht* overrunning the main mobilisation areas of the Western USSR from August to October 1941. **The most important mobilisation area was, by far, the Moscow-Tula-Kalinin-Gorki area. In terms of production output from factories, and the Soviet rail net, this was also the single most important industrial area in the USSR during 1941.**

[130] **Note: The Soviets actually 'over mobilised' in that they called up too many men too quickly, and it significantly damaged their short-term economic output.** In 1941-42, possibly as many as 1.5 million of those called up were returned to the war-economy (especially those with trade and farming skills). I*n the event, the USSR never had anywhere near sufficient weapons in 1941 to equip all the personnel 'called up'*. For example, the entire stockpile of rifles and carbines in the USSR in June 1941 amounted to **7,740,000** (including several hundred thousand stockpiled rifles dating back to beyond the Russian Civil War, and all those already in the Soviet Army, Navy and Air Force). There were also only around 100,000 SMGs in the whole of the USSR. Ibid, p. 246, Table 95.

average strength of around 200 men (with a great many unarmed). Many of these fighter battalions were incorporated directly into mobilising Red Army units or were eventually merged into larger militia units. By the end of 1941, approximately **1,350 of the initial batch of fighter battalions had been incorporated into the Red Army.** However, by that time more battalions had been formed in Moscow and Leningrad, and there were still around 600 in existence. (p. 412)

3. **Militia Cavalry**. On 13 November 1941 the Central Defence Committee authorised the formation of 'national volunteer' (*Dobrovoleniy*) units. **On 27 November the Central Asia and North Caucasus Military Districts started forming national cavalry divisions**, taking advantage of the large number of trained horsemen in these areas. These were soon designated Red Army cavalry divisions, and are included in the previous section covering July 1941 cavalry divisions. (p. 413)

4. **Red Army Units. Some militia divisions were immediately redesignated as Red Army rifle divisions and completed their formation under a Red Army numerical designation.** It is likely these divisions used a mixture of mobilised militia and regular reservists to fill their ranks. In addition many small militia units and individuals went directly into Red Army units, mostly new rifle divisions. These are included in the previous sections covering July and December 1941 rifle divisions.

Militia Rifle Divisions, 1941:

Current research has failed to uncover an exact and specific official *Shtat* (TOE) for militia divisions. It is possible that there was no official *Shtat* for several reasons. Firstly, most of the divisions formed in June-July 1941 were formed in a great hurry with whatever personnel and equipment could be sourced locally. Secondly, the tables of organisation used (at least initially) were largely generated by the local commands under which the militia divisions were forming. Thirdly, the initial organisation of these divisions was very transient and in some cases unique. They likely changed as more personnel and equipment became available and official Red Army TOEs came into effect. . . (p. 414)

In the event the pattern most used was the 29 July 1941 rifle division TOE, which was in effect until December 1941. This structure was much lighter in almost all respects, including: small arms, heavy weapons (especially anti-tank guns and artillery), signal equipment, all forms of motor transport and all forms of support infrastructure. **The July 1941 rifle division represented a much more realistic TOE for militia rifle divisions to conform to during 1941.**

Furthermore, **from August 1941 most militia rifle divisions were redesignated as 'newly mobilised' Red Army rifle divisions.** When this happened, these rifle divisions were then expected to conform to the July 1941 TOE (or at least a very close representation of it). Therefore in any military simulation considering the period to December 1941, it must be possible for militia rifle divisions to be able to reach the personnel and equipment detailed in the July 1941 rifle division TOE. The one exception to all this (and it seems there are always exceptions!) is the militia rifle divisions formed in Moscow.

The combat, signal, transport and supply elements of a typical 1941 militia rifle division are shown in table Sov MRD 1941. This organisation is based on the rifle division TOEs issued on 29th July 1941, specifically *Shtat* No. 04/600 to 04/616. There were also a number of differences that most militia rifle divisions experienced which stemmed from *equipment and transport shortages*. These included the following:

- Even fewer LMGs than the Red Army's July rifle divisions. In this case most militia division rifle platoons had 1x rifle squad (with an LMG) and 3x light rifle squads (with no LMGs).
- Only a single 82mm mortar battery in the militia rifle battalion, versus a mortar company in the rifle battalion.
- Only 1 light and 1 heavy anti-aircraft company in the militia anti-aircraft battalion, versus 2 light and 1 heavy anti-aircraft company in the anti-aircraft battalion.

● The staff (signal) company in the militia signal battalion was horse-drawn, while it was motorised in the signal battalion.
● **The divisional truck company was missing in the militia division**. This unit (using *Shtat* 04/610) was possibly added to some divisions in late 1941. However, **through 1941 the acute motor transport shortages remained throughout the Red Army,** and units such as the newly mobilising tank brigades always had a far higher priority to receive any available truck companies.

Ultimately **46 militia rifle divisions were mobilised in the second half of 1941**, and of these 43 were actually Mobilised and Deployed (MD). Of this total, 15 were Moscow militia rifle divisions (see below) of which 14 were Mobilised and Deployed (MD) in 1941. The large majority of both these division types **were redesignated as regular Red Army rifle divisions later in the year.** (p. 414)

Moscow Militia Rifle Divisions, 1941:

The Moscow militia rifle divisions were formed on a more limited basis compared to militia divisions in other districts. This was mostly due to the large number of militia divisions formed using the **huge manpower base in the Moscow district**, while at the same time there was a corresponding shortage of heavy weapons. It is likely, but not certain, that in late 1941 most Moscow militia divisions were built up to a similar strength as other militia rifle divisions.

The combat, signal, transport and supply elements of a typical 1941 Moscow militia rifle division are shown in table Sov Mos MRD 1941. The division followed the t*raditional triangular divisional structure*, and as far as is known the rifle regiments were ultimately based on *Shtat* 04/601 as per other militia rifle divisions. Beyond this, there were a number of significant differences as follows:

● The Moscow militia rifle division possessed little organic artillery. The division had only a single light artillery battalion with 12 76mm guns (in 3 batteries). Other contemporary rifle divisions (Red Army and militia) usually had an artillery regiment with 2 artillery battalions with a total of 16 76mm guns and 8 122mm howitzers.

● The Moscow militia rifle division did not have a dedicated signal battalion.

● The Moscow militia rifle division had an engineer company in place of a full engineer battalion. Also the small flame platoon (*Shtat* 04/609 and normally associated with the engineering battalion) was missing.

● Moscow militia rifle divisions appear to have had an additional anti-tank battalion attached with 12 45mm anti-tank guns. It is unclear if this unit was added to the Moscow divisions later in 1941.

● The number of men in the division varied. The table indicates an establishment strength of around **9,300** men. However these divisions varied from having 8,770 men to around 11,780 men, depending on the time period and how many rifle men were assigned.

With these changes, the Moscow militia rifle division was significantly smaller than other newly mobilised rifle divisions. . . As we can see, all the newly mobilised rifle divisions were relatively small divisions by WWII standards, with the smallest militia divisions being similar to most Western army's perception of a rifle brigade. Based on individual division histories, **a total of 15 Moscow militia rifle divisions were mobilised during July and August 1941.** Of these, 14 divisions were Mobilised and Deployed (MD). **All 15 divisions were redesignated as regular Red Army rifle divisions later in 1941.** (p. 416)

Militia Fighter Battalions:

Militia 'fighter' or 'destroyer' battalions (*Istrebitelnyi*) were **territorial in nature** and were formed by local government, security and party organisations. The leadership or 'officers' came from the active army or retired service personnel who had served as far back as the Russian Civil War. **The fighter battalions were intended for local defence and security, and were based on the idea that locals would be highly motivated to defend their home towns, cities and local communities.** *The term 'battalion' is really a misnomer* when applied to Soviet 1941 militia fighter battalions. A battalion implies trained infantry organised into companies and supported by battalion heavy weapons. In reality the militia fighter battalions consisted of whatever personnel could be raised from a factory, precinct, city block or village, and armed with whatever weapons became available. The number of men in a fighter battalion varied from 100 to 500, while the battalion was fortunate to have small arms (with very few LMGs) and light mortars.[131]

Obviously fighter battalions varied tremendously in size, with the average estimated to have contained around **200 men.** Of these, only around two thirds of them would likely have been armed during 1941. Weapons consisted mainly of old and very **old rifles, pistols, Molotov Cocktails, a few SMGs (especially if near an SMG factory) and a few LMGs.** The only common artillery type weapon issued was the small 50mm mortar, due to the availability of this weapon in 1941 and the fact that it required very little training.

The most significant and valuable contribution of the militia fighter battalions in WWII was that they **acted as a military training 'primer'; before the units or individuals were incorporated directly into the Red Army**. Due to the *large numbers of fighter battalions formed and ultimately used by the Red Army, this was a very significant contribution.*

As mentioned previously, around **1,755 militia fighter battalions** were formed by July-August 1941. These battalions used around 328,000 men and women of the mobilised militia. Of these, approximately **1,350 battalions, with a total of around 250,000 men, had been incorporated into mobilising Red Army units by the end of 1941.**

Approximately 200 additional battalions were formed after August 1941, mainly in Moscow and Leningrad. By **the end of 1941 there were still around 600 militia fighter battalions on strength.** Most of these units were merged into regular Red Army units in 1942 or were disbanded. (p. 418)

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[131] **Note:** This sounds just like the kind of unit elements of Weich's Second Army fought against in Gomel in August 1941 (if I'm recalling correctly).

3H. Red Army Corps, Army and Front Level Units[132]

a. Red Army Corps and Army Level Artillery Units

The artillery tradition in the Red Army came from the long artillery tradition in the Imperial Russian Army. As far back as the Napoleonic wars, the **Russian army had a higher proportion of cannon than even Napoleon's army.** *However by WWI the quantity and quality of artillery in the Imperial Russian Army had declined to the point that some argue this was the root cause of their defeat at the hands of the Germans.* This is oversimplifying to a very large degree as there were many other severe problems in the Russian army at this time; not least the common soldier's justified lack of faith in their officer leadership. (p. 419)

After the Russian Civil War the artillery arm grew rapidly (and steadily) as the Red Army strived to attain absolute artillery superiority over any possible foe. **They were determined not to be caught out by any possible shortage of artillery as they were in WWI.** By June 1941 the Red Army had amassed approximately **33,200 field guns** from 76 to 203mm in calibre, and **56,100** mortars from 50 to 120mm in calibre. If anti-tank and anti-aircraft artillery are included, the Red Army had around 112,800 guns and mortars in its inventory in June 1941. 1314 As with many weapons in the Red Army, this represented the largest gun and mortar pool available to any army in the world at this time, and at least as many as all the armies of Europe combined.

This massive artillery arsenal (excluding mortars less than 120mm, and anti-aircraft, anti-tank, coastal and railroad guns) was organised into the following combat units on 22 June 1941:

- 488 divisional artillery regiments (covered in the various TOE sections above).
- 94 corps artillery regiments with 55 in the Western Military Districts.
- 14 RVGK cannon regiments with 9 in the Western Military Districts.
- 29 RVGK howitzer regiments with 12 in the Western Military Districts.
- 31 RVGK super heavy howitzer regiments with 18 in the Western Military Districts.
- 15 RVGK high power artillery battalions with 6 in the Western Military Districts.
- 8 Mortar Battalions with 2 in the Western Military Districts.

Despite the very impressive TOEs (detailed below) for all the Red Army corps and army artillery regiments during 1941, **there were at least two fatal weaknesses in the Red Army's artillery arm in June 1941. These were lack of transport for both towing and supply columns, and totally inadequate infrastructures (including trained personnel) to enable effective indirect fire operations.**

I**n the immediate pre-war period the Soviets made a serious effort to motorise their corps and RVGK artillery regiments and battalions**. This largely manifested itself in a suitable range of **prime movers (artillery tractors)** being developed and then commencing production. However the artillery regiments in 1940-41 had to line up for motorisation assets along with many other Red Army units, especially the massive number of newly mobilised mechanised corps. **The result was that most of the corps and army artillery regiments in the Western Military Districts had 50-70% of their required tractors, and only 15-25% of their required trucks in June 1941.** When these shortages were coupled with the general repair and supply state of the Red Army's transport park, **it meant that most of the corps and army level artillery regiments could barely move as fast as even the slowest German infantry divisions** (as well as being unable to move sufficient ammunition forward to keep the artillery batteries supplied). This relative immobility was a much more serious weakness in corps and army support units than in divisional units. This was because corps and army units needed to be quickly available to the corps or army HQs in order to support critical sectors in attack and defence. If they were not mobile then

[132] **Note:** These are "General Headquarters" troops (GHQ).

they simply took too long to come into action, and against a fast moving German panzer thrust there was not much time to identify the main axis of attack and redeploy vital defensive support units.

On top of the acute lack of transport, the **Red Army artillery arm suffered from a chronic shortage of the trained personnel and equipment required to enable indirect fire operations**. Once the five year plans were in effect it didn't take long for the Red Army to receive large numbers of guns. However, in the 1930s and early 1940s **Soviet industry was unable to provide the precision electronics, or instruments like radios and wire communication equipment, to meet the needs of the rapidly expanding artillery arm**. Even more drastic was a dearth of educated personnel capable of meeting the demands for surveyors, radio operators, fire direction controllers, communication specialists, trained staff officers, etc. Even if these personnel had been available, by June 1941 the Red Army had had no time or opportunity to train sufficient personnel to provide an indirect fire capability for even a fraction of the over **670 artillery regiments** in the army. **The result was that almost all the Soviet artillery units fielded in 1941-42 were not capable of accurate or responsive indirect fire operations**. Consequently they were usually used in either direct fire mode (most common) **or in indirect fire mode using pre-set fire patterns**. It is important to note that the inability of a ground-force to use responsive indirect artillery fire has a significant impact on its Relative Overall Combat Proficiency (ROCP). (pp. 419-20)

Corps Artillery Regiments:

In June 1941 the Red Army contained **62 rifle corps**. Each rifle corps was supposed to contain around 3 rifle divisions and support units, including 2 motorised corps artillery regiments. The corps artillery regiments initially came in two types: **Type A** with a mixture of guns and howitzers, and **Type B** with only 152mm howitzers. Due to the rapid expansion of the Red Army and the subsequent increase in the number of rifle corps, it became impossible to provide each corps with 2 artillery regiments so a third variant designated **Type C** was created. The Type C corps artillery regiment contained 48 guns and howitzers as opposed to 36 in the Type A and Type B, but was intended to be the sole artillery regiment in a rifle corps. (p. 420)

Despite the attempt to rationalise with the **Type C** regiments, in June 1941 there were only sufficient corps artillery regiments to provide around 40 corps with 2 Type A artillery regiments and 13 corps with a single Type C artillery regiment (i.e., there were 81 Type A and 13 Type C regiments). **No Type B regiments were fielded from June to December 1941.** This should not be viewed as a shortage of artillery as much as an enormous number of rifle corps! Both types of corps artillery regiment [Type A and C] were relatively large units by standards of the time. The large size of these units largely stemmed from the high number of authorised personnel and the large number of authorised trucks. The regiments were also authorised a fourth artillery observation battalion which contained a **sound ranging battery, a flash ranging battery, a survey battery, an aerial photography platoon and a meteorological section**. Some of these elements were important in enabling indirect fire operations. In June 1941 most of these elements were missing, or were still untrained, undermanned and/or ill equipped to fulfil their intended function.

Arguably the biggest weakness of the corps artillery regiments in June 1941 was their **lack of mobility**. This was mostly due to the **absence of suitably powerful and reliable prime movers**. As can be seen from the table, the typical artillery piece in these regiments required an 8 ton towing tractor (or equivalent) and was moved in one load. The only military grade prime-movers produced in the USSR able to fully meet this specification were the **S-2 Stalinets, Komintern and Voroshilovets tractors**. Although fine machines, fewer than 2,200 of these prime-movers were available on 22nd June 1941. This was only enough to fully equip 26 Type A corps artillery regiments, or around a quarter of the number the Red Army was trying to field. On top of this, most of these 'top rank' prime movers were reserved for the even heavier RVGK artillery regiments and battalions (see following sections). (pp. 420-21)

In the event, if a corps artillery regiment had tractors at all, they were usually the lighter 6 tonne **Kommunar tractor, or ChTZ S-60 or ChTZ S-65 tractors**. The Kommunar tractor was an old agricultural tractor which had

been **in production since 1924, and only around 1,200 were in the Red Army in June 1941**. The ChTZ machines were fully tracked agricultural tractors with a 4.1 - 5.5 tonne towing capacity, and possibly as many as 3,600 were in the Red Army's inventory in June 1941. The ChTZ tractors were only just able to tow the Red Army's 122-152mm guns and howitzers (even on roads), had seen heavy use with many desperately needing overhaul (the ChTZ S-60 had been **in production since 1932**), and their top speed was a paltry 7 - 8kph. All these slow prime-movers had never been designed to pull overweight loads across country for long distances and for prolonged periods, or to operate in a harsh military environment. (p. 422)

The overall transport problem in the corps artillery regiments (in June 1941) was compounded by **the fact that they were in the process of being fully motorised and there was no contingency to use horse transport. They were effectively caught in a transitory state while being only partially equipped.** There were no horse teams available to these units in the Western Military Districts when the Axis forces struck on 22nd June 1941, and even if horses became available there was no easy method to use horses to tow such heavy weapons. The artillery limbers and towing trailers needed were not available, and unfortunately simply attaching horses to a 6-8 ton artillery piece simply doesn't work (at least not without crushing the horses at some point). In the event, the large majority of corps artillery regiments lost in the Western Military Districts from June to August 1941 *were simply unable to move out of harm's way*. Just as bad was the fact that they were **largely unable to move quickly enough to bring their formidable firepower to bear** at opportune times in the land campaign, or/and were unable to supply their artillery batteries with sufficient supplies for any extended period.

An illustration of the **huge losses in the corps artillery regiments** is the fact that from June to December 1941 the Red Army lost 400 107mm guns, 900 122mm guns and 2,100 155mm guns.[133] This is equivalent to the staggering loss of over 94 Type A corps artillery regiments in six months! In the disasters in the Western Military Districts in June and July 1941, the rifle corps structure ultimately did not prove much more successful than the mechanised corps. In September 1941 the rifle corps structure was abolished and surviving corps artillery regiments reverted to the RVGK pool. Most of these were broken down, and their personnel and equipment went into forming the smaller 'RVGK (army) artillery regiments' from September 1941.

RVGK Cannon and Howitzer Regiments:

The RVGK (sometimes abbreviated as RGK, **Reserve of the High Command**) artillery units were usually assigned at the army HQ level. The particular army could then use them to support whatever corps and divisions were at it its disposal in order to successfully complete its mission. Therefore armies earmarked for offensive operations and so called 'shock' armies usually had a higher proportion of RVGK units. By 1939 there were 24 RVGK artillery regiments as well as several battalions of even heavier artillery. Following the Winter War the 122mm howitzers in the RVGK artillery regiments were viewed as too light, so these were handed out to the rifle divisions and were replaced with **152mm gun/howitzers.** The old RVGK artillery regiments were redesignated RVGK howitzer regiments, and their TOE was expanded to include 4 battalions, each with 3 batteries of 4 gun/howitzers. At the same time new RVGK cannon regiments were formed with 122mm guns and the same structure as the new Type C corps artillery regiment. (p. 422)

This meant that by June 1941 the **14 RVGK cannon regiments and 29 RVGK howitzer regiments** mostly had the same type of 122mm and 152mm gun/howitzers as in the corps artillery regiments. The equipment included in the TOEs for the combat, signal, transport and supply elements of the 1941 RVGK cannon and howitzer regiments are shown in table RVGK Can & How Art Regs. The exception to this was the 524th RVGK Heavy Cannon Regiment in 24 Army, which called for 24 152mm M1935 (BR-2) guns. . . It is probable that the RVGK artillery

[133] **Note:** Note, these are gun or cannon losses and come from corps and **RVGK** artillery units. They are not divisional artillery, which were mostly 76mm guns and 122-152mm howitzers. An additional **12,300** 76mm guns, **6,000** 122mm howitzers and **2,600** 152mm howitzers were lost by the Red Army from June to December 1941. These losses were predominantly from divisional artillery.

regiments actually had a higher proportion of their authorised tractors and trucks compared to the corps artillery regiments, **but they were still desperately short of transports** and other support elements. The 1941 RVGK cannon and artillery regiment TOEs didn't survive more than a few months. They were replaced with new TOEs on 4th September 1941, which were the smaller and easier to handle 'artillery regiments RVGK', sometimes called 'RVGK (army) artillery regiments.' (pp. 422-23)

RVGK Super Heavy Howitzer Regiments (BM):

The Soviet designations for heavy artillery were somewhat confusing when compared to Western armies in 1940-41. The term 'heavy' (*tyazheliy*) was initially applied to units equipped with **152mm M1935 (BR-2)** guns. The next heavier category was given to units equipped with 203mm M1931 (B-4) howitzers; abbreviated as BM. A final even heavier category was given to units with **210mm or larger guns, and 280mm** or larger howitzers; abbreviated as **OM**. **By May 1940 there were around 20 RVGK BM regiments in the Red Army, and this force had expanded to 31 regiments by June 1941.** . . The regiments were organised into 4 battalions, each with 3 batteries of 2 guns. (p. 424)

Of all the artillery units available to the Red Army during 1941-42, **super heavy howitzer regiments were one of the most difficult types to use. This was especially true in 1941**, given the almost inherent weaknesses in Red Army artillery in terms of motorised transport and the ability to conduct responsive indirect fire operations. In addition, **to use such large and powerful artillery pieces in a direct fire mode was inviting their rapid destruction**, and was an incredible waste of such expensive and difficult to replace weapons. RVGK super heavy howitzer regiments were costly in every respect, and they utilised a great deal of scarce motorised transport and support resources.

The Red Army's solution to this problem appears to have been simple: **they rarely used them in 1941**. **Only 18 RVGK super heavy howitzer regiments were deployed in the Western Military Districts on 22 June 1941**, **and well away from the border regions in these districts**. Most of these regiments were withdrawn eastwards to strategic city locations, such as around Moscow, where they could be placed in heavily fortified defensive positions. In these circumstances mobility was less important and the M1931 (B-4) howitzers were more likely to receive the support they needed to be effective. To illustrate this, only about 100 203mm and above artillery pieces were lost from June to December 1941, which represents around 9% of those available and received in the same period. This is by far the lowest percentage of inventory loss of any category of artillery in the Red Army during 1941. (p. 424)

RVGK High Power Artillery Battalions (OM):

The RVGK high power artillery battalions (abbreviated OM) **represented the heaviest category of artillery utilised by the Soviets during WWII, apart from some types of railroad and coastal artillery.** In June 1941, the
15 **existing RVGK high power artillery battalions** were organised to include 3 batteries, each with 2 **210-305mm guns, howitzers or mortars.** The equipment included in the TOEs for the combat, signal, transport and supply elements of the 4 types of RVGK high power artillery battalions (OM) are shown in table RVGK H Pwr Art Bats. The most significant **high power artillery battalions** were the 8 battalions equipped (mostly) with 280mm M1939 (BR-5) mortars. A few selected battalions also had the 280mm M1915 mortar, which was a slightly lighter and less capable weapon. **Both these 'mortars' were essentially siege weapons and were capable of destroying heavily fortified positions with relative ease**. However heavy siege artillery was not particularly useful to the Red Army in 1941 and they used up an unacceptably large proportion of desperately needed resources, particularly

heavy military tractors which were in very short supply. **Like the RVGK super heavy howitzer regiments, they were thus rarely used in 1941. They were also rarely used later in WWII**.[134] (p. 425)

To a large extent the remaining 7 RVGK high power artillery battalions deployed in June 1941 were attempts by the Red Army to experiment with even larger calibre weapons. A total of 5 of these battalions were equipped with the **extremely heavy 305mm M1915 howitzer, which was the heaviest artillery piece fielded by the Red Army during WWII.** The weapon weighed almost **65** tonnes in action and was usually transported over long distances in a disassembled form on railcars. Tractors were then used to move the weapon to its final location where it was assembled and emplaced on a triangular girder frame (bed). Very few of these artillery pieces saw action during 1941 with the Red Army *as they were clearly designed for relatively static siege warfare.*[135]

A single RVGK high power artillery battalion (in the Moscow Military District) was equipped with another 305mm weapon; namely the **extremely rare 305mm M1939 (BR-18) gun-howitzer**. This weapon originated as a **Skoda design**, and 3 units were purchased by the Soviets (from the German annexed Czechoslovakia) in 1939 in an attempt to satisfy a perceived need for heavier guns. It resembled the 305mm M1915 (above), except that it could be disassembled into 3 major components and moved over long distances using motorised transport. Emplacement was a laborious process involving the construction of a suitable trench. **At least 1 305mm M1939 (BR-18) gun-howitzer was deployed in the Moscow Military District on 22 June 1941**, but it is unknown if these weapons saw action during WWII. . . (p. 425)

On balance, **none of the artillery pieces fielded by the RVGK high power artillery battalions were particularly successful designs**; with the arguable exception of the 280mm M1939 (BR-5). All these weapons required large amounts of heavy transport, and were slow and laborious to set up. They also required the type of trained artillery personnel that the Red Army was least able to supply during 1941-42. Consequently very few of these battalions were fit for action in 1941-42, and they were **rarely used during WWII**.[136]

RVGK Mortar Battalions:

By 1941 the Soviets had the 120mm M1938 mortar in widespread service, and this weapon was arguably the best weapon in its class in the world at that time. The only other contender for this title was the excellent Finnish 120mm Tampella M1940 mortar. (p. 427)

The 120mm M1938 mortar was a **powerful weapon with a good indirect fire capability**, and in Red Army doctrine it was considered an artillery weapon. For this reason the RVGK mortar battalions are included here as artillery units.[137] **By June 1941 the 120mm M1938 mortar was issued to a single mortar company (with 4 mortars) per rifle regiment in the rifle divisions** (i.e. **12 mortars per division**). These mortars were transported on horse-drawn wagons. The M1938 mortar was also used to equip 8 RVGK mortar battalions acting as separate artillery support units. As one would expect, these units were fully motorised.

The mortar battalions proved to be quite successful. They were relatively mobile compared to heavier artillery, and were small enough for the Red Army command and control systems to handle in 1941. Between June and

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[134] **Note:** Soviet super-heavy artillery (e.g., 280mm mortars) were virtually unused throughout Russo-German War. It was essentially *siege artillery.*

[135] **Note:** There were only around **34 305mm M1915 howitzers** available in June 1941; just sufficient to fully equip the 5 battalions extant. A. Ivanov, *Artillerija SSSR v period vtoroy mirovoy vojny* (Artillery of the USSR in Second World War), SPb, Neva, 2003.

[136] **Note:** Unlike the Germans, who employed massive guns at both the Brest Fortress in June 1941, and again Sebastopol in the Crimea in 1942.

[137] **Note:** When the **Germans copied the 120mm M1938** and issued it under the designation *Schwere 12cm Granatwerfer* 42, it was classified and issued as a heavy infantry weapon.

December 1941, 120mm mortar production allowed 11 additional mortar battalions and 1 mortar brigade (with 3 battalions) to be mobilised and deployed. (p. 427)

RVGK (Army) Artillery Regiments, September 1941:

By August 1941 it had become apparent to the Soviet high command that the (surviving) corps artillery regiments, as well as the RVGK cannon and howitzer regiments, were not working for the Red Army. Both regiment types were proving too large, which made them difficult to control or move efficiently. In addition new regiments of 36-48 guns were going to be too difficult to mobilise and deploy quickly due to shortages of: new artillery pieces, motorised vehicles (especially trucks), all types of prime movers and trained artillery personnel. To alleviate some of these problems, the Soviet high command initiated four key actions:

● Firstly, surviving corps artillery regiments reverted to RVGK control. This was easy because the rifle and mechanised HQs were already in the process of being abolished.

● Secondly, **existing RVGK cannon and howitzer regiments had the number of guns and howitzers halved** by the simple expedient of reducing each battery from 4 to 2 artillery pieces.

● Thirdly, on 4 September 1941 new TOEs for RVGK artillery regiments were issued. These became known simply as 'artillery regiments RVGK' or 'RVGK (army) artillery regiments'.

● Fourthly, all TOEs called for an **increase in horse transport and did away with the idea that that these units had to be fully motorised**: the old fashioned horse teams were far better than no motorised transport at all. (p. 428)

There were 2 types of new RVGK (army) artillery regiments; **Type 1 and Type 2**. The Type 1 regiment called for 2 battalions of 120mm guns and 1 battalion of 152mm gun/howitzers. The Type 2 regiment called for 3 battalions of 152mm gun/howitzers. Both the Type 1 and Type 2 regiments employed 2 gun/howitzers per battery. The equipment included in the TOEs for the combat, signal, transport and supply elements of both types of 1941 RVGK (army) artillery regiment are shown in table RVGK Army Art Regs.

Although still designated artillery 'regiments', the RVGK (army) artillery regiments **were really now battalion sized formations.** Applying the 'size' equation we find the Type 1 regiment's TOE was only 14% of the MDS value
while the Type 2 regiment's TOE was only 13% of the MDS value. Although delivering less than half the firepower of the pre-war corps artillery regiments, **the RVGK (army) artillery regiments were considerably better suited to the Red Army's modus operandi in 1941-42. They were smaller and easier to control and coordinate with other units**, and could now at least move all their guns and equipment when they needed to (albeit slower than a fully motorised unit).

From September to December 1941 a total of **38 RVGK (army) artillery regiments** were Mobilised and Deployed (MD). These comprised 12 Type 1 and 24 Type 2 RVGK (army) artillery regiments, and 2 RVGK (army) howitzer regiments. (p. 428)

RVGK Rocket Artillery Regiments and Battalions:

The first 3 Soviet rocket artillery batteries were rushed to the front near Orsha (in the Western Front) in mid-July 1941, equipped with the **BM-13 rocket system.** Their official title was 'guards mortar breakthrough' units, and after July 1941 the *Soviet rocket artillery arm saw one of the most rapid expansions of any branch of the Red Army.* (p. 430)

In early August the Stavka ordered the formation of **8 rocket artillery regiments**. These comprised 3 rocket artillery battalions, each with 3 batteries of 4 rocket launchers (36 launchers per regiment). The rocket artillery regiments used both the BM-8 and BM-13 rocket systems, while the separate rocket artillery battalions used the BM 13 rocket system. The equipment included in the TOE for the combat, signal, transport and supply elements of
both types of rocket artillery unit are shown in table Soviet Rct Art Reg.

By the end of 1941 no fewer than 14 RVGK rocket artillery regiments and 20 separate RVGK rocket artillery battalions had been Mobilised and Deployed (MD). These units used the large majority of the approximately 400 BM-8 and 600 BM-13 rocket launchers received by the Red Army to the end of December 1941. Also refer to the section on Soviet rocket artillery for more on the limitations of these units, and bombardments rockets in general, during WWII. (p. 430)

b. Red Army Corps and Army Level Anti-Tank Units

RVGK Anti-Tank Brigades (April 1941):

Up to April 1941 the only anti-tank (AT) units in the Red Army were found in divisions. **Following the German victories in 1940, the Red Army was forced to completely re-evaluate its policy on large mechanised forces as well as its whole anti-tank doctrine.** The result was an order on **26th April 1941 to form 10 very large and fully motorised anti-tank brigades**. The April 1941 anti-tank brigades were intended to be huge organisations with no fewer than 6,800 men each, and theoretically capable of stopping a panzer division in its tracks. This was of, course, in keeping with the Soviets' tendency to overreact in the immediate pre-war era, and then going overboard in attempting to 'rectify the situation' on a mega-scale. The philosophy behind the creation of these units was that they would be **fully motorised and highly mobile.** They would be held as an '**army level reserve**', and when the enemy's point of main effort had been established (presumably spearheaded by one or more panzer divisions) the anti-tank brigade would be rapidly moved into position and committed to block the enemy's thrust. **It was intended that the brigade would be so well equipped with anti-tank guns that this would neutralise and defeat any possible enemy armour concentration.** (p. 431)

The brigade included 2 anti-tank regiments, a mine laying engineer battalion, a motor transport battalion and brigade support elements. Each anti-tank regiment was supposed to contain: 2 76mm gun anti-tank battalions, 2 85mm gun anti-tank battalions, a 107mm gun anti-tank battalion, a light anti-aircraft battalion and a AAMG company. The number and type of guns authorised comprised:

- 48 76mm M1936 (F-22) and/or 76mm M1939 (F-22USV) field guns (acting as anti-tank guns).
- 48 85mm M1939 (52-K) heavy anti-aircraft guns (acting as anti-tank guns).
- 24 107mm M1940 (M-60) heavy corps gun (acting as heavy anti-tank guns).
- 16 37mm M1939 (61-K) light anti-aircraft guns (acting as anti-aircraft guns).
- 72 12.7mm DShK 1938 HMGs (acting as anti-aircraft machine guns).

In total, the **anti-tank brigade was authorised 120 anti-tank capable guns**, 16 light anti-aircraft guns, 72 AAMGs, 1,000 anti-personnel mines, 1,200 anti-tank mines, 180 tractors, and 706 trucks and cars. Applying the 'size' equation we find the April 1941 anti-tank brigade's TOE was 75% of the MDS value. Clearly these units were intended to be large units capable of defending the type of frontage assigned to a full division. **At full strength anti-tank brigade was capable of defending a 5-6km front with 20-24 guns per kilometre**, and backed up by considerable minefields. With this kind of firepower, a full strength, well trained and competently deployed April 1941 anti-tank brigade would likely have successfully fulfilled its intended role.

One interesting observation is that Soviets were obviously worried about the possible thickness of armour on German tanks of the period. The **standard Red Army anti-tank guns of the period were the 45mm M1932 and 45mm M1937 guns. However, these were considered too light and ineffective for the anti-tank brigades, which were promptly authorised the biggest and best anti-tank capable weapons available**. This included commandeering as many of the 85mm M1939 anti-aircraft guns as possible (mainly squabbling with the PVO forces to get these), and the **very powerful 107mm M1940 which was still not fully developed**. In the event, the anti-tank brigades would have been far better off with more 45mm guns because on 22 June 1941 **none of the anti-tank brigades had any of their authorised 107mm guns. Furthermore only 6 anti-tank brigades had any 85mm guns at all, and even then they only had 73 85mm guns between them vs. the 288 authorised.** (p. 431)

Unfortunately all 10 anti-tank brigades had had less than two months to form up and train before going into action against the invading *Wehrmacht* forces. In addition, shortages of equipment (especially motorised vehicles), as well as poor command and control of such large units, **resulted in all the anti-tank brigades rapidly disintegrating when thrown into the front line in June and July 1941**. Refer to chapter 6. for details on the actual strength of these units in June 1941, which was the principal cause of their ineffectiveness as well as their rapid demise. (pp. 431-32)

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Purnell's *Illustrated Encyclopedia of Modern Weapons and Warfare*: part 60, Phoebus Publishing, London, 1979, pp. 1191-1195.

Anti-Tank Regiments (July - November 1941):

In late June 1941 the Stavka ordered the formation of 20 new anti-tank (AT) regiments, with a further 15 ordered in July. These formations were much smaller than the anti-tank regiments used in the anti-tank brigades, and although called ‘regiments’ they were equivalent to anti-tank battalions in contemporary Red Army divisions as well as most Western armies. The new anti-tank ‘regiments’ better suited the Red Army’s command and control abilities during 1941-42 by being small and easy to handle. Between July and December 1941 the Stavka ordered three distinct waves of anti-tank regiments to be mobilised. Each wave contained a different TOE depending on the circumstances and weapons availability when the TOE was issued. For our purposes they are referred to as Types 1 to 3. The equipment included in the TOEs for the combat, signal, transport and supply elements of the various types of 1941 anti-tank regiments are shown in table Soviet AT Regs. (p. 433)

The initial batch of 35 anti-tank regiments, referred to here as Type 1, included 5 batteries with 4 guns each (i.e. 20 anti-tank guns in the regiment). There was no intermediate battalion HQ, although in such a small unit it was hardly necessary as these were battalion sized formations anyway. Due to shortages of 45mm anti-tank guns and 76mm divisional (field) guns, these units were authorised and often equipped with 85mm anti-aircraft guns. It is interesting to note here that the Red Army, like the German Army, didn’t have an aversion to using heavy flak guns the anti-tank role (which the British and US armies had). The 85mm M1939 anti-aircraft gun was a powerful gun, although it was relatively vulnerable compared to the much smaller anti-tank guns available. It is also interesting that the 85mm M1939 never achieved anything like the anti-tank or anti-personnel reputation of the German 88mm Flak 18/36 gun, even though the Soviet gun saw widespread use in the ground combat role (particularly in 1941-42). All the Type 1 anti-tank regiments were lost by October 1941 in the battles west of Moscow.

The second batch of 36 anti-tank 'regiments' (Type 2s) were ordered and formed from August to October 1941. *These were even smaller than the Type 1 anti-tank regiments,* with 4 batteries with 4 guns each (i.e. 16 anti-tank guns in the regiment). Half of the batteries were authorised **85mm anti-aircraft guns** while the remaining batteries were authorised **45mm anti-tank guns.** In reality many of these anti-tank regiments were equipped with whatever high velocity guns were available, since the 85mm anti-aircraft gun remained in short supply and the **45mm anti-tank gun was not even in production when the war started**. By late October 1941 sufficient 76mm divisional guns had become available to permit these guns to be authorised as the preferred type in **Type 3** anti-tank regiments. The Type 3 anti-tank regiment included 5 batteries with 4 guns each (i.e. 20 anti-tank guns in the regiment). For the first time an additional anti-aircraft battery was added with 4 37mm anti-aircraft guns for air defence. Only 1 Type 3 anti-tank regiment was Mobilised and Deployed (MD) in 1941, but 9 older existing anti-tank regiments were converted to this TOE before the end of 1941.

Table Soviet AT Regs also shows the structure of the unique 705 Anti-Tank Regiment. This regiment was formed by the Leningrad Front in July 41 using available 107mm M1910/30 corps cannons. The exact structure of this unit is unknown, but it was probably very similar to the Type 1 anti-tank regiments being formed at this time. The 705 Anti-Tank Regiment combined with the already existing 94 Light Artillery Regiment / 67 Rifle Division on 19 July 1941 to form the **improvised 14 Anti-Tank Brigade**. This anti-tank brigade was nowhere near as large as the 10 pre-war RVGK anti-tank brigades, but explains why it is sometimes said that 11 such anti-tank brigades existed during 1941. (p. 433)

c. Red Army Corps and Army Level Anti-Aircraft Units

Army Anti-Aircraft Battalions:

In June 1941 the responsibility for the air defence of the Red Army's field forces fell into two main areas. Firstly, there were the line divisions themselves with integral anti-aircraft (AA) units. For example, the April 1941 rifle divisions were authorised an anti-aircraft battalion with **2 batteries of 37mm anti-aircraft guns and 1 battery of 76mm anti-aircraft guns**. Secondly, there were the separate anti-aircraft battalions assigned to the controlling army HQs. These units usually had 3 batteries of 76mm M1931-38 anti-aircraft guns or, very rarely, **85mm M1939** anti-aircraft guns. In addition the army anti-aircraft battalion was authorised a battery equipped with AAMGs for close air-defence. (p. 435)

On 22 June 1941 there were **44 army anti-aircraft battalions in the Red Army**, of which 27 were deployed in the Western Special Military Districts. This meant it was possible to supply almost 71% of the existing rifle corps with at least 1 anti-aircraft battalion in June 1941. In addition to the army anti-aircraft battalions, another **31 naval anti-aircraft battalions** were deployed on 22 June 1941. These were part of the coast defence forces deployed with the Hanko garrison, the Kronshtadt Naval Area, the Saaremaa and Hiiumaa islands garrisons, and the Tallinn, Paldiski, Liepaja and Odessa naval bases.

In the second half of 1941 **an additional 57 Red Army anti-aircraft battalions were Mobilised and Deployed** (MD) using predominantly older 76mm anti-aircraft guns. (p. 435)

d. Red Army Corps and Army Level Engineer Units

Army engineers are usually trained and equipped to fulfil a variety of missions, including: laying and clearing minefields, building and destroying obstacles, destroying enemy fortifications, and general engineering construction work. When the term 'sapper' is used in Western armies, or the term 'pionier' is used in the German Army, it should mean the engineer unit concerned is trained and equipped to perform its engineer functions under fire, and that it can be used in the infantry close-assault role if needed. **This is a grey area, with most armies (and many current authors) using the terms 'engineer', 'sapper' and 'pionier' interchangeably.** However in

a great many of these cases the engineer unit being considered was more akin to a construction unit that had received very little training in the 'combat engineer' or 'infantry-assault' role. It was, accordingly, also not equipped to perform this role. (p. 436)

The Germans Army (Heer) was relatively strict in this matter: if the term 'pionier' was used, it usually meant the unit was trained and equipped for close assault and demolition missions under enemy fire if necessary. In this regard German Army pionier troops were very well trained and equipped, while similar Red Army troops where much less so.[138] At the same time, the German Army used the designation Heer Bautruppen (Army Construction Troops) and Bau-Bataillon (Construction Battalion) to indicate units trained and equipped for construction duties.

RVGK Engineering Regiments and Battalions (June 1941):

Red Army engineer forces, like the artillery forces considered above, consisted of force engineers and separate RVGK engineers. On 22 June 1941 force engineers were authorised at the divisional level on the basis of one small company per rifle regiment, and 3 companies and a bridging platoon per rifle division (an engineer battalion). In addition each tank division had a 3 company motorised pontoon battalion, while each mechanised division had 2 companies of engineers and a bridging company (an engineer battalion). Above divisional level, each mechanised corps HQ was authorised a dedicated motorised engineer (construction) battalion. Additional separate RVGK engineer battalions were assigned to reinforce the rifle corps, armies and fronts as required. It is these separate RVGK engineer units that we are concerned with here.

On 22 June 1941 there were 18 separate engineer regiments and 23 separate engineer battalions (of which 3 were fully motorised) listed in the OOB for the Red Army and naval coastal forces. Of these, 10 engineer regiments and 14 engineer battalions (2 motorised) were deployed in the Western Special Military Districts (excluding 3 more battalions in the Stavka reserve). Note, this does not include engineer battalions in any of the 170 Red Army divisions or 20 mechanised corps in the Western Special Military Districts (including the Odessa Military District) at this time. It does include the engineer battalions which were assigned to the rifle corps, army and front HQs. . .

When the Germans attacked on 22 June 1941 the large majority of the divisional and separate engineering forces in the Western Military Districts were working on the construction of border defences. **This initially deprived most of the Red Army's field forces of any engineering support and significantly reduced their overall combat readiness**.[139] On top of this many engineer units were deployed very close to the front line (building defences) and were wiped out in the initial *Wehrmacht* assault before they ever had chance to re-join their parent units. (p. 436)

Starting in July 1941, the Soviets quickly mobilised and deployed an additional 10 engineer battalions (2 motorised) with the same 3 company structure as the pre-war battalions. (p. 437)

RVGK Pontoon Bridge Regiments and Battalions, June 1941:

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[138] **Note:** This marked difference in equipment and training is one of the main reasons why full 'Engineer Squads' are shown in the German pionier units; but only if each pionier squad was armed with a MG-34 GPMG. This is also why 'Light Engineer Squads' (with no LMGs at all) are shown in the Red Army's engineer units. **If LMGs were present in a Soviet engineer unit (which was rare)** then the LMGs are listed separately. In addition, the German pionier and engineer squads had 12-15 men each (depending on the precise unit), while the Red Army's engineer sections (or squads) usually had 8-9 men each (and sometimes as few as 6). Therefore in the FILARM database, 2 Red Army engineer sections are considered the equivalent of a 'Light Engineer Squad'. This then goes some way to compensate for the smaller engineer squads in the Red Army units, as well as their lack of combat training and infantry-assault weapons. The latter includes not only LMG/GPMGs in each squad, but also includes flame throwers, mines or all types, grenades of all types, and various types of demolition charges.

[139] **Note:** This is an EXTREMELY SIGNIFICANT POINT!

Pontoon bridge regiments had the specialised training and equipment required to quickly construct a pontoon type bridge over water obstacles. In all the armies fielded during WWII there were significant differences between the combat abilities of bridging engineers compared to regular army engineers or sappers. Bridging units came in various forms and could have been any of the following:

● **Combat capable bridging units or bridging pionier units. These relatively rare units were heavily armed and capable of crossing water obstacles, and even building limited bridges, whilst under enemy fire.**

● Bridge construction units, which contained the troops trained to build bridges of various types. They usually used the bridging material from other units. These units could also often repair existing permanent bridges and on occasion build a new permanent bridge structure.

● Bridge columns, which contained the material for a pontoon or other temporary bridge type and the transport needed to move it. The transport could be motorised or/and horse drawn. These units required additional troops to actually construct the bridge (such as a bridge construction unit, or a regular army engineer or sapper unit).

● Bridge units, which contained elements of bridge construction units and bridge columns.
(p. 438)

Apart from bridging engineer units in the divisions (described above), the **Red Army also deployed separate pontoon bridge regiments and battalions at the army and front level.** These units contained the pontoon bridge equipment as well as the troops needed to assemble the bridge, **although their combat abilities were extremely limited**. **The pontoon bridge regiment** had 3 battalions each with 3 companies, which was typical of all the engineer type regiments in the Red Army. **These units were meant to be fully motorised** so they could quickly deploy and build a bridge for any offensive operation they might be supporting. Each pontoon bridge company was authorised around 24 small pontoons, sufficient to build a 110 metre, 3 ton pontoon bridge. Thus a pontoon bridge battalion could build 330 metres of 3 ton bridge, or a much shorter but much stronger bridge.

One noteworthy point is the **number of authorised trucks**. These needed to be at least medium sized 3-3.5 tonne capacity trucks such as the **ZiS-5 and ZiS-6**. If the lighter and more common GAZ-AA or GAZ-MM trucks were used (with 1.5 tonne capacity) then far more trucks were required to move all the bridging material in one lift. **As the Red Army was extremely short of trucks (especially the heavier 3 tonne and 5 tonne capacity trucks)**, and as most of the Red Army's bridging engineer units were also well below their truck TOE strengths, it is unlikely many (if any) of the existing bridging engineer regiments could move all their bridging material in a single lift during 1941.

On 22 June 1941 there were 14 separate pontoon bridge regiments and 6 separate pontoon bridge battalions listed in the OOB for the Red Army. Of these, 8 regiments and 4 battalions were deployed in the Western Special Military Districts (excluding 1 battalion in the Stavka reserves). The exact fate of these units is unknown, but the fact that they **were at least partially motorised and were deployed to the rear means it is likely that a large proportion survived the initial border battles**. As far as is known, no new units using this TOE were mobilised and deployed in the second half of 1941. (p. 438)

Construction Battalions:

Similarly to bridging units, **military construction units can take various forms**. They can be sophisticated military units capable of laying and clearing mines, and building airfields and harbours, **or they can be very basic improvised affairs**. The latter are usually thrown together using a mixture of military and civilian construction crews, and whatever construction equipment is at hand.

Following the German invasion the Soviets attempted to mobilise construction 'battalions' to quickly build defensive positions, especially on the approaches to Leningrad and Moscow. Most of these units were comprised of civilians commandeered (or 'volunteered' if preferred) and sent to the approaching front, and told to dig trenches and build defensive obstacles. These units do not qualify as army construction battalions as they were generally unarmed and incapable of combat.

However, some construction battalions had a significant proportion of trained military personnel and were at least partially armed, so under the FILARM model 'rules' they have limited combat capability and qualify as 'army' construction battalions. A typical army construction battalion mobilised after June 1941 is shown in table Soviet Sep Eng Units 2. Around **28 armed construction battalions** were Mobilised and Deployed (MD) before the end of 1941. (p. 439)

e. Soviet Corps and Higher Command Headquarter (HQ) Units

Rifle Corps HQs:

On 22 June 1941 most of the rifle elements within the Red Army were organised into rifle corps. There were **62 rifle corps HQs in the Red Army, of which 34 were in the Western Military Districts** and 14 were in reserves of the Stavka GK. The rifle corps HQ was supposed to control 3 rifle or similar divisions, 2 corps artillery regiments, 1 anti-aircraft battalion, 1 engineer battalion and 1 signal battalion. The personnel in a typical full strength rifle corps was meant to be around **50,000 men**. For our purposes the TOEs for all the corps' major subordinate combat units are shown in the relevant sections (as well as shown separately in the Soviet Deployment Matrix), with the exception of the corps' signal battalion which is included here as part of the corps HQ. **On balance the rifle corps' divisions had relatively strong artillery support, relatively weak anti-aircraft and engineer support, and very weak additional (corps level) logistical support.** (p. 440)

The personnel and equipment included in the TOE for the combat, signal, transport and supply elements of a June 1941 Soviet rifle corps HQ is shown in table Soviet HQ Units 1. **The HQ units included:** a signal battalion to facilitate communication across the corps and with higher levels of command, an anti-aircraft platoon to provide close air-defence (mainly for the HQ's command group), an aviation squadron to provide local aerial reconnaissance, liason and courier aircraft for the senior commanders, and a security group. The security group was not only responsible for the corps' HQ security, but was also responsible for providing security and traffic control in the immediate rear area, as well as being available to subordinate units (such as the rifle divisions) if they had a security or discipline problem. **During the initial border battles in June 1941 it quickly became apparent that the army HQ and subordinate rifle corps HQ structure was not functioning as hoped**. The rifle corps HQs did little to increase the overall command and control capabilities of the army they were subordinate to. There are three main reasons why this occurred.

The HQ units included: a signal battalion to facilitate communication across the corps and with higher levels of command, an anti-aircraft platoon to provide close air-defence (mainly for the HQ's command group), an aviation squadron to provide local aerial reconnaissance, liason and courier aircraft for the senior commanders, and a security group. The security group was not only responsible for the corps' HQ security, but was also responsible for providing security and traffic control in the immediate rear area, as well as being available to subordinate units (such as the rifle divisions) if they had a security or discipline problem.

During the initial border battles in June 1941 it quickly became apparent that the army HQ and subordinate rifle corps HQ structure was not functioning as hoped. The rifle corps HQs did little to increase the overall command and control capabilities of the army they were subordinate to. There are three main reasons why this occurred.

● Firstly, the German attack moved so fast and was such an initial surprise that many corps HQs never had time to organise themselves or to organise their subordinate units (before they were surrounded or overrun).

● **Secondly, the signal assets in all the HQs were well below TOE strength**, and those that remained were largely equipped with obsolescent equipment and barely trained signals personnel. **In general, Soviet industry lagged severely behind the West in terms of the production of all types of modern communication equipment**. In June 1941 the mobilised signal units averaged only around 39% of their authorised RAT radios, 46% of army and airfield radios, 77% of regimental radios, **35% of telegraph sets**, and only 43% of the required telephone wire. Overall, fronts averaged 75% of their required radios, armies 24%, divisions 89% and regiments 63%.

● **Thirdly, and perhaps most significantly, the rifle corps HQs suffered from an utter lack of experienced command and control cadre,** as well as effective logistical support units. *The lack of experienced officers, and any officers willing to show initiative and take charge, was largely due to the effects of Stalin's ruthless pre-war purges.*

Let us consider two examples of the breakdown that occurred in the rifle corps HQ structure and doctrine. If a rifle corps HQ lost communication with its superiors (which wasn't difficult even during peacetime manoeuvres given the inadequate signals situation), then a major function of the rifle corps HQ was to use its assigned divisions to continue the 'command and control function' with the objective of achieving the overall mission set for the superior army HQ. However, when this situation occurred during the initial stages of Operation Barbarossa (and it was a very frequent occurrence), the less senior Soviet officers commanding the corps **were generally reluctant to initiate independent decisions or show much initiative when out of communication.** This was because to do so might not have aligned with the commanding army's overall objectives and could easily be interpreted as treason. **The whole Soviet pre-war officer culture was geared to oppress such initiative.** (p. 440)

Table Soviet HQ Units 1 (cont.) Principal References:

D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, 1998, pp. 117, 147, 157, 159, Table 5.13 and 166.
The Initial Period of War on the Eastern Front, Proceedings of the 4th Art of War Symposium, Garmisch Oct 1987, ed. D. M. Glantz, Frank Cass, London, 1993, pp. 17, 18, 19, 21 and 22.
C. C. Sharp, '*Red Sabers' Soviet Cavalry Corps, Divisions and Brigades 1941 to 1945*: Soviet Order of Battle World War II, Volume V, George F. Nafziger, West Chester, OH, 1995, p. 99.
V. I. Fes'kov, K. A. Kalashnikov, V. I. Golikov, *Krasnaya Armiya v pobedakh i porazheniyakh 1941-1945* (*Red Army in victories and defeats 1941-1945*), Tomsk University, 2003.
www.niehorster.org and www.rkka.ru/iorg.htm (RKKA - *Raboche Krest'yanskaya Krasnaya Armiya* site).

Another example is the corps' artillery support. The rifle corps HQ was supposed to organise its 2 corps artillery regiments to support its subordinate divisions. But most rifle divisions were so short of personnel, signals and training that they had great difficulty organising the (in-house) divisional artillery to provide indirect fire support for the division's own units. To then expect the divisional HQs to communicate with the corps HQ, and organise artillery support from units external to the divisions, was unrealistic. In the event, this proved far too difficult for most rifle divisions and rifle corps Hqs. (p. 442)

The 1941 rifle corps HQs' deficiencies in personnel and equipment only compounded the problem. **From June to September 1941, most Soviet corps artillery went into action (if it had the transport to do so) in direct fire (line of site) mode and was lost accordingly**. German accounts of the campaigns in the summers of 1941 and 1942 make practically no mention of the effectiveness of Soviet artillery, except in those instances when the Soviets were defending long-term fixed positions (i.e., where concentrated artillery forces could use predetermined indirect firing solutions).

By early July 1941 it was clear to the Soviet high command that the existing rifle corps HQs were mostly redundant. Given the circumstances, these HQs simply did not have the means to function as planned, and were unable to enhance the command and control between the army HQs and the divisions in the field. **Consequently, in**
July 1941 the Soviet high command made the decision to disband any surviving rifle corps HQs. The Red Army's divisions, brigades, separate regiments and separate battalions would now report directly to the relevant army or front HQs. Most of the signal assets that existed in the surviving rifle corps HQs went into the newly mobilising army and front HQs (covered below).

Cavalry Corps Hqs:

On 22 June 1941 there were 4 cavalry corps in the Red Army, a**nd by most assessments these were the most combat ready mobile corps available to the Red Army at this time.** There were several key reasons for this rather odd state of affairs. The cavalry had a long and established tradition in the Russian Army which carried over to the later Red Army, largely due to the importance of cavalry during the Russian Civil War. This meant the cavalry corps HQs and their component divisions **were well established and relatively well equipped by 1941.**[140] Furthermore, the relatively prestigious cavalry arm was generally able to maintain a better trained and more experienced officer force. **This was not hurt by the fact that the cavalry arm was also Stalin's favourite branch of the Red Army and, unsurprisingly, many of the future leaders of the Red Army emerged from the cavalry ranks.** (p. 443)

The 1941 cavalry corps HQ was supposed to control 2 cavalry (or mountain cavalry) divisions and supporting units. The personnel authorised in a June 1941 full strength cavalry corps was **19,430** men. The authorised equipment included: **16,020 horses, 128 light tanks and tankettes, 44 armoured cars,** 136 artillery pieces (including infantry guns, anti-aircraft guns and anti-tank guns), 128 50mm mortars, 42 tractors, and 1,270 trucks and light transports. The personnel and equipment included in the TOE for the combat, signal, transport and supply elements of a June 1941 Soviet cavalry corps HQ is shown in table Soviet HQ Units 1. The HQ units included a signal squadron (or company), strong reconnaissance elements (mounted and motorised), an aviation squadron, a security group, and supporting motorised maintenance and supply units.

On 22 June 1941, 3 of the Red Army's cavalry corps were already deployed in the Western Special Military Districts, and one (the 4th Cavalry Corps) was in the Central Asia Military District in control of 3 mountain cavalry divisions. **During the initial stages of Operation Barbarossa the cavalry corps performed relatively well. The command and control 'span' expected of the cavalry corps HQ was much less than that required of either the rifle corps HQ (expected to control around 50,000 men) or the mechanised corps HQ** (expected to control around **36,000** men and 1,031 tanks). In addition, the cavalry corps HQs did not have to coordinate large formations of corps artillery, and the (better prepared) cavalry divisions required less logistical support than either the rifle or mechanised divisions. Furthermore, the cavalry corps HQs were maintained at a relatively high peacetime strength, **so even in June 1941 they had a high proportion of the trained staff officers and equipment required to control and support any attached divisions**.

However, it is rather significant that the 6 Cavalry Corps (initially in the Western Special Military District), was still wiped out by early July 1941; and this was the only cavalry corps which faced fast moving German panzer forces in the initial border battles. The 2 and 5 cavalry corps were initially deployed against the much less dangerous Rumanian forces in the south. Both these corps were able to mount several counterattacks and complete a fighting withdrawal in good order.

[140] **Note:** For example, the 2 Cavalry Corps had been **in existence since the 1920s**. Its component divisions were the 5 Cavalry Division formed in 1922 and the 9 Cavalry Division formed in 1920.

By August 1941 the Red Army's cavalry forces represented their best chance of quickly raising a new mobile force capable of making deep strikes. Realising this, the Stavka ordered several new cavalry HQs to be formed to control some of the **newly mobilising July 1941 cavalry 'divisions**'. These were initially called 'cavalry groups', and were organised to control 2 or 3 of the **small July cavalry divisions**. The cavalry groups were generally improvised HQs which were named after their local commander. Some of these formations lasted for several months during 1941, while others were reformed into cavalry corps HQs later in 1941. By the end of 1941, **5 new cavalry corps HQs had been mobilised**, but only the 3 Cavalry Corps was Mobilised and Deployed (MD) before the end of the year. (p. 443)

Airborne Corps HQs:

As described in the previous section on Red Army airborne units, the **Soviets had been pioneers in the development of airborne forces and had led the world in this field for most of the 1930s**.[141] By 22 June 1941 the Red Army had **5 brand new airborne corps HQs and 16 airborne brigades, of which 10 were only two months old.** (p. 444)

The airborne corps HQ controlled 3 airborne brigades, **1 light tank battalion**, 1 long range signal platoon, 1 mobile equipment platoon (with reconnaissance and courier sections), 1 control aircraft flight (with 3 light aircraft) and the **designated VVS air transport units. The latter was supposed to comprise 2 VVS assault landing bomber aviation regiments, but on the 22 June 1941 none of these units had been formed**. [142]The total personnel authorised in a full strength April 1941 airborne corps was **10,419** men, although this figure includes the airborne corps' designated air units. The corps' tank battalion comprised the battalion HQ, a reconnaissance platoon, and 3 tank companies with 3 tank platoons (with 5 tanks) and a command tank each. Although the tank battalion is correctly shown (here) as part of the airborne corps HQ, if it existed in reality it was usually parcelled out with 1 tank company going to each subordinate airborne brigade. **Although 'light tanks' were specified, all the airborne corps were exclusively equipped with light 2 man tankettes in June 1941**. These were most commonly **T-37s, T-38s or/and T-40s,** and even then the strongest corps actually had only around half the authorised tankettes (24) on strength.

Only two months before the start of Operation Barbarossa the Red Army's airborne forces had literally tripled in size, so the airborne corps were all very new formations. As a result these forces had an elite and experienced cadre, **but the large majority of the personnel were untrained in airborne operations**. In addition the individual airborne corps were still forming, had had no opportunity to exercise as a complete unit, and were **short of a large proportion of their heavy weapons and transport.** On 22 June 1941, 4 airborne corps were deployed in the Western Military Districts (including 1 in the Odessa Military District), while the 2 Airborne Corps was not far away in the Kharkov Military District. **This placed most airborne corps in a position where they were forced to go into combat almost immediately, and they were thus committed as lightly armed ground infantry**. Given the structural and equipment weaknesses in these lightly armed units when facing heavily armed enemy troops, and the airborne brigade's overall state of preparedness in June 1941, the results were, unfortunately, predictable. (p. 444)

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[141] **Note:** In the inter-war period, the Soviets were pioneers in several key areas: "deep battle" and "deep operations of mechanized forces; also led world in development of airborne forces, etc.

[142] **Note:** These aviation regiments were going to be equipped with **modified TB-3 bombers**, designated G-2 troop and freight transports. It is worth noting that **only 818 TB-3s of all types were ever built** and many were obsolescent and out of service by 1941. To fully equip 5 airborne corps it is very likely another aircraft type would have been needed to supplement the TB-3/G-2.

During the summer of 1941, 3 out of the 5 existing airborne corps were completely destroyed. The remaining corps were decimated and then withdrawn to be rebuilt or to form cadre for new units. On balance, the original 1941 airborne corps were essentially wasted. This was because committing these units as ill-equipped ground troops was playing into the Germans' hands and the overall damage (and delay) to the *Wehrmacht* was negligible. It would probably have been better to keep these relatively high morale units temporarily out of the line, equip them with heavy weapons and commit them when they were more prepared. Of course this is easy to say when the Stavka was throwing almost everything available into the desperate battles during the summer of 1941.

Despite the poor overall results, two things were apparent from the airborne corps' experience. Firstly, the airborne corps was a small enough formation for the Red Army corps level command and control infrastructure to handle in 1941. Even at full strength the corps was still smaller than a July 1941 rifle division, and was much smaller than a pre-war rifle division. **Secondly, although the airborne troops suffered heavy casualties, they exhibited a high degree of morale and often had to be destroyed rather than surrender. These factors assisted the decision to expand the airborne forces as quickly as possible.** From September to December 1941, 9 new airborne corps HQs and 31 airborne or manoeuvre-airborne brigades were Mobilised and Deployed MD). These new airborne corps HQs and airborne brigades did not have the light tank battalion . . . Most of the new airborne corps were assigned to active armies in December 1941. However only a few of the new brigades were combat ready, and only a few saw any combat during 1941. It is unlikely the second generation of airborne corps would have exhibited the same level of morale as the original units if they had been committed to combat on a large scale in late 1941, despite the 'airborne' name designation. (p. 444)

Army Hqs:

During the entire period of WWII (including Operation Barbarossa) the 'army' represented the basic high level command HQ in the Red Army. It is at this level of command that some of the most well-known Red Army commanders start to appear in WWII literature. Rifle, mechanised, cavalry and airborne corps HQs were attached to (and subordinate to) the army HQ. **On 22 June 1941 there were 27 armies in the Red Army**. Of these, 15 were in the Western Special Military Districts and 6 more were in the reserves of the **Stavka GK**. **In theory the Soviet rifle army HQ in 1940-41 was supposed to be able to control: 4 to 6 rifle corps** (with 14 to 18 rifle divisions), 1 mechanised corps to conduct operational manoeuvre as the army's mobile group, 6 to 8 tank brigades to provide infantry support, 2 to 3 air divisions, 10 to 12 artillery regiments, and several smaller service support units (engineer, signal, supply, replacements, repair, transportation, etc). In this form this large formation would contain over 1,400 tanks and 200,000 to 300,000 men, and be similar in size to many Western WWII armies. (p. 445)

In practice the average Soviet army in the Western Special Military Districts on 22 June 1941 contained 2 to 3 rifle corps (with 4 to 8 rifle divisions), a partially formed mechanised corps, various artillery regiments and various service units. **The size of the armies varied greatly depending on the theatre (front) and any expected enemy offensives.** For example, on 22 June 1941 the armies in the Leningrad Military District and Baltic Special Military District averaged around **100,000 men each. At the same time the armies in the Western Special Military District had from 150,000 to 170,000 men each**, while those in the Kiev Special Military District and the Odessa Military District had from 170,000 to 190,000 men each. Even with around 150,000 men, which was a considerably smaller army than the pre-war theoretical army size, **the average Soviet army HQ struggled to exercise effective command and control over its units during 1941.** The intermediate rifle and mechanised corps HQs, which were meant to augment the army's overall command and control capabilities, barely improved the situation in practice.

During peacetime each army headquarters was served by a separate signal battalion, which, upon mobilisation, was supposed to expand into a full signal regiment. **In addition the army HQ possessed a number of telegraph-telephone communication companies used for the construction of a wire-based communication network**. In June 1941 these units were as understrength as the more mobile radio units, and were of limited value in a rapidly

changing mobile battle (when there was little or no time to set up a wire-based network). The reader should remember that, at this point in time, the army HQ's subordinate corps HQs were expected to control and coordinate most of the divisions and other units in the army's area of responsibility. In addition to signal units, the army HQ possessed a security group responsible for providing security and traffic control in the army's rear area, an air-force liason HQ and several small support elements.

From 23 June to 31 December 1941 the Red Army mobilised no fewer than 48 new armies. This is a huge number considering that there were only 27 armies in the entire Red Army at the start of the war. Of the newly mobilised armies, **41 were Mobilised and Deployed (MD) west of the Urals**: no figure better illustrates the massive Soviet mobilisation effort during Operation Barbarossa and WWII.[143]

Despite the increased signal assets (mostly obtained from disbanding rifle and mechanised corps HQs, and existing RVGK signal units), **a full strength July 1941 army HQ still had a very heavy workload. This was because each army HQ now directly controlled and coordinated all the divisions and other units in its area or responsibility (i.e. there were no intermediate corps HQs).** This meant that the maximum practical size of the individual Soviet armies was reduced due to command and control (C&C) and logistical limitations. As a consequence, the average pre-war army was well over twice as large as the average newly mobilised army during 1941 (i.e. the pre-war armies had more and bigger divisions, etc.). This situation remained unchanged until 1942 and the gradual reinstatement of smaller corps level HQs. On the plus side, the simplified C&C enabled the Red Army's 1941-42 army and front HQs to better control their subordinate divisions as well as coordinate their attacks with other HQs.

The July 1941 army HQ also had beefed up security in the form of a dedicated army (not NKVD) HQ security battalion and an additional military police platoon for traffic control. The security battalion replaced the security company attached to the HQ in the June organisation. The NKVD units within the HQ were unchanged, except for the addition of an **NKVD cavalry security platoon** (in line with the more horse drawn nature of the July *Shtat*). Some of the smaller headquarters administration and support units may have also changed, but this is unknown. (p. 447)

Front HQs:

Above the army level, the next highest command level in the Red Army was the 'front'. **Many of the most well-known Red Army commanders in WWII were, unsurprisingly, front commanders.** The Soviet front was loosely equivalent to the Western term 'army group', although after June 1941 it was usually somewhat smaller. **Conceptually a front was responsible for an entire theatre of operations (sometimes controlling a large number of armies) and was of strategic significance.** On 21 June 1941 there were 5 active front HQs deployed across the USSR. These comprised 4 on the western borders of the USSR which were given the peacetime designation 'special military districts', and the **Far Eastern Front.** On 22nd June 1941 the Baltic, Western and Kiev Special Military Districts became the Northwestern, Western and Southwestern Fronts, respectively, and on 24 June 1941 the Leningrad Military District became the Northern Front. (p. 448)

Even in peacetime its **signal assets were extensive (at least on paper)** and they included: a full signal regiment, a line signal battalion, a radio signal battalion and **9 telegraph-telephone communication companies** (with 3 types). **On 22 June 1941 most of the communication systems employed by the Soviet military district HQs were of the fixed-line type**, and this can be seen by the fact that the large majority of signal units in the HQ *Shtaty* were of this type. **Unfortunately this type of communication is vulnerable to enemy disruption**, and in the opening phases of Operation Barbarossa **a great many of these phone and telegraph lines were cut by German**

[143] **Note:** The 35th, 36th, 53rd and 58th Armies were left in the Far East, Transbaikal, Central Asia and Siberia Military Districts, respectively. The 3rd/10th, 2nd Shock and 3rd Shock Armies were formed by simply redesignated existing army HQs.

Special Forces units (mainly the Brandenburgers), air-strikes or motorised reconnaissance units exploiting a breakthrough in the main defence line (from the panzer and motorised divisions). When coupled with the fact that the average front HQ had only around **75% of its authorised radios (and these were most often old equipment having to cope with German jamming efforts**), it is not really surprising that the Red Army's communication networks in the western USSR rapidly broke down. In other respects the military district (front) HQ was essentially an enlarged army HQ. It employed similar NKVD and army security units, had an air-force liason HQ, and had the usual higher HQ support elements.[144]

From June to the end of December 1941, **11 new front HQs were Mobilised and Deployed (MD)**.[145] The personnel and equipment authorised in a typical front HQ from July 1941 is shown in table Soviet HQ Units 3. **The new front HQs were around 80% larger than the peacetime establishment strength, and this was largely due to the addition of at least 4 signal battalions** (sometimes 5 or 6 battalions were added). The signal units were mostly obtained from the surviving (and now disbanded) rifle and mechanised corps HQs, and a few existing RVGK signal units. A large proportion of these signals units were now horse-drawn, but, more seriously, the **additional signal units were mostly of the fixed-line type due to the chronic shortage of radios in the USSR (especially the more modern longer-range types).**

The newly mobilised front HQs also employed a full army HQ security battalion; with the first 4 such battalions being created from the existing HQ security regiments. These were already Deployed (D) in the Western Special Military Districts on 22 June 1941. The NKVD elements remained unchanged, while an additional army 'military police' platoon was added for traffic control. (p. 448)

Front HQ Security Regiments:

On 22 June 1941 the **Deployed (D) 2, 60, 4 and 681 HQ Security Regiments** were assigned to the Leningrad, Baltic Special, Kiev Special and **Siberian Military District** HQs, respectively. These 4 regiments were Red Army units and were not related to the more common NKVD security regiments of the period. They were designed to provide security for the highest level HQ in each military district (which became front HQs in wartime), as well as a measure of security support to the military district's subsidiary army HQs. The Western Special Military District HQ had the 87 Reserve Cavalry Regiment fulfilling its front HQ security function. (p. 450)

The TOE for a typical front HQ security regiment in June 1941 . . . consisted of 3 rifle battalions, an engineer support company, **a chemical platoon** (for protection against chemical attack on the HQ's elements), a signal company, and minimal HQ and supply/support services. The regiment was motorised for the most part to ensure its elements could maintain contact with the HQ it was meant to protect (which were also meant to be fully motorised in June 1941). Immediately after 22 June 1941, the 2, 60 and 4 HQ Security Regiments were redesignated the **2, 60 and 4 HQ Security Battalions** assigned to the Northern, Northwestern and Southwestern Front HQs, respectively. It is possible other battalions in the regiments were also used to form HQ security battalions for the newly mobilising army HQs in July 1941. A further 6 front HQ security regiments were Mobilised and Deployed (MD) from July to December 41, and 2 of these later became regular rifle regiments (assigned to rifle divisions). (p. 450)

PVO Air Defence HQs:

The Soviet PVO *strany* (*Protivo-Vozdushnaya Oborona strany* - Anti-Air Defence of the nation) **was the main organisation responsible for national (strategic) air defence of the USSR during WWII**. The details of the

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[144] **Note:** As I note in my book, *Guderian's Panzers*, General Pavlov (Western Front) had no idea he was facing the bulk of Guderian's panzer group for more than 48 hours! So disrupted had his comm lines become.

[145] **Note:** Also note, the Odessa Military District HQ and 9 Separate Army HQ provided at least some of the assets used for the new Southern Front HQ in June 1941.

PVO ground forces available in 1941 are covered in the next section. The PVO was organised into PVO regions, divisions, brigades and regiments within each military district, and these formations were often concentrated in order to defend particularly important strategic targets and cities. Where there was a particularity large concentration of PVO air and ground units, a PVO Corps HQ might be used to assist in the command and control of these units. (p. 451)

Three of the largest concentrations of PVO units in June 1941 were around Leningrad, Moscow and the oil fields in the Caucasus. On 22 June 1941 there were 3 PVO Corps HQs deployed: the 1 PVO Corps in the Moscow Military District, the 2 PVO Corps in the Leningrad Military District and the 3 PVO Corps in the Transcaucasus Military District. There were also 2 PVO division HQs, 40 PVO regional brigade HQs and 9 PVO brigade HQs deployed on 22 June 1941. No official Shtat (or PVO VVS equivalent) has been found for PVO HQs. However based on the size and number of units the average PVO HQ controlled, and the 'command span' required, we can make a reasonable estimate. (p. 451)

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3I. Soviet Strategic Defence Ground Forces

In this section we consider the TOE of Soviet combat units that would **normally be considered part of a national strategic defence system.** They were normally used to protect important strategic targets and/or the approaches to such targets. Strategic targets included cities, ports, oil fields, factory complexes, major rail or road junctions, etc. The nature of the strategic defence ground forces meant that they were usually relatively immobile and in many cases were fixed in place. The strategic defence forces considered here include those that were considered part of the Red Army, as well as those that reported separately, such as the PVO strany. In any event these forces were important in Operation Barbarossa because the Axis objectives included the seizer or destruction of as many strategic targets as possible. Thus the invading Axis ground, air and sea forces inevitably came into direct contact with the Soviet strategic defence forces. (p. 452)

PVO *strany*, National Air Defence Ground Units:

On 14 February 1941 **a People's Commissariat of Defence (NKO) order created a new national air defence organisation (the PVO strany) under the Main PVO Directorate of the Red Army.** This designated 13 special PVO zones, which were subdivided into regions that encompassed possible threatened territory to a depth of 1,200km from the USSR's western borders. The PVO zone borders corresponded with the military district borders they were in. Specially designated PVO regions, corps, divisions, brigades and regiments within each military district then defended important targets and cities in that district. **Thus, each military district command was responsible for air defence in their district through the commander of the PVO zone**. In conjunction with the air (VVS KA) and naval-air (VVS VMF) forces in the military district, these combined forces were responsible for overall air defence.

On 22 June 1941 there were 3 PVO corps HQs, 2 PVO division HQs, 9 PVO brigade HQs, 40 PVO regional brigade HQs, 60 PVO regiments and 158 separate PVO battalions deployed in the USSR. **These forces were supported by 4 PVO AAMG regiments, 9 PVO AAMG battalions, 5 PVO searchlight regiments, 12 PVO searchlight battalions, 5 PVO air-warning regiments, 38 PVO air-warning battalions, 6 PVO air-barrage regiments and 11 PVO air-barrage battalions.**

Normally PVO units were grouped together under a higher PVO command, which was then supposed to organise and unify the command and control of these units. **The highest command level was the PVO corps**, and these were used wherever a highly concentrated PVO force was needed to defend a particularly important target. For example, on 22 June 1941 the **1 PVO Corps HQ was stationed in Moscow and had 6 PVO anti-aircraft regiments, 1 PVO AAMG regiment, 1 PVO searchlight regiment, 1 PVO searchlight battalion, 2 PVO air-warning regiments, 1 PVO air-warning battalion and 2 PVO air-barrage regiments assigned to it**. Targets around the USSR of lesser importance were defended by PVO division and brigade HQs, with the PVO regional brigade HQs having the smallest 'command span'. A particular PVO regional brigade HQ may have controlled only a single PVO battalion.

In addition to the concentration of PVO units varying across the USSR, **the actual personnel and equipment level within individual PVO units also varied widely.** This depended on its assigned geographic location, the importance of the targets being defended and whether or not the PVO unit needed to be mobile (obviously static units required fewer tractors and trucks). Therefore, although a PVO anti-aircraft battalion was authorised up to 24 heavy anti-aircraft guns in 6 batteries, many PVO anti-aircraft battalions actually had only 1 or 2 batteries on strength. For example, the PVO anti-aircraft regiments in the 2 PVO Corps defending Leningrad, the 1 PVO Corps defending Moscow, and the 3 and 4 PVO Divisions defending Kiev, all contained many more batteries than the PVO regiments in the PVO regional brigades in the Western Military Districts.

Most of the heavy anti-aircraft guns in PVO units in June 1941 were older 76mm models. These could be any of the 76mm M1915, M1931, M1931/33 or M1938 models. These were being steadily replaced by the new

85mm M1939 anti-aircraft gun when possible. But this weapon was still in relatively short supply even though PVO units had had first priority to receive this weapon since its introduction. **Shortages of light to medium (20-40mm) anti-aircraft gun were critical in June 1941, and many PVO units had no 37mm M1939 guns at all**. (p. 452)

Although the large PVO force generally looked good on paper, **there were major organisational and systemic problems within the PVO structure. A PVO command usually included anti-aircraft guns, AAMGs, searchlights, balloon obstacles, radio location (radar) stations and fighter aircraft.** Such a large and varied force required a great deal of efficient command and control to be effective in intercepting fast moving enemy air attacks. The problems were magnified by the need to provide a unified PVO command system while attempting to coordinate activities with Red Army units. There were many examples of organisational problems which included the following. (p. 454)

● **There was no unified command system for air defence**. For example, the military district Air Force (VVS) commander controlled fighter aviation, but fighter aviation regiments that were tasked with providing air defence of key cities and strategic targets were operationally subordinate to the PVO commander. Similarly, anti-aircraft units reported to the PVO HQ regarding training, while at the same time reporting to the military district artillery commander regarding material and technical support.

● The **PVO leadership was not immune to the same purges** that afflicted the Red Army so officers in the PVO commands suffered from similar personnel instability. For example, during 1940 and 1941 the PVO Directorate had no fewer than six different commanders.

● PVO formations **were untrained, ill-equipped and generally incapable of operating at night** against enemy aircraft.

● On the eve of war there were **no up to date regulations or common procedures for air defence**. Existing regulations were obsolete versions that had been prepared in the mid-1930s. Unified staff procedures were still to be worked out.

● **Unified air defence communications had not been organised**. For example, the Western and Kiev Special Military Districts had 119 and 110 communication centres, respectively, that were not connected to any unified system.

● **The air defence warning system (VNOS) had many problems.** Many observation posts and radio communication systems within VNOS either didn't work or did not exist. Those that did work struggled to provide timely information because they **largely relied on wire communications**. The VNOS system in the Western Military Districts had only 25-30% radio communications. Moreover, **most PVO personnel were still relatively untrained in the use of radios.**

● **VNOS units mostly employed visual methods of aircraft detection, and employed primitive means to determine the course and objective of enemy aircraft.** This was made even worse by **shortages of optical devices**. In June 1941 only 6 VNOS stations were equipped with the modern RUS-2 radio locators, while the older RUS-1 production had stopped in 1940.

In summary, the PVO and air defence forces suffered from: an unified command system, disorganised command and control, weak organisational structures, poor personnel and unit training, little to no night operation training, shortages of communication and detection equipment, and the absence of uniform and modern regulations and procedures. The overall ability of PVO ground and air units to defend against enemy air attack was very severely handicapped by all these problems.

It should be noted, however, that PVO ground forces were often concentrated around major cities, especially Moscow and Leningrad. In the event the *Wehrmacht* had managed to enter or fully surround these cities, these **PVO ground forces would have almost certainly become involved in directly supporting the defending Red Army troops. This represents a significant increase in the anti-tank and artillery weapons available to the troops defending these cities**, and is one of the main reasons why the PVO ground forces need to be carefully simulated in the Soviet FILARM model.

Fortified Sectors or Regions:

The Soviet fortified sector (or region, depending on source) was **a Red Army ground combat unit**. I**t was modest in personnel and strong in firepower**, and was designed to be the standard combat unit manning Soviet fortified defence lines by mid-1941. Fortified sectors were first created by the Red Army in **1923, and by the mid-1930s major portions of the USSR's borders were fortified and manned by these troops.** (p. 455)

During the 1930s the most extensive fortified defensive line in the USSR was the **so-called Stalin Line**, and it was intended that it would extend the whole length of the USSR's western border. The line started at Kingisepp (west of Leningrad) and then went through Pskov, Polotsk, Minsk, Mozyr, Novgorod-Volynskii, Letichev, Mogilev, Rybnitsa and Tiraspol (east of the Dniester River). The huge distances involved meant that the Stalin Line was never going to be a continuous (trench like) defensive line, but rather a series of small concrete pillboxes, bunkers and gun emplacements. **The idea was that the fortifications would be placed on the main access routes, and this would force any potential invaders into channels, or 'corridors', whereby they could be effectively engaged and stopped by the Red Army's mobile forces**. From 1928 to mid-1939 a total of 27 fortified sectors were built and at least partially manned. **Most of the 'completed' fortifications were on the approaches to Leningrad and Kiev, on the borders with the Baltic States and in the Far East. However, by mid-1939 the Stalin Line was still nowhere near complete and even the strongest sectors were only partially manned and equipped.** Given all the other rapid changes occurring in the Red Army at this time, the **fortified sectors remained well down on the Red Army's list of priorities.**[146]

During the Winter War with Finland in 1939-40 the strong Finnish fortified defences impressed the Red Army general staff. This renewed the Soviets' faith in fortifications generally, and led to further expansion and development of the fortified sectors. After the Soviet invasion of eastern Poland in 1939, the seizure of the Baltic States in 1940, and the occupation of Bessarabia, new fortified sectors were built along the USSR's new western border. **This new defensive line is commonly referred to as the Molotov Line**, presumably because it came about as a consequence of the Soviet-German Molotov–Ribbentrop Pact (signed on 23 August 1939). The new defensive line started at Memel-Tel'shiai in the north, and proceeded through Kaunas, Grodno, Zambruv, Brest, Kovel, Strumilov, Rava-Russkaia, Peremysl, Nizhne-Prut, Chernovtsy and Mogilev.

During 1940 and the first half of 1941, the Soviets built 20 new fortified sectors along their new western border, consisting of 2 defensive belts to a depth of 15 to 20 kilometres. As before, the idea was to use the fortified sectors t**o channel attacking enemy forces into regions where they could be destroyed by counterattacking Red Army mechanised forces.** It was intended that each fortified sector would include several machine-gun artillery battalions, separate machine-gun companies, separate artillery battalions and service sub-units (with an average wartime strength of some 4,000 men). Despite the best efforts, by 22 June 1941 there were **still large sectors of the Molotov Line that were incomplete**, as well as being severely undermanned and ill-equipped.

[146] **Note:** The 13 fortified sectors built in 1938 on the USSR's western border were manned by some 18,000 men in 25 machine-gun artillery battalions. A total of 8 more fortified sectors were added by early 1939. D. M. Glantz, Stumbling Colossus, University Press of Kansas, Lawrence, Kansas, 1998, p. 149.

Unfortunately the demands of the new Molotov Line also meant that most of the ongoing construction work on the Stalin Line was suspended. Even more critical was that the Stalin Line was largely stripped of its guns and troops in order to provide the resources to man the Molotov Line. **Whole sectors of the Stalin Line were stripped bare and all but abandoned.** What this did, in effect, was move the majority of the existing strength of the fortified sectors into positions where they would be hit by the initial German surprise attack, and before the fortified sectors could consolidate their positions and/or receive reinforcements.

On 21 May 1941 the NKO ordered the fortified sectors to begin full deployment, and mandated measures for their reinforcement. This comprised the addition of 17 new fortified sectors, 110 battalions, 16 companies, 6 artillery battalions and 16 artillery batteries. This would have added around 120,700 men to the existing force structure, and was to be completed by early July 1941 for fortified sectors on the new western border and by early October 1941 for the fortified sectors on the old border (the Stalin Line). As part of this 'upgrade' the fortified sectors were reorganised, and now full strength machine-gun artillery battalions were authorised around 1,400 men. (p. 455)

However, none of these measures had been completed by 22 June 1941 (or, in many cases, even started), and both the Molotov and Stalin Lines **remained in a relatively parlous state**. On 22 June 1941 there were a total of **60 fortified sectors** in the USSR, and of these 44 were in the Western Military Districts (including 5 in the 9 Separate Army and 1 in the Odessa Military District). The personnel and equipment included in the TOE for a typical 1941 fortified sector is shown in table Soviet Fort Sec. It should be stressed that this is the TOE only, and **that on 22 June 1941 all the fortified sectors were actually at a much lower strength than that shown here.** (p. 456)

Principal References:

S. J. Zaloga, L.S. Ness, *Red Army Handbook 1939-1945*, Sutton Publishing Ltd, Stroud, 1998, pp. 53-55, Table 1.19. Shtat 09/98 (dated March 1942).
D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, pp. 149-151.
C. C. Sharp, '*Red Legions', Soviet Rifle Divisions Formed Before June 1941*: Soviet Order of Battle WWII, Volume VIII, George F. Nafziger, West Chester, OH, 1996, p. 14.
www.niehorster.org and www.armchairgeneral.com/rkkaww2 (RKKA - *Raboche Krest'yanskaya Krasnaya Armiya*).

Each fortified sector was meant to be similar to a brigade in strength, and was made up of a series of machine gun (MG)-artillery battalions manning a variable number of concrete fortifications. The number of MG-artillery battalions varied from 2 to 5, with an average of 3 shown in table Soviet Fort Sec. Each MG-artillery battalion would typically comprise: **15-20 anti-tank positions** (each with an anti-tank gun and 1-2 MGs), 10-15 MG positions, 5-10 artillery positions (each with 1-3 76mm guns or 122mm howitzers), 5-8 searchlight positions, and around a dozen smaller observation and communication posts. Some fortified sectors also had an engineer-construction battalion or company, or/and a signal battalion or company attached. These units were often on temporary assignment, especially if fortifications were still being constructed or/and a signals network was being installed. (p. 456)

Furthermore the artillery in the fortified sector was sometimes concentrated into one or more artillery units, in which case it is likely the artillery component in the MG-Artillery battalions was reduced. Obviously the signal, transport and support elements in the fortified sectors were generally weaker than similar sized mobile units. This was due to the stockpiling of supplies and ammunition, **and the existing wire communication network in the fortifications.** If the troops in the fortified sectors were forced to retreat they were basically on foot without their heavy weapons. (p. 457)

Coastal Artillery:

In June 1941 the USSR possessed the three most heavily fortified ports in the world (which is a little known fact). These were Sevastopol, Vladivostok and Leningrad. In addition many other coastal artillery batteries were deployed on the **Baltic islands, the Hanko Peninsula**, near many ports along the Baltic and Black Sea coast, and near Archangel. **In all an estimated 54 coastal artillery battalions (each with an average of 3 batteries) and 118 separate coastal artillery batteries** were deployed across the USSR by 22 June 1941. Of these, 28 battalions and 36 batteries were deployed in the Western Military Districts, including the Odessa Military District. (p. 458)

In addition the most important coastal artillery battalions and batteries defending Sevastopol, Vladivostok and the Hanko Peninsula are shown. **The most noteworthy coastal artillery batteries were 3 huge 305mm naval gun batteries; 2 in Sevastopol and 1 in Vladivostok**. **In Sevastopol they were well known as Battery Maxim Gorki I and Battery Maxim Gorki II.** Obviously there was a very wide range in size, capability and protection of different coastal artillery batteries; depending on the importance of the target they were defending. **The vast majority of coastal artillery was in fixed fortifications**, and due to their fixed emplacements and fire control systems **only a small percentage of them were able to engage enemy land forces attacking from inland**. In general these units had very limited (if any) mobility. The little available transport was primarily used for bringing up supplies for stockpiling in fortified positions and maintaining the infrastructure around the prepared defences. Typical Soviet Coastal Artillery/Defence Battalion, 22 June 1941: The Coastal Defence Battalion was usually in fixed emplacements in fortifications. Includes Range Finding, Spotting, Signal Sections, 1x Light Supply Column and 3x Batteries with around 4 guns each. **Typical Guns included:** 100mm B-24 Guns, 130mm B-13 Guns, 120mm/50 Model 1905 Naval Guns and 152mm Kanet Guns. Some battalions included fixed emplacements (sometimes turreted) with guns up to 203mm in calibre. (p. 458)

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3J. Railroad Artillery & Armored Trains

Railroad Artillery:

In 1941 Soviet railroad artillery units were controlled by the Soviet Navy (VMF) and were manned using naval personnel. As such, in 1941 (and during WWII in general) Soviet railroad artillery was used primarily for supplementing the coastal defence forces. **On 22 June 1941 there were 14 identified railroad artillery batteries in the USSR.** A total of 6 batteries were deployed with the 12 Naval Railway Artillery Brigade in the Vladivostok fortress, **2 batteries were on the Hanko Peninsula and the remaining 6 batteries were in the Baltic Special Military District.** The latter were supporting coast defences for the **Tallinn Naval Area (3 batteries), the Liepaja Naval Base (1 battery), and the Irbensky Sector (2 batteries)**, and reported to the Baltic Fleet Command. (p. 460)

Armoured Trains and Armoured Train Battalions:

The personnel and equipment included in the combat, signal, transport and supply elements of a typical 1941 Soviet armoured train battalion is shown in table Soviet Arm Trains. The RVGK armoured train battalion usually consisted of 2 type A trains, a type B train and several rail going armoured cars (usually 1 per armoured train in the battalion). The armoured cars were usually BA-20ZhD or BA-6ZhD (*Zheleznaya Doroga* or 'steel wheel') armoured cars, which were BA-20 and BA-6 armoured cars adapted for running on railroad tracks. These were used for scouting and rail protection around the armoured trains in the battalion. This structure underwent only minor modifications before WWII broke out. For more details on the weapons used on the various types of armoured trains in service with the Red Army in 1941 refer to Chapter 2. 8 - 'Armoured Trains'. On 22 June 1941 there were **9 armoured train battalions deployed in the USSR with only 1 of these in the western USSR (in the Kiev Special Military District**). An additional separate and single armoured train (the 66 Armoured Train) was deployed in the Far East Front.

In addition to the Red Army's armoured train battalions, the NKVD also operated a number of 'security armoured trains'. A typical June 1941 NKVD security armoured train is shown in table Soviet Arm Trains. These operated separately and in conjunction with the NKVD's railroad security divisions. These trains were more lightly armed and armoured than trains in the Red Army, and their principal function was guarding transportation convoys and garrisoning key strategic rail facilities such as bridges. **On 22 June 1941 there were 33 NKVD security armoured trains deployed with 18 deployed in the Western Military Districts**. Apparently the NKVD believed there was a higher risk of enemy rear area incursions in these districts.

In the months following June 1941 most of the armoured trains initially deployed in the west, and those sent as reinforcements to the west, were lost. In order to replace these losses, **approximately 40 new armoured trains were Mobilised and Deployed (MD) from August to November 1941.** These consisted of reactivated trains from revolutionary times and some improvised new constructions which included the use of tank turrets. These trains usually came in the common 2 gun car configuration with 2 45-76mm guns per car and additional 12.7mm HMGs for air defence. These trains were designated armoured train type **NKPS-42**, and a typical train of this type is also shown in table Soviet Arm Trains. (p. 460)

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3K. Review of the Authorised Sizes of Soviet Divisions and Brigades, from 22nd June to 31st December 1941

So far in this chapter we have looked in detail at the TOEs (*Shtaty*) of the various combat units fielded by the Soviets from 22 June to 31 December 1941. These were the maximum strengths authorised by the Soviet high commands for each unit type, although, as we shall see later, **very few units actually reached their full TOE strength in 1941 (or for that matter at any time during WWII)**. . . The reader should always bear in mind when reviewing the table above [not shown] that these figures are based on full strength units (the TOE). In actuality, none of the Red Army's rifle divisions were at full strength on the 22 June 1941, many tank and mechanised divisions were in a deplorable or barely formed state, and very few units mobilised after June 1941 ever reached full strength. In Volume IIIB a similar analysis to the above is carried out on the average actual strength of Soviet combat units Mobilised and Deployed (MD) from June to December 1941 (as opposed to the TOE strength shown in the above table). (pp. 463-64)

Pre-War Divisions and Brigades:

● **The Red Army's pre-war rifle divisions were generally large formations**, easily meeting the criteria to be truly called divisions. The rifle divisions were intended to be large and well balanced formations with substantial rear area infrastructures and supporting heavy weapons.

● **The Red Army's pre-war tank and mechanised divisions were particularly large**. However this was primarily due to the very large numbers of tanks authorised in these divisions; namely 375 in the tank divisions and 275 in the mechanised divisions. Unfortunately the supporting infrastructures and the other heavy weapon units in these divisions were relatively weak, particularly in the tank divisions. The large pre-war tank divisions were particularly tank heavy formations. By way of comparison, the German 1941 panzer division's TOE called for only 182 tanks (including 10 Pz I engineer vehicles) and its size was approximately 197% of the MDS value. Therefore the panzer division was significantly larger than the pre-war tank division (at 180% of MDS) despite having fewer than half the number of tanks. The panzer division had far more supporting infrastructures, transport units, reconnaissance units, anti-tank units and motorised infantry units than the Red Army's pre-war tank division: it was also large but for very different reasons.

● **The Soviet pre-war cavalry and mountain-cavalry divisions were relatively small formations**, despite both types of division having a tank battalion. This was due to the small number of authorised personnel, and lack of heavy weapons such as artillery and anti-tank guns. Note, pre-war cavalry and mountain cavalry divisions were only authorised 9,240 and 7,281 personnel, respectively. So the reader doesn't simply dismiss the small size of the Soviet cavalry divisions as being in the nature of cavalry divisions, it should be borne in mind that these units were far smaller than the German 1st Cavalry Division (at 140% of MDS), and very similar in size to the contemporary Rumanian and Hungarian cavalry brigades. Despite their relatively small size the Soviet cavalry divisions were probably the most combat ready mobile formations available to the Red Army on 22nd June 1941. Their superior mobility (and their initial deployment), rather than their absolute strength, enabled them to survive longer than any other Red Army division type fielded during Operation Barbarossa.

● Apart from the single NKVD Motorised Rifle Division for Special Purpose, **all the NKVD security and guard divisions were very small to be called 'divisions'**, and clearly they were never intended for front line combat duties.

● **The large majority of Soviet pre-war brigades were small units with the exception of the 1st Naval Infantry Brigade, which was a genuine brigade sized unit.** Apart from airborne and NKVD security brigades, there were only 5 special rifle brigades in the Red Army on 22 June 1941.

● **The 16 pre-war Soviet airborne 'brigades' were actually regimental sized units**, and at least 3 - 4 of them can be considered a 'division equivalent' (and even then, a small division). The airborne brigades were small because they only had approximately 2,600 men each and lacked all types of heavy weapons. In fact, an entire Soviet airborne corps (3 airborne brigades and all the airborne corps HQ assets) was barely the equivalent of the western concept of an airborne division. (p. 464)

Post June 1941 Divisions and Brigades:

● **The only new division types mobilised after June 1941 that can be reasonably called divisional sized (i.e. at least 100% of the Minimum Divisional Size (MDS) value) were the July tank divisions, and, arguably, the rather improvised NKVD motorised divisions.** The July 1941 tank divisions were still authorised a large numbers of tanks (**215 tanks each**) but they generally suffered from the same weaknesses as the larger pre-war tank divisions. Accordingly they didn't survive much longer in combat during 1941. The few NKVD motorised divisions that were fielded lacked anti-tank, artillery and signals assets, but they were authorised 4 rifle regiments versus normally 3. This fact increased their overall size by around 22%.

● **The vast majority of new Red Army divisions mobilised after June 1941 were the various types of rifle divisions, and they were all relatively small formations.** In particular they all suffered from lack of support infrastructure, transport, anti-tank weapons, LMGs and medium to heavy artillery. Red Army rifle divisions mobilised between June and December 1941 were authorised ca.: 75% of the personnel, 41% of the LMGs, 65% of the MMGs, **33% of the anti-tank guns**, 82% of the light artillery (76mm), only **18% of the medium to heavy artillery (122-152mm), 35% of the trucks**, and 5% of the tractors in the pre-war rifle divisions. The militia rifle divisions were significantly weaker than even this when they were mobilised. These huge reductions meant that the **July 1941 rifle divisions**, and the militia-rifle divisions, mobilised after Operation Barbarossa commenced **can barely be called 'divisions**'. Even at full strength they were easily the smallest rifle-infantry divisions being fielded by any major combatant at that time. Of particular note is the lack of anti-tank and medium to heavy artillery: the rifle divisions were authorised only 18 45mm anti-tank guns and 8 122mm howitzers each.

● **Soviet cavalry 'divisions' mobilised after June 1941 should not be called divisions in any modern literature on WWII.** These units completely fail in every regard to conform to any definition of a WWII division, **and are a constant source of misinformation (and consequently, misconception) regarding Operation Barbarossa**. This is because the number of cavalry 'divisions' fielded by the Red Army in 1941 is often quoted as further evidence that the *Wehrmacht* could never have defeated such a large force by November-December 1941. The figure of 101 cavalry divisions is sometimes quoted, of which all but 13 were mobilised after June 1941.

In actuality, not only were the 13 pre-war cavalry divisions only 61-92% of the MDS value, but, far more importantly, the remaining 'divisions' were only 40% of the MDS value. This means that **the 88 cavalry 'divisions' mobilised after June 1941 were the equivalent of around 35 small divisional sized combat units**, even if all of them were at full TOE strength! In addition, only 50 of these divisions (the equivalent to only 20 divisional sized combat units) were actually Mobilised and Deployed (MD), and very few, if any, were at full strength. **The July 1941 cavalry division's TOE included only 4,239 men**, 6 45mm anti-tank guns and 20 76mm artillery pieces (including infantry guns): **at most the equivalent of a light cavalry brigade by any contemporary measure of a cavalry division.**

● **The Soviet rifle 'brigades' mobilised after June 1941 were actually regimental sized rifle units**. In terms of size, at least 3 rifle brigades (including naval rifle brigades) were the equivalent of a small divisional sized combat unit. However, in terms of realistic combat power, around 4 Soviet 1941 rifle brigades were the approximate equivalent to one of the newly mobilised (small) rifle divisions. This was mainly because the rifle brigades lacked adequate heavy weapons, support infrastructures and even rudimentary training.

● **The Soviet airborne 'brigades' mobilised after June 1941 were barely even regimental sized units**. Even at full strength they had only around 2,500 men; 682 fewer men than a pre-war rifle regiment, and even 195 fewer men than the rifle regiments in the small July 1941 rifle divisions. At least 5 1941 post-June 41 airborne brigades were the equivalent of even a small divisional sized combat unit (**Note: Very few of the newly mobilised airborne brigades ever saw combat as airborne brigades).**

● **Like the cavalry divisions (above), the number of rifle and airborne brigades mobilised in 1941 is also often used as evidence of the colossal nature of the Red Army in 1941**. This is usually the result of tallying 2 rifle or 2 airborne brigades as the equivalent of a rifle division.[147] It is possible that this stems from the Western conception of an infantry brigade during WWII. Whatever the reason, the **very large majority of current literature on Operation Barbarossa grossly overestimates the size and overall combat power of all Soviet 'brigade' types mobilised during 1941.**

● **Like the rifle brigades, the Red Army's tank 'brigades' mobilised in 1941 were very small units:** at best, 3-4 of them can be considered the equivalent of a divisional sized combat unit. The only reason the August and September 1941 tank brigades had even this size was because they were authorised 93 (64 light) tanks and 67 (38 light) tanks, respectively. In terms of personnel they were authorised only 1,943 and 1,762 men, respectively: **barely the equivalent of a Western army's tank regiment with very little infrastructure support.** By December 1941 the tank 'brigades' had shrunk even further and were authorised only 46 (16 light) tanks and 1,146 men: **the equivalent of a Western tank battalion**. On top of all this, very few of these tank brigades ever reached their full tank or equipment strength, **with the August-September 1941 tank brigades averaging around 50 tanks each.**

Finally, it is worth noting that the strongest Red Army tank brigade fielded in 1941 was only 20% of the size of a pre-war tank division, and by December 1941 this figure had shrunk to only 11%. It is simply absurd to count 2 Soviet 1941 tank brigades as equivalent to any type of divisional sized combat unit. In terms of overall combat and staying power, even a reasonably well equipped (and relatively small) newly-mobilised July 1941 tank division was still around 5 times stronger than a typical 1941 tank 'brigade'.[148] (p. 466)

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[147] **Note:** E.g., D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, pp. 15-17. Glantz quotes 174 rifle brigades and 93 tank brigades as being mobilised from June to December 1941, and later goes on to total this force as equivalent to 133 divisional sized formations. No effort is made to indicate how many of these brigades were actually Mobilised and Deployed (MD); i.e. **how many were formed from existing units, how many were simply name changes from already deployed units, how many were only partially (or even barely) formed and/or remained in the eastern USSR, etc.**

[148] **Note:** This is really clarifying. Western historians (myself included) have thrown around these terms—regiment, brigade, division, etc.—while being mostly oblivious to what they actually signified. When using these terms to denote Red Army units, we need to be much more careful than we have been.

3L. The Principal Regiments and Battalions, Assigned to Red Army and NKVD Divisions and Brigades on 22nd June 1941

The following tables [not shown] show the numerical designations of the principal regiments and battalions assigned to the Red Army and NKVD divisions and brigades, which were Deployed (D) on 22 June 1941. The tables include **all 308 Red Army divisions and brigades**, and all **32 NKVD divisions and brigades**, fielded. The Red Army divisions and brigades comprised: 177 rifle, 2 motorised rifle, 61 tank, 31 mechanised, 19 mountain, 9 cavalry and 4 mountain cavalry divisions, and 5 rifle brigades. The NKVD divisions and brigades comprised: 4 motorised, 9 rail security, 1 industrial guard and 2 convoy escort divisions, and 5 rail security, 4 industrial guard and 7 convoy escort brigades.[149] (p. 467)

In around 2% of cases there is some doubt about the precise designation of a particular regiment or battalion due to conflicting data. In this case the most probable designation is shown (i.e., where the balance of evidence shows a particular designation). On occasion, a particular regiment type may have had the same numerical designation in different divisions of the same type. Thus, for example, finding 2 rifle regiments in 2 different rifle divisions with the same number is possible.

This, however, was very rare, and it most often occurred in different division types. For example, a rifle regiment in a rifle division and another motorised rifle regiment in a mechanised division may have had the same designation number. **In general the regiments of a particular type (e.g. rifle regiments or artillery regiments) were numbered consecutively in the Red Army's OOB.**

Similarly to the German Army, it was uncommon for the Soviet command to change these divisional assignments in the field, after the division or brigade was assigned to an active corps or army HQ. It was more common to add or remove a particular regiment or battalion when the unit was withdrawn for a refit, or if it was to be 'modified' as a new division type. **For example, most of the Soviet mechanised divisions fielded in June 1941 were 'mechanised' in name only (i.e. they had very few trucks).** Very soon after the Axis invasion most of the surviving mechanised divisions were converted to rifle divisions by getting rid of the tank regiment and replacing it with a new rifle regiment. Thus, the pre-war 7 Mechanised Division had the 27 and 300 Motorised Rifle Regiments and the 23 Tank Regiment on 22 June 1941. In September 1941 it was converted to the 'new' 7th Rifle Division with the 27, 300 and 405 Rifle Regiment.

Unfortunately for the Red Army, a huge proportion of the divisions fielded on 22nd June 1941 were (more or less) annihilated; especially if they were trapped in one of the large pockets formed between June and November 1941. **These divisions, along with their assigned regiments, were generally struck off the Soviet OOB for a short period. Later, the divisional and regimental designations were usually used for new formations.** In these cases the new divisions generally incorporated regiments with completely different regimental designations to the original division. For example, the pre-war **8 Rifle Division** had the 151, 229 and 310 Rifle Regiments assigned on 22 June 1941. The division was destroyed near Minsk in late June 1941. In late September 1941 a new 8 Rifle Division was formed (using the smaller July 1941 TOE) and it had the 1299, 1301 and 1303 Rifle Regiments assigned. **Given the chaotic situation that ensued, it is not surprising to find the same numbered regiment (of a particular type) in 2 Red Army divisions at the same time.** However, in general, after June 1941 the Red Army attempted to number the regiments of a particular type consecutively in the Red Army's OOB (as they did pre-war), and in the large majority of cases they were successful.

* * *

[149] **Note:** The data is mostly compiled from: Sharp, C, C., *Soviet Order of Battle World War II* series . . . Also, www.niehorster.org with contributions by Dr. L. Niehorster, M. Avanzini, P. Carmoy, and E. Drig; and **www.armchairgeneral.com/rkkaww2/formations** and **www.rkka.ru.**

4. The Order of Battle (OOB) of Soviet Land Combat Units on 22 June 1941

4A. The Soviet Deployment Matrix

● The Orders of Battle (OOB) of the Red Army, PVO ground units and naval ground combat units, existing on 22 June 1941 in all military districts, are shown in the series of tables with the common title Soviet Deployment Matrix. The NKVD combat capable units are shown separately in the next section (the NKVD Deployment Matrix). Together, these tables are referred to as the '**Soviet Deployment Matrix**', and all combat units in the 'Soviet Deployment Matrix' are classified as in a Deployed (D) state in the Soviet FILARM model. For the purposes of this book and the Deployment Matrix, the military districts, reserves and fronts on 22 June 1941 (just prior to Operation Barbarossa) are defined as follows.

● The Western Special Military Districts: includes the Leningrad Military District, the Baltic Special Military District, the Western Special Military District, the Kiev Special Military District, and the Odessa Military District (which includes the 9th Separate Army).

● The Reserves of the **STAVKA GK**: includes the 1**6, 19, 20, 21, 22 and 24 Armies, and Separate Stavka Reserves.**

● **Internal Military Districts and Non-Active Fronts:** includes the Moscow Military District, the Orel Military District, the Kharkov Military District, the Volga Military District, the North Caucasus Military District, the Transcaucasus Military District, the Archangel'sk Military District, the Urals Military District, the Central Asia Military District, the Siberia Military District and the Transbaikal Military District.

● The Far Eastern Front. (p. 477)

The Soviet Deployment Matrix lists each military district, Stavka reserve or front in the USSR on 22 June 1941. Within each military district, Stavka reserve or front, the subordinate armies are shown as columns (if armies were present). Rifle, mechanised, cavalry and airborne corps HQs, which were subordinate to each army HQ, are listed within each 'army column', along with all attached divisions and support units. Relevant notes at the bottom of each column indicate divisional and brigade corps attachments, the names of fortified sectors, the names of PVO regional brigades, garrisons, information on when units transferred from internal military districts and the Far Eastern Front to the 'west' (refer Volume IIIA 5.), and some important details on the status of individual combat units.

Table Soviet Deployment Matrix indicates that on 22 June 1941 there were **303 ground divisions in the Red Army (or RKKA**), excluding all NKVD and PVO divisions. These were made up of 177 rifle divisions, 2 motorised rifle divisions, 19 mountain rifle divisions, **61 tank divisions, 31 mechanised divisions**, 9 cavalry divisions and 4 mountain cavalry divisions. In addition there were 5 rifle brigades, 16 airborne brigades, 1 naval infantry brigade, 10 anti-tank brigades, **168 large corps and RVGK artillery regiments, and 15 RVGK high power artillery battalions deployed.** Of the 303 available Red Army ground divisions, **170 divisions were in the Western Special Military Districts while a further 57 divisions were in the Reserves of the STAVKA GK**. The latter were either already in the Western Special Military Districts, were in the western USSR or were in transit to the western USSR. (p. 477)

In total, **227 Red Army divisions (75% of the total number) were either already committed in the western USSR or would be quickly available** to meet any Axis invasion force coming from the European mainland. These 227 divisions were made up of 138 rifle divisions, 7 mountain rifle divisions, 50 tank divisions, 25 mechanised divisions and 7 cavalry divisions. In addition, 2 rifle brigades, 12 airborne brigades, 1 naval infantry brigade, 10

anti-tank brigades, 111 large corps and RVGK artillery regiments, and 6 RVGK high power artillery battalions were also in the Western Special Military Districts or in the Stavka reserves. (p. 478)

When examining the forces deployed in the Western Special Military Districts on 22 June 1941, **defence of the area known as Bessarabia was the responsibility of the 9 Separate Army.** Bessarabia was the area south of the Kiev Special Military District, north of the Black Sea, east of the Rumanian border and west of the Dniester River. In late June 1940 Stalin took advantage of the German preoccupation in the West to consolidate his position in Eastern Europe. He demanded that Rumania cede the provinces of **Bessarabia and Northern Bukovina** to the USSR. Not wanting a major rift with the Soviets at this stage, the Germans advised Rumania to 'hand over' these territories. Having no real choice in the matter, and coupled with the fact that French and British forces could no longer offer support, the **Rumanians allowed the Soviet troops to occupy the above territories unopposed from the 28-30 June 1940.** The Soviet 9 Army was then tasked with occupying the newly gained territory and preparing it for any possible invasion. Sometime between September 1940 and June 1941, the 9 Army was removed from direct assignment to the Odessa Military District and placed directly under the command of the Stavka. It was then designated the 9 Separate Army, although it appears the command positions still came from the headquarters of the Odessa Military District.

As a result the 9 Separate Army grew into a powerful army with 3 rifle corps, 1 cavalry corps and 2 mechanised corps at its disposal by June 1941. Immediately behind the 9 Army, the Odessa Military District remained responsible for the defences east of the Dniester River and for Odessa itself. Although the 9 Army was considered 'separate', it was closely aligned with, and largely controlled by, the Odessa Military District. In time of war the 9 Army would draw its directions, supply and reinforcements from the Odessa Military District. After Operation Barbarossa started the forces in the 9 Army, the Odessa Military District and the hastily deployed 18 Army HQ from the Kharkov Military District, **became the Southern Front on 25 June 1941.**

A considerable number of sources list the Odessa Military District as an Internal Military District on 22 June 1941 as it was not directly on the border with the West and was 'buffered' by the 9 Separate Army. However forces deployed in the Odessa Military District in June 1941 were much closer to Axis forces than many units in the so called Western Special Military or 'Frontier' Districts, and were drawn into the campaign almost immediately. Therefore, for all intents and purposes, **the Odessa Military District was one of the Western Special Military Districts in June 1941 and will be considered as such in this analysis.**

The total personnel and equipment in the Soviet armed forces (including the NKVD) on 22 June 1941 amounted to over: **5,447,900 men** (with over 4,553,000 in the ground forces and PVO), 23,300 tanks, 20,800 combat aircraft, 15,100 anti-tank guns, 8,600 anti-aircraft guns, 56,100 mortars and 34,000 artillery pieces. **The Soviet armed forces that were Deployed (D) on 22 June 1941 easily represented the largest armed force in the world at that time.**

In fact, the Soviet armed forces that existed on 22 June 1941 were probably the largest armed forces ever maintained by any single country which was not at war (i.e. a peacetime army and air-force). This was even before the massive mobilisation effort that occurred after 22 June 1941. So the reader gets these figures in perspective, consider that on 22 June 1941 the Soviet armed forces contained almost 2.4 times as many active personnel as the modern Chinese People's Liberation Army (PLA).[150] When the staggering number of available Soviet tanks, guns and aircraft is included, this 'number' becomes even greater.

There are many reasons why the German invasion of the USSR came close to success and was not literally stopped in its tracks by the massive Soviet forces in the Western Special Military Districts. These reasons are analysed in various parts of this work, **but arguably the four main reasons were:** (p. 478)

[150] **Note:** As of 2016, the Chinese People's Liberation Army (PLA) contained around 2,300,000 personnel; easily the largest armed force extant.

● The parlous state of the majority of existing Soviet divisions and their equipment in June 1941. Most divisions were well below their TOE strength, especially in critical areas such as transport.

● The overall condition the Red Army's leadership at all levels of command. This was largely (but not wholly) the result of Stalin's purge of the military which had been ongoing since 1937.[151]

● The poor tactical and operational deployment of the Red Army's ground forces and the VVS's air forces in the Western Special Military Districts in June 1941.

● The extremely high degree of tactical and operational combat proficiency exhibited by the invading German Army and *Luftwaffe* forces. (Note: The stress here is tactical and operational level proficiency, **because at the strategic level the German proficiency left much to be desired** (as can be seen from some of the figures in the German FILARM model). (p. 479)

[**Note:** What follows are exquisitely detailed color tables of all the *districts* in the Western Military Districts, beginning with the *Leningrad Military District*. These would all become "fronts" on 22 Jun '41 following the German attack. The color tables lay out the entire OOBs for each district.] (pp. 460 -)

Western Special Military District (OOB)[152]

● Front HQ: **1** (Minsk)
● Army HQs: **4**[153]
● Rifle Corps HQs: **8** (**4** in reserve)
● Rifle Divisions: **24** (**11** in reserve)
● Mech Corps HQs: **6** (**2** in reserve)
● Tank Divisions: **12** (**4** in reserve)
● Mech Divisions: **6** (**2** in reserve)
● Cavalry Divisions: **2**
● Fortified Sectors: **8** (**5** in reserve)
● Engineer Rgts.: **3** in reserve)
● RVGK AT brigades: **3**
● Corps Artillery Rgts: **15**
● RVGK Art. Rgts/Btls: **11**[154] (**7** in reserve)
● PVO Air Defense Btls.: **33**[155] (all in reserve)

Kiev Special Military District (OOB)

● Front HQ: **1** (Kiev)

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[151] **Note:** Perhaps equally important in my view was the utterly massive expansion of the Red Army and other elements of the armed forces beginning perhaps as early as 1937. Simply put, so many formations of all types were generated that they could never be fully manned with experienced personnel or provided with all the weaponry, transport, etc., as laid out in their TOEs. A situation of some chaos ensued.
[152] **Note:** Here I have just listed the basic OOB.
[153] **Note:** 3 Army (Grodno); 4 Army (Kobrin); 10 Army (Belestok); 13 Army (HQ only until 24 Jun '41 (Mogilev).
[154] **Note:** This included: Cannon & Howitzer Regiments; Super Hvy How Rgts.; High Power Art. Battalions.
[155] **Note:** Bewildering number of PVO units! AD rgts., AD btls., AAMG rgts., AAMG btls.; Searchlight Rgts./Btls.; Air-warning rgts./btls.; Air-barrage rgts./btls.

- Army HQs: **4**[156]
- Rifle Corps HQs: **11** (**4** in reserve)
- Rifle Divisions: **26** (**12** in reserve)
- Mech Corps HQs: **8** (**2** in reserve)
- Tank Divisions: **16** (**4** in reserve)
- Mech Divisions: **8** (**2** in reserve)
- Cavalry Divisions: **2**
- Fortified Sectors: **16** (**9** in reserve)
- Engineer Rgts.: **3**
- RVGK AT brigades: **5** (**1** in reserve)
- Corps Artillery Rgts: **22** (**8** in reserve)
- RVGK Art. Rgts/Btls:[157] **17** (**16** in reserve)
- PVO Air Defense Btls.: **33** (**28** in reserve)

Reserves of the STAVKA GK[158]

- Army HQs:
- 16 Army (Orel)
- 19 Army (Cherkassy)
- 20 Army (Kaluga)
- 21 Army (Gomel)
- 22 Army (Velikie Luki)
- 24 Army (Siberia / in transport)
- Rifle Corps HQs: **14**
- Rifle Divisions: **42**
- Mech Corps HQs: **5**
- Tank Divisions: **10**
- Mech Divisions: **5**
- Corps Art. Rgts.: **13**
- RVGK Art. Rgts.: **4**

* * *

[156] **Note:** 5 Army (Lutsk); 6 Army (Lwow); 12 Army (Stanislav); 26 Army (?).
[157] **Note:** Same breakdown of gun types as with WSMD.
[158] **Note:** A minority of units listed here were attached directly to the **Separate STAVKA Reserves.**

4B. The NKVD Deployment Matrix.

As we have seen, by June 1941 **the NKVD was a large and complex organisation which operated many diverse unit types**; effectively an 'army within an army'. It numbered some **490,000 personnel in June 1941, and of these around 388,800 personnel were deployed in NKVD units which could be considered 'combat capable'.** The Orders of Battle (OOB) of the NKVD ground units existing on 22 June 1941, in all military districts, are shown in the series of tables with the common title NKVD Deployment Matrix. Because these units had a significant combat capability, they are considered combat units in the Soviet FILARM model and are considered Deployed (D). (p. 505)

It does need to be stressed, however, that applying the term 'combat capable' to the large majority of these NKVD units is being generous. All the NKVD units fielded in June 1941 were trained, organised and equipped to operate as rear-area security forces. **In June 1941 the NKVD 'divisions' were not divisions in the same sense as used in the Red Army**, i.e. a large combine-arms force designed to operate as a concentrated unit. **NKVD divisions and brigades generally operated in a very dispersed fashion (often over thousands of square kilometres)**, and the NKVD divisional or brigade HQ was essentially an administrative centre. Orders were issued via the HQ and it controlled the deployment of its subordinate NKVD regiments and battalions. However, the small NKVD HQ did not provide the supply, maintenance and support infrastructure normally associated with an Army type divisional or brigade HQ. The NKVD regiments and battalions were commonly reassigned to different HQs, and essentially operated independently in an internally-focused security manner. . .

Table NKVD Deployment Matrix [not shown] indicates that on 22 June 1941 there were 18 border district HQs, and 29 divisional and brigade HQs in the NKVD. There were also 3 more divisional HQs mobilising in the Western Special Military Districts; namely the 21, 22 and 23 NKVD Motorised Rifle Division HQs. **Only 1 NKVD 'tactical' division existed in a complete form: the NKVD Motorised Rifle Division for Special Purpose in Moscow.** All the other 'divisions' were HQs with various security, guard, escort, rifle or cavalry regiments assigned. On 22 June 1941 these 'divisions' had no heavy weapon battalions assigned, such as artillery, anti-tank, anti-aircraft or engineer battalions. Available to the NKVD HQs were **94 NKVD border guard units** (assigned to the border district HQs), and a total 85 NKVD **security, guard, escort**, rifle and cavalry regiments. There were also an additional 65 separate security, guard, escort and rifle battalions available, which were not (yet) assigned to any of the NKVD regiments.

Of this force, 8 border district HQs (with 48 border guard units), and 9 divisional and brigade HQs were in the Western Special Military Districts (**excluding the still forming 21, 22 and 23 NKVD Motorised Rifle Division HQs**). There were also 40 NKVD security, guard, escort, rifle and cavalry regiments, and an additional 11 separate guard, escort and rifle battalions in the Western Special Military Districts. **Unlike the Red Army, the majority of the NKVD's strength was deployed in the internal military districts and none-active fronts**, and the Far Eastern Front. This is not surprising as these units were responsible for security across the whole of the USSR, including some **troublesome hotspots such as Chechnya and Armenia,** and were not focused on any potential invading force coming from mainland Europe.[159] (p. 505)

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[159] **Note:** In the event, **the large majority of NKVD rail-security, industry-guard and convoy-escort units never saw front line combat**. These units mostly fell back while continuing their **rear area security and 'policing' duties**. *This is probably just as well as these units would not have lasted long in the front-lines in 1941*, and, on balance, this was probably the best course of action.

5. The Transfer Schedule of Soviet Land Combat Units, which were in a Deployed (D) State, to the USSR's Western Fronts (23.6.-31.12.1941)

Table Soviet Transfer Matrix [not shown] shows the transfer schedule of land combat units to the 'West' (i.e. western regions of the USSR) from 23 June to 31 December 1941. It only includes units from the Soviet Army and Soviet Navy (naval ground forces) which were Deployed (D) on 22 June 1941. For this purpose 'West' is defined as west of a line running north/south, 100km west of the Urals. Therefore the following military districts and non-active fronts are included as being east of this line: (p. 517)

- The Urals Military District.
- The Siberia Military District.
- The Central Asia Military District.
- The Transbaikal Military District.
- The Far Eastern Front.

Table Soviet Transfer Matrix [not shown] shows that a **total of 28 divisions were transferred west from June to the end of December 1941**. These comprised 18 rifle divisions, 1 mountain rifle division, 3 tank divisions, 3 mechanised divisions and 3 mountain cavalry divisions. The transfers occurred mainly in June (11 divisions) and October (9 divisions). Of the 11 divisions transferred in June, 9 were rifle divisions already assigned to the Reserves of the STAVKA GK. These divisions comprised the 153, 174 and 186 Rifle Divisions attached to the 22 Army, and the 91, 119, 166, 107, 133 and 178 Rifle Divisions attached to the 24 Army. **These were already in transit, or already under orders to move westwards, on 22 June 1941.**

After 22 June 1941, **an additional 19 divisions were ordered west.** Therefore by the end of the year only 23 of the original 42 divisions Deployed (D) east of the Urals remained there. **Altogether these figures show that 280 Red Army divisions that were Deployed (D) in the USSR on 22 June 1941 were committed west of the Urals during the second half of 1941. This represented 92% of the 303 ground divisions** in the Soviet armed forces (excluding NKVD security divisions and PVO air-defence divisions) on 22 June 1941.

* * *

The precise transfer of Deployed (D) NKVD ground units to the 'West' is unknown. From the NKVD Deployment Matrix we can ascertain that there were: 7 border district HQs, 36 border guard units, 9 NKVD divisional and brigade HQs, 23 NKVD security, guard, escort, rifle and cavalry regiments, and 20 separate security, guard, escort and rifle battalions deployed east of the Urals on 22 June 1941. **It appears that none of the HQs, and very few (if any) of these regiments and battalions transferred west in 1941**. The NKVD preferred to mobilise new security units in the western USSR by calling on the NKVD reserves and conscripting new personnel, and reorganising and expanding existing units.[160] It is known that a number of NKVD personnel did transfer from the NKVD units deployed east of the Urals to provide experienced cadre for the newly mobilised NKVD units in the western USSR.

The main reason why the NKVD preferred to mobilise new units stems from the fact that in 1941-42 it was facing a very different situation to that facing the Red Army. The Red Army's focus was almost entirely on stopping the *Wehrmacht*, while the NKVD still had to ensure all the remaining regions (and borders) of the USSR were secure. The areas and borders concerned were vast, and the NKVD units patrolling them were already stretched. In addition, these areas included regions where the local populace was not entirely subjugated by the Soviet regime.

[160] **Note:** Around **134,000 NKVD personnel** went into newly mobilising NKVD units from June to December 1941. In addition, **114,000 NKVD personnel went into the Red Army to form 15 new rifle divisions** between 22 June and late July 1941.

On top of this the NKVD still had to maintain and operate its vast network of forced labour camps (Gulags), many of which were in the Siberia, Urals and Central Asia Military Districts. There is no evidence that Stalin relaxed the detainment (or elimination) of individuals and ethnic minorities he deemed a threat during late 1941 and 1942. Thus most of the NKVD's convoy-escort units, and many of the guard units, had to carry on as they did prior to June 1941.

Lastly, it is worth pointing out that many of the NKVD security units east of the Urals had a significant proportion of personnel that had been recruited from the local populace. From a security and intelligence gathering perspective this makes obvious sense when attempting to 'police' and control a local ethnic group. An NKVD security unit with a large proportion of loyal Uzbekistani personnel was always going to be a lot more effective in Uzbekistan than it would be attempting to control the Red Army's rear area in western Russia. (p. 517)

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5A. The Myth of the Siberian Divisions

At this point it is very instructive to examine **the legend regarding 'Siberian' divisions**. According to current historical wisdom the veteran and well equipped Siberian divisions were deployed protecting the USSR's eastern borders against a possible attack by Japan on 22 June 1941. They were then apparently transferred west from October to November 1941 in time to have a strong influence on the battle for Moscow. According to the same historical wisdom these divisions were 'released' from October to November 1941 after Stalin had learned from his spy network in Japan, run by **Richard Sorge**, that the Japanese had no intention of attacking the USSR. Apparently by November 1941 these same Siberian divisions were being encountered all along the front protecting Moscow.[161] (p. 519)

The first thing that is apparent from table Soviet Transfer Matrix is that only 14 divisions, in total, were transferred west after July 1941. These are the only divisions that could possibly have been influenced by any information from Richard Sorge's spy ring, going back as far as early August 1941. **The decision to move the 24 Army from Siberia with its 6 rifle divisions had already been made before Operation Barbarossa started in June 1941**. On 22 June 1941 the 24 Army was already assigned to the **Reserves of the STAVKA GK**. **The 24 Army's rifle divisions had all arrived west of Moscow by 7 July 1941**, and these divisions were all committed to the front before the end of the month. The 24 Army (moving from Siberia on 22nd June 1941) had the 91, 119, 166, 107, 133 and 178 Rifle Divisions, and all these divisions were formed in the **Siberia Military District**. The 91 and 166 were c**ompletely destroyed in the Vyazma pocket in October 1941, whilst the remaining divisions were mere skeletons of their former selves by October 1941**. The table below shows the status of the **14 divisions** that were deployed on 22 June 1941 and were later t**ransferred west from the Far Eastern Front**, as well as from the **Urals, Transbaikal, Central Asia and Siberian Military Districts**, from August to December 1941. Of these 14 divisions, **2 were small mountain cavalry divisions** from Central Asia, while the 3 tank and mechanised divisions were very new and had very little (if anything) to do with Siberian personnel. **The 58 and 60 tank divisions had only started forming in March-April 1941.**

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[161] **Note:** Examples of these or similar statements are common in WWII historical literature and most film documentaries on the subject. E.g., A. Clark, *Barbarossa*, Orion Publishing Group, London, 1995, p. 170. *The Times Atlas of the Second World War*, Times Books Ltd, London, 1989, p. 60. **The following quote typifies the common perception**, "The Siberians are coming! It was a cry that spread terror through the ranks of the German *Wehrmacht* in the winter of 1941. Since June 22, the Red Army had lost millions of dead, wounded and captured soldiers, while the *Wehrmacht* had advanced to the very gates of Moscow itself. Now, however, new armies seemed to be springing out of the Russian soil as if by magic as the Germans prepared their final thrust toward the Soviet capital. The ever distrustful Josef Stalin had primarily put his faith in the word of one man (Richard Sorge), and had ordered division after division of his armies in the Far East to be transported as quickly as possible to the west to blunt the German advance". Quote from; WWII History, Sovereign Media Company Inc, March 2002 issue, pp. 30 and 81.

The 'Siberian' and Far Eastern Divisions Transferred West after July 1941:

1) Div. Transferred to the 'West'
(Aug,-Dec. 41)
2) Where formed
3) Where assigned (22.6.41)
4) Largely Siberian Troops
5) Where (and when) assigned after transfer
6) Possible Moscow Defense?

26 RD: 2) Far East 3) Far East 5) 11 Army (Northwestern Front) (Sep '41)
21 RD: 2) Siberia 3) Far East 4) **Largely Siberian troops** 5) 7 Separate Army (Sep '41)
114 RD: 2) Transbikal 3) Transbikal 5) 7 Separate Army (Sep '41)
92 RD: 2) Far East 3) Far East 5) 4 Separate Army (Volkov area) (Oct '41)
65 RD: 2) Transbikal 3) Transbikal 5) 4 Army (Volkov Front) (Nov '41)
32 RD: 2) Volga/Siberia 3) Far East 4) **Largely Siberian troops** 5) 5 Army (**Western Front**) (Oct 41) 6) yes
93 RD: 2) Siberia 3) Transbikal 4) **Largely Siberian troops** 5) 43 Army (**Western Front**) (Oct 41) 6) yes
78 RD: 2) Far East 3) Far East 5) 16 Army (**Western Front**) (Oct/Nov '41) 6) yes
238 RD:[162] 2) Central Asia 3) Central Asia 5) 49 Army (**Western Front**) (Oct '41) 6) yes

58 TD: 2) Far East 3) Far East 5) 16 Army (**Western Front**) (Nov '41) 6) yes
60 TD 2) Far East 3) Far East 5) 4 Separate Army (Volkhov area) (Oct '41)

82 MD: 2) Transbikal 3) Transbikal 5) 5 Army (**Western Front**) (Nov '41) 6) yes

18 Mtn. Cav. 2) Central Asia 3) Central Asia 5) 30 Army (**Kalinin Front**) (Nov '41) 6) yes
20 Mtn. Cav. 2) Central Asia 3) Central Asia 5) 16 Army (**Western Front**) (Nov '41) 6) yes

(p. 519)

Of the rifle divisions, 3 arrived in August and September and were sent to 11 Army defending the southern approaches to Leningrad or to 7 Army defending the far north against the Finns. Only 6 rifle divisions arrived in October and only 4 of these went to any Army that could be even remotely linked to defending Moscow against Army Group Centre. These were the 32, 93, 78 and 238 Rifle Divisions. Of these, only the 32 and 93 Rifle Divisions had a significant proportion of Siberian personnel, while the 238 had only started forming in March 1941 in Central Asia. (p. 520)

In short, of all the divisions transferred west after July 1941, **only 3 rifle divisions originated with Siberian personnel and only 2 of these went into the Western Front defending Moscow.** Where are the "newly arrived Siberian divisions being encountered all along the front protecting Moscow"? To fulfil this statement there would need to have been 16-20 Siberian divisions in Western Front. The only division which actually earned the reputation bestowed upon the Siberian divisions in 1941 was the **32 Rifle Division which defended near Borodino in October 1941.**[163] Ironically this division was **formed in 1922** in the then Volga Military District and only a portion of its personnel came from western Siberian oblasts. **Another thing apparent from table Soviet Transfer Matrix and table East Tran is how early these divisions transferred. Most accounts claim the information from Sorge's spy ring came in October 1941 at the earliest and November 1941 at the latest. Yet it is apparent that the decision to move the vast majority of available divisions west was made well before this time, and no new rifle divisions were actually shipped after October.**

[162] **Note:** Had only started forming on 14 Mar '41.
[163] **Note: 32 RD** defended Borodino against **SS Reich** and (I believe) **10 PD**.

What of Siberian divisions formed after 22 June 1941? There were 6 rifle divisions formed after June 1941 in the Siberian Military District. They were the **366, 372, 374, 376, 378 and 382 Rifle Divisions**. **All 6 divisions were assigned to the 59 Army in Volkhov Front defending south of Leningrad in November 1941.** These were all brand new divisions, their combat performance proved to be no more than average and **they had nothing to do with the winter offensive against Army Group Centre**. Whichever way data is analysed, the entire Siberian transfer story is a myth in all respects; including timing, numbers, source of personnel and overall combat performance.

So the question is, who stopped the Germans on the approaches to Moscow in December 1941 if it couldn't possibly have been 'hordes' of newly arrived Siberian or East Front troops? The answer is a massive number of newly Mobilised and Deployed (MD) divisions and brigades (of which very few came from Siberia or the East Front). The Soviet land model shows that **182 rifle divisions, 43 militia rifle divisions, 8 tank divisions, 3 mechanised divisions, 50 small cavalry 'divisions', 62 tank brigades,** 55 rifle brigades, 21 naval rifle brigades, 11 naval infantry brigades, 41 army HQs, 11 front HQs and a multitude of other units were newly Mobilised and Deployed (MD) during the second half of 1941. If Mobilized and Not Deployed (MND) units are included then the numbers in this list are considerably higher.

Even if the few 'Siberian divisions' fielded had exhibited a higher than average combat proficiency in the winter of 1941-42, **their contribution was almost insignificant compared to the mass of newly mobilised units.** There is no doubt that the **1941 Soviet mobilisation programme easily remains the largest and fastest wartime mobilisation in history,** and it was the multitude of average Soviet soldiers from all over the USSR that made up these new units that saved the day. It was definitely not the existing units transferred west after June 1941, or the mostly non-existent and mythical Siberian divisions.[164]

It seems very likely the term 'Siberian' was applied to any division that exhibited an above average proficiency or resilience in combat. This was similar to, but less official than, a 'Guards' designation which the Stavka started awarding to such divisions in 1941. Ultimately it cost nothing to name a division 'Siberian', 'Guards' or 'elite', and if it enhanced morale, scared the enemy and enabled better divisions to be easily identified, then it was certainly worthwhile. **It is easy to forget that all the combatants in WWII were waging a morale and propaganda war alongside the real one**. Unfortunately much post WWII military history calls on the same propaganda based sources as the basis of historical fact. This then results in certain war stories, legends and myths becoming cemented over the years as unquestioned historical events.[165] (p. 520)

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[164] **Note:** Even Paul Carell in his book, *Unternehmen Barbarossa*, notes the "*entscheidende Rolle*" played by the Siberian divisions (p. 171).

[165] **Note: It is surprising how few of the military stories, legends and myths from WWII actually stand up to any sort of close scrutiny.** Often even a high-level examination of the forces and numbers involved, along with an examination of timing and context, leads to very different possible conclusions than the WWII '**received wisdom**' on the subject. It has to be said, unfortunately, that most of these stories and 'versions of events' stem from the Western Allied and Soviet accounts of WWII (presumably because they were the victors and had a free hand in the post-war era). The Siberian division myth is a good case in point. **I am unsure why WWII military history, in particular, seems to suffer from this phenomenon.**

6. The Actual Strength of all Soviet Land Combat Units in a Deployed (D) State on 22.6.1941

In this chapter we will examine **one of the main reasons why the Red Army forces in the Western Special Military Districts in June 1941 were unable to stop the German invasion**. So far we have examined the authorised Tables of Organisation and Equipment (TOEs or *Shtaty*) of Soviet combat units deployed in the USSR in June 1941, and the actual units deployed (using the Soviet and NKVD Deployment Matrices). We will now examine the actual personnel and equipment in these same combat units compared with their TOEs, and, where appropriate, the overall state of these units on 22 June 1941. (p. 521)

The actual strength of Soviet land combat units on 22 June 1941 is determined using **historical references, the principles of heterogeneous and homogeneous models, and checksums**. Refer to the Volume I Part I 7. in order to see how different information relating to the actual manpower and equipment in a particular combat unit is reconciled between various sources. If reconciliation between sources is impossible and only conflicting information is available, then the most likely and/or reliable source is used and referenced.

6A. Review of the Overall Strengths of Selected Red Army Units and PVO forces on 22.6.1941.

Before establishing the actual strength of individual combat units and reconciling this with the actual strength in each military district, we need to make some general observations about the actual strength of selected unit types and branches of the Soviet armed forces in June 1941. **This is because reliable data is available on the actual manpower and equipment present in certain branches of the Soviet armed forces in June 1941.** The particular forces examined in our initial review are rifle divisions, mechanised corps, anti-tank (AT) brigades, fortified sectors and PVO forces. In later sections of this chapter we will be examining the actual strength of the forces in each military district on 22 June 1941. In these sections, we will also reconcile the military district strength data with the actual strengths presented in this section. (p. 521)

a. The Rifle Divisions:

On 22 June 1941 there wasn't even a single rifle division in the entire Red Army that was at the strength authorised by the April 1941 rifle division TOE (Shtat). There were several reasons for this. **In June 1941 the Red Army was on peacetime establishment strength, and the rifle divisions were closer to their peacetime authorised strengths than their wartime authorised TOE.** Outside of the Far East there were two peacetime strength levels, the '6' and the '12' strength levels, based on 6,000 and 12,000 men, respectively. Rifle divisions in the Far East had maintained a strength approximately 10% higher than the '12' strength since 1939. The table below indicates the authorised personnel and equipment for the various rifle division peacetime strength levels. [Table not shown.][166] (p. 522)

In the spring of 1941 **approximately 500,000 reservists were called up**,[167] primarily to bring the rifle divisions in the Western Special Military Districts up to the '12' strength level. However, even with this additional manpower most of the rifle divisions in the Western Special Military Districts remained well below the '12' strength level in June 1941. On 1 June 1941 the average strength of the rifle divisions in these districts was as follows:

- Leningrad Military District: 11,985 men
- Baltic Special Military District: 8,712 men
- Western Special Military District: **9,327** men

[166] **Note:** A full-strength Rifle Division in June 1941 included following: **14.483** (men); **392** LMGs, **166** MMGs, **54** (45mm) AT guns; **78** artillery pieces (76-152mm); **150** mortars; **3039** horses; **564** trucks.

[167] **Note:** Other sources put the call-up at ca. 800,000.

- Kiev Special Military District: **8,792** men
- Odessa Military District: 8,400 men

The rifle divisions in the interior of the USSR, including many in the Stavka reserve, were considerably weaker than those in the Western Special Military Districts. They are more likely to have been closer to the '6' strength level shown above.

The second major reason so many rifle divisions were below strength in June 1941 has to do with the massive expansion of the Red Army as a whole from 1939 to 1941. On 1 January 1938 the Red Army contained 84 rifle divisions, 14 mountain rifle divisions and 5 rifle brigades. By April 1940 this force had expanded to include 144 rifle divisions, 10 mountain rifle divisions, 3 motorised rifle divisions and 4 mechanised rifle divisions. By June 1941 the rifle elements of the Red Army included 179 rifle divisions, 19 mountain rifle divisions and 5 rifle brigades. Even taking into account the very large TOE of earlier rifle divisions, this means that in only three and a half years the rifle elements of the Red Army had more than doubled, while the number of rifle corps had almost tripled. **This is before we even consider the expansion of other Red Army units such as the new airborne corps, and the entirely new and very large RVGK anti-tank brigades**. (p. 522)

Probably the greatest shortage of rifle division equipment, particularly all forms of motorised transport, was caused by the decision to create 29 full mechanised corps from June 1940 to February 1941. As late as February 1941, 20 mechanised corps HQs, 41 tank divisions and 21 mechanised divisions started forming. By any standards this was an immense undertaking and this mechanised force dwarfed any similar force in the world at that time. **Because the newly forming rifle divisions had a low priority for equipment compared with the new mechanised units, many of these rifle divisions remained very scantily equipped**. At the same time **existing rifle divisions were striped of any attached tank forces** in order to support the new mechanised units, while the need for motor transport in the new mechanised units **meant the vast majority of rifle divisions were desperately short of trucks and, to a lesser extent, tractors.** Apart from a few select rifle divisions in the west, only those in the Far East retained any tank units. (p. 523)

The Soviet mobilisation plan in wartime called for rifle divisions in the Western Military Districts to be brought up to full strength in a **period of 7 to 14 days after commencing mobilisation**.[168] This required a huge number of reservist personnel to be very rapidly mobilised, as well as a great many trucks and horses to be commandeered from the civilian economy. This was essential to enable these divisions to manoeuvre because the average '6' and
'12' strength rifle divisions were short 30-70% of their required horses and 25-80% of their required motor vehicles. Unfortunately, the speed of the German attacks, and the unavailability of trucks and tractors, meant the mobilisation plan wasn't worth the paper it was written on from day one. **Most divisions (not just rifle divisions) never received anything like the additional transport or heavy equipment required for them to fully mobilise**. This placed the bulk of the rifle divisions in the Western Special Military Districts at an immense disadvantage when faced with more mobile German infantry divisions, and was catastrophic when they were faced with highly mobile panzer forces.

Most of the rifle divisions dispatched to the front from the internal military districts did not fare much better than those initially deployed in the Western Special Military Districts: **generally they were also sent into action before they had had a chance to fully mobilise**. On 22 June 1941 these divisions were mostly in a far worse readiness state than their counterparts in the border military districts, and they often completely lacked rear service units and transport. Separated too early from their mobilisation base, they were never able to mobilise fully.

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[168] **Note:** The Soviets believed war would come like it did in **1914—**gradually, as both sides took time to fully mobilize their forces after war had been declared. Why they believed this after what they saw in Poland, France, etc., is beyond anyone's guess.

In addition to general equipment shortages, it is important to understand that the **Red Army as a whole was suffering from a shortage of trained and experienced officers due to the debilitating effects of the recent officer purges** (entirely due to Stalin and his entourage). **The officer purges also ensured a very centralised and hierarchical command system, where any officer literally risked his life by showing any independent initiative.** Even at the height of Operation Barbarossa, many Soviet officers were more afraid of their own political commissars than the *Wehrmacht*. The shortage of trained and experienced officers was one of the principal factors leading to poor communication, command and control (mostly at the operational and tactical level) throughout the Red Army in the summer of 1941.

The officer purges generally had a greater detrimental effect on the rifle divisions than other large Red Army units, because the majority of surviving 'competent and trained' officers went into the more prestigious mechanised, cavalry and airborne corps, or the politically protected NKVD. The officer shortage in rifle divisions is not readily apparent when examining differences between the TOE and actual strength. However, in terms of impact on the actual combat power of the rifle divisions, the officer shortage was no less real than shortages of weapons and transport. (p. 523)

When the dire shortage of transport is coupled with shortages of trained key personnel (especially NCOs and officers), anti-tank guns, anti-aircraft guns and many types of ammunition, it is hardly surprising that the actual combat power of the rifle divisions Deployed (D) in June 1941 was far less than that indicated by their TOE strength.

b. The Mechanised Corps:

The Soviet 1940-41 mechanised corps were very large and ambitious formations, **and most of them were also entirely new in 1941. The order to form the first batch of 8 mechanised corps and their component tank divisions came in June 1940,** with another mechanised corps ordered in November 1940. This meant 9 mechanised corps HQs and 20 tank divisions (2 separate) were formed in just six months. With the simultaneous rapid expansion of other Red Army units, **the ambitious mechanised corps programme had already over stretched the USSR's available equipment and transport resources.** The notable exception to this was the numbers of available tanks and tankettes. The USSR possessed around 3 times as many tanks as the rest of the world's combined armed forces in December 1940, so there was still a very large tank pool available along with **45 separate tank brigades**. (p. 524)

If the Soviets had stopped at this point, they would already have possessed the largest concentrated mechanised force in the world. **By June 1941 the 29 new tank and mechanised divisions** (including the 2 separate divisions) making up this force would have had a good chance of getting to full strength in terms of motorised transport, modern tanks, artillery, motorised infantry and logistical support. Equally important, the 9 mechanised corps would have been ready (and hence able) to conduct divisional and corps level manoeuvres before June 1941.

However in February-March 1941 the Red Army started forming no fewer than 20 new mechanised corps, which required 40 new tank divisions and 20 new mechanised divisions! This tripling of the number of required divisions meant that **all the remaining tank brigades**, 2 out of 3 armoured car brigades and all except 2 independent motorised rifle divisions and brigades, **had to be disbanded**. Thus, the diversion of critical man-power, equipment and transport into this mass of the new units meant that the original 9 mechanised corps now also struggled to mobilise and to become anything like combat ready.

Given this history it is hardly surprising that when the Germans struck on 22 June 1941 the mechanised corps were all still forming. Many of them were barely equipped or trained, and **most suffered chronic shortages in almost every department**. This was the case despite many tank and mechanised divisions **being close to full strength in terms of tank numbers**. Unfortunately, simply having large numbers of tanks on strength is very different to having operational tanks and supporting arms with the logistical infrastructure to support them. Many

of these tanks were in desperate need of maintenance and repair, which was precisely the type of activity that the tank divisions and mechanised corps were least well equipped or trained to carry out.

If there is a single piece of evidence that indicates that the Red Army had no intention of attacking Western Europe until mid-1942, at the earliest, it is the overall state of the mechanised corps. None of the mechanised corps in June 1941 were combat ready, and they would have required at least another year before sufficient of them were equipped, trained and ready to spearhead an attack on the required scale (especially against the demonstrably efficient German Army of 1940-41). **The mechanised corps' required divisional training exercises were not even scheduled until August 1941.** As the mechanised corps represented the main offensive arm of the Red Army, there was simply no way they would have launched an attack (into Western Europe in 1941) without them. When coupled with the many other problems facing the Red Army at this time, the evidence is overwhelming. (p. 524)

Reasonably detailed information on the location and strengths of the Soviet mechanised corps in the Western Special Military Districts on 22 of June is available. . . Below the basic strength information (in the above table) is a brief analysis of the following: the average mechanised corps strength in the Western Military Districts, the average mechanised corps strength in each of the five military districts in the Western Military Districts, the average mechanised corps strength in the Western Military Districts for those corps formed from June to December 1940, and the average mechanised corps strength in the Western Military Districts for those corps formed from February to March 1941. The actual average strengths are all expressed as a percentage of the full TOE strength in order to gauge the state of the mechanised corps formations in each category (above) on 22 June 1941. (pp. 524-26)

There are several instructive observations forthcoming from this analysis, which include:

1. **Apart from the obvious very large variation in strength between the mechanised corps across the board, there was a very large variation in strength between mechanised corps in particular military districts.** [author emphasis]

For example, in the Western Special Military District the 6 Mechanised Corps was close to full strength. It had 89% of its authorised personnel, almost a full complement of tanks (including 238 T-34s and 114 Kvs) and almost 97% of its authorised vehicles. In complete contrast, the 17 Mechanised Corps in the same district was barely formed with only 46% of its authorised personnel, 36 light tanks and tankette 'training tanks', and only 12% of its authorised vehicles. It is no surprise at all that the 17 Mechanised Corps ceased to exist very shortly after it came into contact with German forces.

2. **The average mechanised corps in the Western Military Districts was fatally short of all types of motorised transport.** [author emphasis]

This is highlighted in table Mech Cps WMD, which shows severe shortages in most categories but **fatal shortages in motor vehicles.** The average mechanised corps in the Western Military Districts **had only 40% of the required motor vehicles,** 42% of the required armoured cars, 47% of the required tractors and 21% of the required motorcycles.

In June 1941 the Soviet tank and mechanised division TOEs were not extravagant in terms of the number of authorised motor vehicles (unlike the number of tanks). On the whole, the minimum number of motor vehicles was authorised that could just do the job. For example, a Red Army tank division in June 1941 was authorised 1,568 trucks and light transports to support 375 tanks (i.e. 4.2 motor vehicles per tank in the division). In comparison, a panzer division in June 1941 was authorised 2,304 trucks and light transports to support 182 tanks (i.e. 12.7 motor vehicles per tank in the division). **In addition, the panzer divisions were largely equipped with 2.5 ton supply trucks while most Soviet supply trucks were lighter 1.5 ton trucks**. The average full strength

panzer division had around 5 times as much 'transport lift capacity' per tank, as the average full strength Red Army tank division. Therefore mechanised corps with fewer than half of their authorised vehicles had little hope of remaining mobile, or of sustaining themselves under combat conditions, for long. (p. 526)

Notably, the mechanised corps in the Western Special Military District and the Kiev Special Military District had an average of only 31% and 34% of their required motor vehicles, respectively. These were the largest and most important districts in the Western Military Districts, and as such they bore the brunt of the initial German invasion. **Without motor vehicles and trucks there is no fuel and ammunition supply, no tank recovery, no transport for supporting arms such as infantry and artillery, and probably little to no command and control. Without trucks and logistics the biggest and most powerful armoured formations rapidly screech to a halt in a few days** (defensive or offensive operations making only a little difference), and the tanks become little more than static defences or scrap metal.[169] **The critical shortage of motor transport, alone, and before even considering other factors, meant the destruction of most 1941 mechanised corps in the Western Military Districts was almost ensured**. (pp. 526-27)

3. **The principal reason for the mechanised corps' weaknesses was not shortage of tanks, but shortage of almost everything else.** (p. 527)

In literature on Operation Barbarossa it is often stated that "the 1941 mechanised corps did not have their authorised number of tanks" and that "they had relatively few T-34 and KV tanks". **The implication is that lack of tanks was therefore the mechanised corps' most critical weakness** and that this was exacerbated by not having sufficient numbers of the most modern tanks. At first glance the data from table Mech Cps WMD would appear to support this view, with the average mechanised corps in the Western Military Districts having **52% of the tanks called for in their TOE.**

However the mechanised corps were very tank-heavy formations with far more authorised tanks than most contemporary tank corps. The mechanised corps' TOE called for the huge number of **1,031 tanks**, and having 50% of TOE didn't, in itself, mean that the mechanised corps were weak because they had "few tanks". The average mechanised corps still had over **530 tanks** compared to the average panzer corps with 340-380 tanks (in 2 panzer divisions and a motorised division). Thus the average mechanised corps in the Western Military Districts in June 1941 still had considerably more tanks than any of the invading panzer corps. **Furthermore, the most common Soviet tanks of the day, namely the T-26 and BT tanks, were superior or comparable to the Pz Is, Pz IIs, Pz 35(t)s, Pz 38(t)s and Pz III (37mm)s, which together represented the bulk of German armour in June 1941.**

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[169] **Note:** Many authors take pains to point out that only **11,900 Lend Lease tanks and SP guns** were received by the Soviets during WWII, which 'only' represented around 11% of the total received by the Red Army during WWII. What is not often pointed out is that the **USA (alone) supplied over 427,300 motor vehicles (including over 375,800 trucks) and over 5,000 APCs. This represented almost twice the Soviet wartime production of motor vehicles**, and as the US trucks were much better and heavier, **it represented 60-70% of the total Red Army truck lift capacity in the last few years of WWII.** The impact of not having these vehicles in the Red Army from 1942 onwards cannot be overstated; especially on the ability for large tank and mechanised forces to carry out sustained offensive operations. Even with these additional trucks, a relatively weak Supply Distribution Efficiency (SDE) plagued the Red Army for most of WWII and possibly caused a halt to more offensive operations in 1943-45 than stubborn German defences did. In defence, or even when repelling a large enemy counter attack, **lack of these vehicles invariably proved fatal to a large armoured force. This was because lack of fuel, ammunition, supplies, spare parts, recovery vehicles and mobile support units, meant that large armoured forces often had to abandon their heavy equipment if forced to retreat.** The total destruction of many of the Soviet mechanised corps in 1941 is an excellent example of the latter occurrence. **Similarly, by far the greatest contribution of Allied airpower against German AFVs in Normandy in 1944 was the destruction of the 'soft support vehicles' in the German panzer divisions, and not the few AFVs actually destroyed by direct air-attack.**

Consider the case of the 6 Mechanised Corps. On paper at least, the 6 Mechanised Corps (in the Western Special Military District) was one of the best equipped units in the Red Army in June 1941. Its tank divisions were better equipped with heavy and medium tanks than any German panzer division throughout 1941 and well into 1942. **The 6 Mechanised Corps had 1,021 tanks on strength including 352 T-34 and KV tanks**, considered to be the most powerful tanks in service anywhere in the world at that time. In fact it is safe to say that, based on tank strength alone, the **6 Mechanised Corps represented the most potent tank corps anywhere in the world in June 1941** (the closest competitor to this title being the 4 Mechanised Corps in the Kiev Special Military District). Despite this, the corps' 4 and 7 Tank Divisions, and the 29 Mechanised Division (the entire 6 Mechanised Corps), **were all completely destroyed in less than two weeks of combat without inflicting any serious damage on any German units.**

There are many reasons why this occurred; suffice to say here that many tanks were simply abandoned due to lack of fuel or breakdowns. Those tanks that did manage to engage the enemy **were usually committed to action piecemeal and without any infantry or artillery support.** The latter were usually dispersed, out of command control, elsewhere, or simply immobile due to lack of transport. The fate of the 6 Mechanised Corps serves to provide a perfect example of why tank strength alone (and especially operational tank strength at a certain point in time) should never be used in isolation to assess any armoured unit's overall combat power, or its ability to sustain prolonged combat operations.

4. **The Western Special Military District contained the weakest average mechanised corps.**

The most important strength categories in table Mech Cps WMD for assessing a mechanised corps' overall combat power are **manpower, tanks, artillery, motor vehicles and tractors**. In every one of these categories, the mechanised corps in the Western Special Military District were the weakest of any in the Western Military Districts. I**n particular, they averaged only 31% of their required motor vehicles and towing tractors.** It is little wonder that their combat readiness dropped so rapidly when they attempted to attack or even retreat. Being hit by the strongest German forces, namely Army Group Centre, simply accelerated the rate with which the mechanised forces in the Western Front were destroyed. (p. 527)

5. T**he average mechanised corps formed in 1940, were substantially stronger than those formed in February-March 1941 (in the Western Military Districts).** (p. 528)

This was true in every category, and especially true in the critical categories of manpower, tanks, artillery, motor vehicles and tractors. **The average mechanised corps formed in 1941 had only 24% of their required motor vehicles on 22 June 1941!** This meant that **many of these mechanised corps were barely able to move and were extremely fragile.** On balance, the Red Army would have been better served to have used the resources in the 1941 mechanised corps to fill up the ranks of the 1940 mechanised corps (the 1 to the 9 Mechanised Corps). Of course this is easy to say in hindsight **as the Soviet high command was not expecting an attack (or to attack) in 1941. They assumed the USSR had at least another year to build up and train the 20 new 1941 mechanised corps before they would need to be combat ready.**

c. The Anti-Tank Brigades:

Despite their commitment to mobilise massive mechanised forces in February-March 1941, the Soviets were still so worried about the panzer threat that on **26 April 1941 they decided to create 10 very large RVGK anti-tank (AT) brigades**. The TOE for the anti-tank brigade called for sufficient manpower and equipment to stop, and possibly destroy, a panzer division's panzer regiment, while being fully motorised for rapid deployment. When the German panzers struck on 22 June 1941 **all 10 RVGK anti-tank brigades were in the Western Military Districts, in ideal locations to thwart a panzer thrust**. They were assigned on the basis of 1 anti-tank brigade per forward rifle army and were meant to cooperate with the locally deployed mechanised corps. What followed is best described as a disaster, with the existing RVGK anti-tank brigades proving to be a failure: over half the

anti-tank brigades **were quickly overrun and destroyed within a short time of coming into contact with German forces**. Anti-tank brigades that survived with some semblance of their original organisation were all disbanded by the autumn of 1941, with surviving cadre going into new and smaller anti-tank units. There are several reasons why this occurred. (p. 529)

On 22 June 1941 the average anti-tank brigade had **only 46% of their authorised personnel**, were short of guns, and were completely short of the required vehicles. In the gun department, t**he 107mm gun wasn't even in series production and was destined to remain an experimental weapon.** The 85mm anti-aircraft gun was in short supply, with first priority for these weapons being given to the various air defence forces (especially the PVO forces). The result was that **76mm divisional (field) guns were used in place of the heavier guns**, and even then the anti-tank brigades had only 30% to 79% of their total TOE gun strength available, depending on the individual brigade.

The anti-tank brigade relied on being in position in front of a panzer attack to be effective. This required some (tactical level) warning of where the tanks were going to strike next and the mobility to get into position quickly. In the chaotic situation that the Red Army found itself in during June and July 1941, **forewarning of impending panzer attacks was not forthcoming. Much worse than this, however, was the dire transport situation, which meant that few anti-tank brigades could move into position even if they had any forewarning**. Out of the 10 anti-tank brigades fielded, **6 had no towing tractors at all**, while the remaining 4 had only between 4 and 46 of their required 180 tractors. Overall the 10 anti-tank brigades had only **19% of their required vehicles**, which amounted to a total 1,308 vehicles on strength. The result was most of the guns couldn't be moved in a single trip. Without mobility, the anti-tank brigades could neither move in response to a tank attack nor withdraw quickly out of harm's way.

The Actual Strength of the [10] RVGK Anti-Tank Brigades on 22nd June 1941[170]

a. Manpower: **31,374** (46% of TOE)
b. 76mm Guns: **761** (159% of TOE)
c. 85mm AA/ATG: **73** (15% of TOE)
d. Trucks: **1246** (18% of TOE)
e. Tractors: **80** (4% of TOE)
(p. 529)

In inspecting this table and comparing the strengths (and average strength) to the anti-tank brigade's TOE, it becomes obvious the anti-tank brigades had had less than two months to form up, and then in an environment with scarce available resources. As with the mechanised corps, the shortage of vehicles and tractors was especially grave. This was despite the anti-tank brigades being given a higher priority to receive equipment compared to most other Red Army units in the immediate pre-war period. (p. 530)

The **RVGK anti-tank brigades** were very large units requiring a great deal of command and control to use effectively, especially in a mobile defensive situation. This was exactly the kind of unit the Red Army had the most difficulty controlling in 1941. This was compounded by the fact that the brigades had never had the opportunity to train or move as a unit (or work with other units) on any type of manoeuvres. **With the gift of hindsight it is unsurprising that the 1941 RVGK anti-tank brigades took such grievous losses**. What is more surprising is that the Soviet high command expected to form such massive motorised units in May and June 1941, when they were already struggling to find any type of motorisation for the massively expanding mechanised forces.

[170] **Note:** The 1-5 AT Brigades were Deployed (D) in the Kiev Special Military District (SW Front from 22 June). The 6-8 AT Brigades were Deployed (D) in the Western Special Military District (W Front from 22 June). The 9 and 10 AT Brigades were Deployed (D) in the Baltic Special Military District (NW Front from 22 June).

Ultimately this sealed the fate of the 1941 anti-tank brigades before they had any real opportunity to perform. (p. 530)

d. The Fortified Sectors

On 22 June 1941 there were a total of **60 fortified sectors in the USSR, and 44 of these were in the Western Military Districts** (including 5 in the 9 Separate Army and 1 in the Odessa Military District). Table Sov FS Distribution (over page) shows details of:

- The fortified sectors within each military district.
- The 'fortified line' that each fortified sector was part of (usually the old Stalin Line or the newer Molotov Line).
- The fortified sector's defensive length and depth.
- The number of pillboxes built and under construction in each fortified sector.
- The number of machine gun-artillery battalions present and planned for in each fortified sector.
- The identity of the machine gun-artillery battalions in each fortified sector (where known).
- The identity of other miscellaneous units assigned to each fortified sector (where known).

When the Germans struck on 22nd June 1941, **the existing fortified sectors in the USSR contained approximately 192,240 men**, 1,700 mortars and artillery pieces of all types, and 9,800 LMGs and MMGs. They were organised into 203 machine gun-artillery battalions, of which 149 were Deployed (D) in the Western Military Districts. Within the Western Military Districts, **the old Stalin Line (around 2,070km long) contained 52 machine gun artillery battalions with 18 more planned, while the Molotov Line (around 1,700km long) contained 95 machine gun artillery battalions with 45 more planned.**

Despite the best efforts by the Soviets to increase the strength of the forces in the fortified sectors, on 22 June 1941 the average machine-gun artillery battalion was still very understrength.[171] The average fortified sector was manned by only 34% of their required officers, 28% of their NCOs and 47% of their enlisted men.

To make matters even worse, only around 50% of the required fortifications had been completed, and most fortified sectors were very short of modern MGs to install in the existing structures. Although only 14% of the **3,817 pillboxes in the Stalin Line** were still under construction, the troops and equipment in this line had been mostly removed to supply troops for the more forward **Molotov Line**. Unfortunately, on 22 June 1941 around **85% of the 5,807 pillboxes in the Molotov Line were still under construction.**

The consequence of all these factors was that **many of the fortified sectors were overrun in the initial German attacks, and most of the fortified sectors along the main axis of the German advance only held out for a few days (at most).** Noticeably, those fortified sectors on the northern approaches to Leningrad, and on the borders with Bessarabia and Bukovina, performed the best. This was largely due to the more suitable terrain, having time to prepare and/or being attacked by less well supported infantry assaults.

Taking into account all the above information, the average actual strength of the 60 fortified sectors deployed in the various military districts in the USSR on 22nd June 1941 is shown in table Soviet Fort Sec Act. **On balance most fortified sectors cannot be considered to have been combat ready or capable.** Despite this, the fortified sectors in the Western Military Districts were in a relatively high state of readiness and still represented a significant potential stumbling block for any major offensive. German field commanders still had to ensure the

[171] **Note:** As noted previously, on **21 May 1941** the NKO ordered the fortified sectors to begin full deployment, and mandated measures for their reinforcement. This would have added around **120,700** men to the existing force structure, and was to be completed by early July 1941 for fortified sectors on the new western border and by early October 1941 for the fortified sectors on the old border (the Stalin Line).

appropriate forces were quickly available to neutralise these fortified defences along their main axis of advance, and before they were reinforced sufficiently to become a main enemy defence line. (p. 531)

[**Note:** Nigel's table, "**Soviet Fortified Sectors in the USSR in June 1941**," offers a list of every fortified sector, its number, its length, manpower, weaponry, etc.

● For example, the ***Rava Ruskii*** fortified sector was sector No. **68** and in the Kiev Special Military District. It held a front of **90** kilometers; had a defensive depth of **5/6** km; **95** pillboxes built (**306** still under construction); 5 MG / Art. Battalions; and other units including the **76, 78, 80 Art-illery Batteries.**

● Defensive fronts of the fortified sectors collectively ranged in length from **40-50** kilometers to **230 km** (***Minsko-Slutskii*** / Stalin Line) and **259 km** in the Odessa region (Stalin Line).

● Pill boxes already built on the Stalin Line = **3279** (to still be built: **538** = **14%** still under construction. Pill boxes already built on the Molotov Line = **880** (to still be built: **4927** = **85%** still under construction.
(p. 532-33)]

e. The PVO Ground Forces:

On 22 June 1941 the **USSR's national air defence system (PVO-*strany*)** was organised under the Main PVO Directorate of the Red Army. **The ground based field forces were organised into corps, divisions, brigades, regional brigades, regiments, battalions and batteries**. This force contained 182,000 men, **3,329 85mm anti-aircraft guns, 335 37mm AA guns,** 649 12.7mm AAMGs, 1,597 anti-aircraft searchlights, 853 balloon obstacles, and **75 RUS-1 and RUS-2 radio location (radar) stations**.1448 In addition to the new heavy 85mm M1939 anti-aircraft guns, **there was also an estimated 2,360 older 76mm** M1915, M1931, M1931/33 and M1938 anti-aircraft guns in service with the PVO ground forces. The more effective 85mm guns were replacing the 76mm guns as they became available. The table below [not shown] summarises the distribution of PVO ground forces across the USSR on 22 June 1941, and includes the **total number of 76-85mm AA guns** assigned to the PVO forces within each of the military districts. (p. 535)[172]

In June 1941 the PVO forces defending rear area targets in the European part of the USSR formed two main defensive belts of PVO zones. The first belt included the PVO zones corresponding to the territories covered by the Western Military Districts. These PVO zones were the Northern, Northwestern, Western, Kiev and Southern zones. These zones corresponded to the Leningrad, Baltic Special, Western Special and Kiev Special Military Districts, and the territory covered by the 9 Separate Army, respectively. This territory included the cities of Kiev, L'vov, Leningrad, Riga, Minsk, Odessa and Krivoi Rog. The PVO forces in the first belt contained 579 PVO AA batteries, representing around 50% of the existing PVO ground forces.[173]

The forces defending Kiev, L'vov and Leningrad were organised into the 3 PVO Division defending Kiev, the 4 PVO Division defending L'vov, and the 2 PVO Corps defending Leningrad. The PVO regiments defending Kiev, L'vov and Leningrad were at the highest strength levels in the Western Military Districts, averaging 86% to 97% of full TOE strength.

The second defensive PVO belt in the European part of the USSR included the **Moscow, Orel and Kharkov PVO zones.** These corresponded with the Moscow, Orel and Kharkov internal military districts, and contained 223 PVO AA batteries representing around 19% of the PVO ground forces. Of the batteries in the second belt, 137 were employed in the defence of Moscow. 1450 As might be expected, the PVO regiments defending Moscow

[172] **Note:** Areas most heavily defended by Soviet national air defense system were: Leningrad, Kiev, and Moscow Military Districts. All told, the PVO had a total of **5689** 76-85mm guns throughout the system.
[173] **Note:** PVO AA batteries in the first belt included: **355** batteries defending Kiev, L'vov and Leningrad.

were at the highest strength levels in the ‘second PVO defensive belt’, averaging around 96% of full TOE strength. The remaining 356 PVO AA batteries were distributed in the other internal military districts and non-active fronts across the USSR. Within these areas, the most concentrated PVO defences were in the Transcaucasus Military District (protecting the oil fields and oil refining infrastructure) and, to a lesser extent, the Far East Front. (p. 538)

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7. The Baltic Special Military District (Northwestern Front from 22.6.1941)

In this section we will focus on the actual personnel and equipment strength of the land combat units deployed in the Baltic Special Military District on the 22nd June 1941. We will examine the strength of the individual combat units within the district, and then reconcile this data with the actual listed strength in the entire military district. (p. 561)

a. Rifle Divisions:

On 1 June 1941 the average personnel strength of rifle divisions in the Baltic Special Military District was **8,712 men** and on 22 June 1941 there were **19 rifle divisions in this district**.[174] This meant that the average rifle division had only **60% of its authorised pre-war personnel**. Although many divisions had a considerably higher percentage of their authorised equipment, the **shortage of transport** to move or supply the divisions can only be described as absolutely **desperate**.

Table Bal MD Divs 1 shows the actual strength of the rifle divisions in the Baltic Special Military District on 22 June 1941. Of the 19 rifle divisions, 12 were formed as regular Red Army divisions before or during 1939. These 12 older divisions should have been relatively well established, **but they still had only around 66% of their authorised pre-war personnel. Much worse than personnel shortages was the fact that these 12 'established' divisions only had an average of around 13% of the required trucks, 69% of the required prime movers and 42% of the required horses**. Given a few weeks, the Soviet mobilisation process might have rapidly filled up the personnel in these divisions; **but the mobilisation plan to rapidly commandeer motorised vehicles (and horses) from the civilian economy was always fraught with problems.** In addition the German Army (in this case Army Group North) rarely gave anyone the luxury of a few weeks, or even a few days. The initial very rapid advance of the 4 Panzer Group was to some extent due to the inability of the Northwestern Front's rifle divisions to manoeuvre and block the route of advance.

Of the 7 newer rifle divisions in the Baltic Special Military Districts, all were formed after the start of September 1940, and **6 of them were products of the Soviet occupation of the Baltic States in 1940**. These Lithuanian, Latvian and Estonian divisions, and their special problems, are discussed in more detail below. If we include the 7 'new divisions', we find the average rifle division in the Baltic Special Military District on 22 June 1941 contained an average of: 63% of their authorised LMGs, 91% of MMGs, 75% of mortars, 90% of anti-tank guns, 93% of the medium to heavy artillery, and 87% of infantry guns and light artillery (75-76mm).

In other critical areas the average rifle division was far weaker. **They contained an average of only around 12% of their authorised trucks**, 58% of the required towing tractors, just over a third of the required horses, 16-43% of their authorised heavy and light anti-aircraft guns (and they were only authorised 12 37-76mm anti-aircraft guns per division), 23% of their authorised AAMGs and around 54% of their full complement of riflemen. **This meant the divisions were all but immobile in terms of moving their heavy equipment**, their supply distribution and signal systems bordered on non-existent, and they desperately needed to fill up their ranks quickly with mobilised (and hopefully trained) infantry.

Applying the size equation and Minimum Divisional Size (MDS) value to the average rifle division in the Baltic Special Military District on 22 June 1941 is revealing: we find that the average rifle division was only at 81% of the MDS value on 22 June 1941. This means that **at their reduced peacetime strength**, the average rifle division in the Baltic Special Military District could barely be called a 'divisional sized' combat unit in June 1941. This was because they averaged only around 8,700 men each, **were desperately short of both horse-drawn and motorised transport, and were short of other selected heavy weapons.** (Note: The pre-war rifle division at full

[174] **Note:** C. C. Sharp, '*Red Legions*': *Soviet Rifle Divisions Formed Before June 1941*, *Soviet Order of Battle WWII.*

TOE strength had an MDS value of 135%, so the average rifle division in the Baltic Special Military District on 22 June 1941 was only around 60% of its authorised size.

The following rifle divisions require special mention due to some specific and relevant circumstances.

The **90 Rifle Division** still had the 54 Tank Battalion attached. However the tank battalion was very weak with only 12 tankettes (i.e., T-37, T-38 or T-40) on strength, and by all accounts they didn't last very long. The only other rifle divisions with any sort of tanks in the Baltic Special Military District were the **125th** with a company of 17 tankettes in its reconnaissance battalion and the 67th with a company of 16 tankettes in its reconnaissance battalion. The 188 Rifle Division had only started forming on 14 March 1941. It was formed using cadre from the 11 Motorised Rifle Brigade, but most of the division was new and in training camps 40-50kms from the border on 22 June 1941. (p. 561)

The **179 Rifle Division** was formed in September 1940 from the **1 Lithuanian Infantry Division**. The latter division was from the Lithuanian Army which was taken over when the USSR occupied Lithuania in June 1940. Along with the other Baltic 'territorial units', the 179 Rifle Division utilised equipment sourced from the old Lithuanian Army as well as Soviet manufactured equipment. **For example, old German 105mm LeFH 16 howitzers were still used in the division's medium artillery regiment in 1941**. In addition non-Lithuanian command personnel and staff officers were only appointed to the division in early June 1941. At this time the division was still forming, was short of all types of equipment and was far from combat ready. More serious than this, however, was the **fact that many of the Lithuanian soldiers were reluctant to fight for the Soviet regime**. The Soviet front commanders were well aware of this and in June 1941 the 179 Rifle Division was **classed as 'unreliable'**. Despite this, draconian discipline ensured that the 179 Rifle Division held together during some very hard fighting. By the end of August 1941 the division was virtually destroyed and was down to fewer than 300 men (in its combat elements) with no heavy equipment. (p. 564)

The **184 Rifle Division** was formed in September 1940 from the **2 Lithuanian Infantry Division**. Like the 179th, Russian command personnel and staff officers were only appointed to the 184th in June 1941. **The Lithuanian soldiers in the 184 Rifle Division proved even more reluctant to fight for the USSR than those in the 179 Rifle Division**, and the 184th was classed as '**absolutely unreliable**' by the Northwestern Front's commander in late June 1941. The best short term solution the Red Army could come up with was to disband the division and spread the soldiers out as replacements for regular Red Army units. A portion of the 184th personnel did go into the 179 'Lithuanian' Division (above) to make up for losses. On 15 August 1941 the 184 Rifle Division was permanently deleted from the Soviet order of battle without ever seeing any significant combat.

The **180 Rifle Division** was formed in September 1940 from the **1 and 2 Estonian People's Army Divisions** after the USSR occupied Estonia in mid-1940. The division had until July 1941 to improve its mobilisation state as it was well to the rear on 22 June 1941. By July 1941 it was still far from combat ready, and, being based on old Estonian units, the 180 Rifle Division possessed a mixture of non-standard Red Army equipment. For example, its medium artillery regiment had Soviet 122mm howitzers and **British 18 pounder (83.8mm) howitzers**, while the divisional anti-aircraft battalion had Swedish 40mm Bofors anti-aircraft guns. Naturally ammunition for these weapons was in very short supply and consisted of whatever stockpiles the Estonians had gathered.

The **182 Rifle Division** was formed in September 1940 from the **3 and 4 Estonian People's Army Divisions**. It was in a very similar state to the 180 'Estonian' Rifle Division (above): it was also partially equipped with non-standard Red Army equipment and was very under strength. **Not unnaturally, the Estonian divisions also exhibited a reluctance to fight for a regime that had just occupied them. Nevertheless it appears the Estonian divisions were not as reluctant to fight as the Lithuanian divisions, and the 180 and 182 Rifle Divisions performed reasonably well in 1941**; at least within the limits of their equipment, training and leadership.

The 181 Rifle Division was formed in September-October 1940 from the *Kurzemskoi and Vidzemskoi* Divisions of the **Latvian People's Army** after the USSR occupied Latvia in June 1940. Like all the divisions formed from the armies of the Baltic States, the 181 Rifle Division was partially equipped with non-standard equipment and was **very under strength**: the division still had only 5,150 men in February 1941. **Under the mobilisation plan the 181 Rifle Division was supposed to fill up with reservists within 7-8 days of war commencing**. However, for several reasons, including the less than enthusiastic desire of hordes of Latvians to immediately join the Red Army, the division was still short 4,240 men by 29 June 1941. Going into battle in early July 1941 the 181 Rifle Division didn't last long. By 10 July 1941 it was already down to a strength of approximately 2,000 men. Never recovering from these massive initial losses, the 181 Rifle Division was officially disbanded on 29 September 1941. (p. 564)

The **183 Rifle Division** was formed in September-October 1940 from the ***Latgalskoi and Zemgalskoi Divisions*** of the Latvian People's Army. On 22 June 1941 the 183 Rifle Division was in a very similar state to the 181 described above. In July 1941 the 183 went into action with even fewer mobilised reinforcements and by 10 July it was also down to around 2,000 men. By mid-August 1941 the 183 Rifle Division had all but disappeared in real terms and was virtually destroyed. The division's remnants were withdrawn and the surviving cadre was used to rebuild the division with new recruits in Northwest Front and then Kalinin Front in late 1941.

The **16 Rifle Division** was one of the divisions the Soviets used to occupy the Baltic States in 1940. In June 1941 it was spread across Estonia and Latvia with its HQ in Tallinin. The division's 156 Rifle Regiment had 2 of its rifle battalions garrisoning islands in the Gulf of Riga. The 16 Rifle Division was assembled as part of the 27 Army's Narva operations group in July 1941, and it was then used to help in the defence of Tallinin in August 1941. Unfortunately the division didn't survive the evacuation of Tallinin. Due to the very heavy casualties it received in this operation, the 16 Rifle Division was officially disbanded on 29 August 1941.

The **67 Rifle Division** was formed in May 1936, but despite its established state it had only around 7,000 men on 22 June 1941. This was because the division was assigned a coast defence mission in Lithuania. On 22 June the bulk of the division (5,300 men) was at **Liepaja, a small port in Lithuania** supposedly well behind any potential front line. However, on the first day of the invasion the German 291 Infantry Division achieved the remarkable feat of reaching Liepaja, which it stormed on 23 June 1941.[175] In the ensuring battle the 67 Rifle Division lost most of its men and its commander. Falling back with the 8 Army, the severely depleted division then became part of the defence in the Oranienbaum sector. Never recovering from its initial unexpected battles and never having had a chance to properly mobilise for war, the 67 Rifle Division was gradually broken up. The 94th Artillery Regiment was used to form the improvised 14th Anti-Tank Brigade, while the rest of the division was disbanded in August 1941 to reinforce other units. It was officially removed from the Soviet order of battle by 19 September 1941.

Of the 19 rifle divisions deployed in the Baltic Special Military District (Northwestern Front) on 22 June 1941, 5 were completely destroyed and officially removed from the Soviet order of battle during 1941. These divisions were:

- The 184 Rifle Division, disbanded in August 1941.
- The 181 Rifle Division, destroyed at Velikie Luki.
- The 16 Rifle Division, destroyed defending and evacuating from Tallinin.
- The 67 Rifle Division, destroyed along the Baltic coast.
- The 126 Rifle Division, destroyed in the Vyazma pocket.

[175] **Note:** The bulk of the **291 ID** not only broke through the frontier defences held by the Soviet 8 Army north of Memel, but it then advanced over 70km along the coast in 24 hours.

The remaining 14 divisions survived on the Soviet order of battle during 1941, but all had lost the large majority of their initial complement of men. Some of the divisions were virtually destroyed, such as the 179 and 183 divisions discussed above. As far as can be ascertained, every rifle division that was deployed in the Baltic Special Military District on 22 June 1941 had fewer than 3,500 men at some point during 1941. Examples include the 10, 33, 125 and 188 Rifle Divisions, which reported total divisional strengths of 2,577 men, fewer than 2,000 men, 3,145 men and fewer than 2,000 men, respectively, on 10 July 1941. The 5 and 128 Rifle Divisions reported a total divisional strength of 3,500 and 2,145 men, respectively, on 20 July 1941 and 1 October 1941. **In numerical terms the entire complement of these divisions was replaced at least once, and sometimes twice, during the second half of 1941**. This is supported by the fact that by 10 July 1941 (when the above strength returns were reported) the divisions in question had already each received several thousand replacements and mobilised reservists. The fact that the USSR's phenomenal and huge mobilisation process could not keep up with losses from June to September 1941, attests to the almost unbelievable attrition rate suffered by these units.

b. 5 Airborne Corps:

The 5 Airborne Corps was formed in April 1941 and comprised the 9, 10 and 201 Airborne Brigades. The 9 and 10 Airborne Brigades were very new formations which had started forming in April 1941. The 201st Airborne Brigade was formed in 1938, and by June 1941 it was the only brigade in the 5 Airborne Corps that was capable of parachute operations. Even this was problematic because many of its experienced personnel had been removed and used as cadre for the other airborne brigades in the corps. (p. 566)

On 22 June 1941 the 5 Airborne Corps' 3 brigades were **scattered across the Baltic States**. **The 9 and 10 Airborne Brigade went into action within the first 3-4 days of the invasion; against German panzer forces establishing a bridgehead near Daugavpils.** While the airborne units had relatively high morale, the lightly armed and equipped airborne brigades were never meant to face a panzer division (and especially not without major support from other large units). Predictably, the 9 and 10 Airborne Brigades suffered very heavy casualties in this battle and **were quickly decimated**. The 201st was stationed south of Pskov on 22 June 1941 and was also quickly drawn into action as ground infantry. **By the end of July 1941 the 5 Airborne Corps was almost destroyed in Northwestern Front** and it was withdrawn into the Stavka reserves to be re-built with newly mobilised draftees. It went into action again in October 1941 near Tula, and **survived 1941 serving as regular infantry with the 43rd Army.**[176]

c. 3 Mechanised Corps:

The 3 Mechanised Corps started forming in June 1940. The detailed status of the 3 Mechanised Corps, with all its component elements on 22 June 1941, is shown in table Bal MD 3MC.[177] Several sources give slightly different

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[176] **Note:** Elements of the 201 Airborne Brigade, took part in a number of parachute operations west of Moscow from late December 1941 to February 1942. On 6 August 1942 the 5 Airborne Corps (now with the 7, 10 and 201 Airborne Brigades) became the 39 Guards Rifle Division. The 9 Airborne Brigade was assigned to the new 4 Airborne Corps in December 1941 (the original 4th having been destroyed and then disbanded). C. C. Sharp, 'Red Guards': Soviet Guards Rifle and Airborne Units 1941-1945.

[177] **Note: Principal references (compiled from)**: C. C. Sharp, '*The Deadly Beginning', Soviet Tank, Mechanised, Motorised Divisions and Tank Brigades 1940-1942:* Soviet OOB WWII Volume I, George F. Nafziger, West Chester, OH, 1995, pp.12, 19, 21 and 57. D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, pp. 126, 145 and 155, table 5.5. M. I. Meltjukhov, *Upushchennij shans Stalina Sovetskij sojyz i borba za Evropu: 1939 -1941 (dokumenty, fakty, Suzhdenija*), (Lost Chance, Stalin's Soviet Union and the struggle for Europe: 1939 -1941 (documents, facts, judgments), Veche, Moscow, 2000. D. M. Glantz, *Barbarossa, Hitler's Invasion of Russia 1941*, Tempus Publishing Ltd, Stroud, UK, 2001, notes 1/19, 2/24. (Individual division data) S. J. Zaloga, J. Kinnear, P. Sarson, *KV-1 and 2 Heavy Tanks 1939-1945*, Osprey Military, London, 1995, p. 16. S. Zaloga, P. Sarson, *T36/76 Medium Tank 1941-1945*, Osprey Military (Reed International Books Ltd), London, 1994, p. 9. M. Kolomiets, *1941. Boi v Pribaltike* (1941. Fighting in the Baltic States), Frontline Illustration No. 5, Moscow, 2002. E. Drig, *Mekhanizirovannye korpusa RKKA v boyu*

(summation) figures for the 3 Mechanised Corps' strengths on this date. On 22 June 1941 the 3 Mechanised Corps contained around 88% of its authorised personnel, 79% of its authorised motor vehicles, 94% of its authorised towing tractors and 63% of its authorised tanks. Unusually, the 3 Mechanised Corps was actually over strength in the number of artillery pieces available (with 104% of TOE, including anti-aircraft and anti-tank guns). On paper the 3 Mechanised Corps was a relatively strong formation in June 1941. Its biggest weakness appears to have been the number, composition and state of its tank forces. (p. 567)

The **2 Tank Division** was formed in July 1940. While still in the early stages of formation the division was moved into the newly occupied Baltic States where it was supposed to complete its formation. The 2 Tank Division's tanks were slow in coming and by 1 February 1941 it still only had 63% of its authorised tanks on hand. However by late June 1941 it had received **52 new T-34 medium and 52 new KV heavy tanks**. In addition, the 2 Tank Division contained approximately 86% of its authorised personnel, **87% of its authorised trucks, all its authorised towing tractors,** and almost all of its authorised mortars, anti-tank guns, anti-aircraft guns and artillery. When one considers that the 2 Tank Division had 104 of the most powerful tanks in the world, tanks which apparently made all German tanks and the majority of their anti-tank guns obsolete in June 1941, and the division was otherwise well manned and equipped, **it is remarkable how rapidly it was destroyed**. **On 24 June, near Rassinye**, the KV tanks made a big impression on the German 1 and 6 Panzer Divisions in the 41 Panzer Corps. Despite the 6 Panzer Division having mostly obsolete **Pz 35(t)s** (it had 160 of them including command tanks), the 6 and 1 Panzer Division managed to destroy the large bulk of the 2 Tank Division along with most of the T-34s and KVs in Northwestern Front by 25 June. **Reduced to fragments, the 2 Tank Division was disbanded in July.**

The **5 Tank Division** was formed in July-August 1940 from the 2 Light Tank Brigade. It appears that the division only ever received the tanks from the original tank brigade from which it was formed, but otherwise it was well equipped. On 22 June 1941 the division had 214 tanks on strength (mostly **good BT-7s**) and was stationed near Alitus in Lithuania. At this time the 5 Tank Division contained approximately 88% of its authorised personnel, 69% of its authorised trucks, all its authorised tractors, and all its authorised mortars, anti-tank guns, anti-aircraft guns and artillery. Unfortunately being in 'good shape' didn't save the 5 Tank Division, or even delay its destruction for long. The division was initially cut off from the 3 Mechanised Corps and 11 Army HQ by the German advances. On 25 June 1941 the 5 Tank Division was placed under the control of 13 Army (Western Front), whereby it was caught in the Minsk pocket and completely destroyed. **It was officially removed from the Soviet order of battle on 18 July 1941.**

The **84 Mechanised Division** was the oldest division in 3 Mechanised Corps. It was formed in April-July 1940 from the 84 Rifle Division at Tula, which may explain why it was so well equipped. By June 1941 it was stationed near Vilnius and by this time **it had 159 tanks (mostly BT-7s) on strength**. The division also had approximately 91% of its authorised personnel, around 74% of its authorised trucks, **over 116% of its authorised towing tractors,** was and was actually over-strength in light and medium artillery. It did, however, lack any 152mm heavy howitzers. The 84 Mechanised Division soon became embroiled in the 3 Mechanised Corp's attempts to block the 4 Panzer Group's strike to the **Southern Dvinia River** [sic]. By early July 1941 the 84 Mechanised Division was mechanised in name only, having already lost almost all its tanks, most of its transport and with the remaining strength of a weak rifle brigade. On 16 July 1941 the 84 Mechanised Division was withdrawn to Northwestern Front reserves and redesignated the 'new' 84 Rifle Division. This was done by the simple expedient of redesignating its 41 Tank Regiment (84 MD) as the 41 Rifle Regiment. No new rifle regiments were added from newly mobilised forces, although large numbers of replacements were obviously used to fill out the division whilst in reserve. The 84 Rifle Division was sent to the front in September 1941 (assigned to the 11th Army).[178] (pp. 567-68)

(Mechanized Corps of the Red Army in Battle), AST, Moscow, 2005. (Flame tank data) M. Kolomiets, M. Svirin, *T-26: Mashiny na ego baze* (Machines based on the T-26), Part 2, Frontline Illustration No. 4, Moscow, 2003.

[178] **Note: 3 MC** had a total of **31,975** personnel.

d. 12 Mechanised Corps:

The 12 Mechanised Corps was one of the late forming mechanised corps which started forming in February-March 1941. The 12 Mechanised Corps included the newly formed 23 and 28 Tank Divisions, the 202 Mechanised Division and the 10 Motorcycle Regiment. The detailed strength of the 12 Mechanised Corps, with all its component elements on 22 June 1941, is shown in table Bal MD 12MC. The various reference sources do supply significantly different figures for the 12 Mechanised Corps' strength on this date. (p. 569)

The 12 Mechanised Corps was reasonably well established by June 1941, considering that it had only started forming 3-4 months earlier. This was largely due to its tank divisions being formed from already existing tank brigades. On 22 June 1941 the 12 Mechanised Corps contained 79% of its authorised personnel, 51% of its authorised motor vehicles, 59% of its authorised towing tractors, 52% of its authorised artillery (including anti-aircraft and anti-tank guns) and 73% of its authorised tanks. Oddly, the 12 Mechanised Corps was over strength in the number of available mortars (105%), but was very short of reconnaissance vehicles with only 29% of the required number of armoured cars.

The **23 Tank Division** was formed in February 1941 from the 6 and 22 Tank Brigades. By 22 June 1941 it had 679 motor vehicles (with 40% of its authorised trucks), most of its towing tractors and over 80% of its authorised personnel. The division's level of motorisation was actually reasonably good for a Soviet motorised unit formed in early 1941. One of the 23 Tank Division's weakest features was its lack of artillery: it had only 2 batteries of medium and heavy artillery, which represented only a third of its authorised strength. The tank strength amounted to **336 tanks and tankettes.** Of these, **320 tanks were T-26s** which represented 85% of the total number of tanks authorised in the division. The main documented weaknesses of the 23 Tank Division at this point in time were that 16% of its tanks were in workshops and in need of repair (even before the shooting started), and **it had no effective reconnaissance capability**. The division's reconnaissance battalion had no HQ or staff, and less than 20% of its authorised armoured cars. **The 23 Tank Division started to counter-attack German forces on the first day of the war.** On 23 June 1941 it was reinforced with the 55 Tank Regiment from the 28 Tank Division. In the ensuing tank battle on 24th June the 23 Tank Division and 55 Tank Regiment lost most of their tanks, and could not recover those damaged or broken down. The 23 Tank Division continued operating under 12 Mechanised Corps during July, but was systematically worn down until it was **disbanded in early August 1941 and removed from the Soviet order of battle.**

As an aside, it is noteworthy that **many authors freely use the terms 'only' and 'old' when describing a Soviet 1941 tank division like the 23rd.** Statements such as the tank division "only had around two thirds of its authorised tanks" and it "only had old T-26 and BT tanks" are replete in WWII literature. The reader is left with the impression that most Soviet tank divisions were severely understrength (in terms of tank numbers) and with only obsolete tanks on strength. **These statements completely disregard the fact that a Soviet June 1941 tank division had the huge number of 375 authorised tanks, with 344 authorised in its 2 tank regiments. In comparison, a typical full strength 1941 panzer division had a single panzer regiment with 162 authorised tanks (with 182 in the entire division).** Thus even the 23 Tank Division, with 'only' 85% of its authorised 'main-battle tanks', still had **138 more main-battle tanks** than all the tanks in the average panzer division in June 1941. (pp. 569-70)[179]

In addition to this, the **so called 'obsolete' T-26 and BT tanks were theoretically equivalent or superior to the Pz Is, Pz IIs, Pz 35(t)s and Pz 38(t)s** that made up the tank numbers in many panzer divisions. In fact the obsolete Pz I was the equivalent to a tankette (it was originally intended as a training vehicle), while the Pz II was really a light reconnaissance tank with a 20mm cannon. The **T-26 and BT tanks also had long 45mm guns with armour penetration abilities able to deal with the heavier German Pz III and Pz IV tanks. The critical weaknesses**

[179] **Note:** Soviet **12 MC** had a total of **28,832** personnel.

of Soviet 1941 tank divisions had relatively little to do with the numbers of available tanks or the technology behind them. It had far more to do with organisation, supporting infrastructure, and combined arms operation and training. At the same time the main strength of the panzer divisions (also) did not lie in the numbers and types of available tanks, but elsewhere. (p. 571)

The **28 Tank Division** was formed in February 1941 from the 27 Light Tank Brigade. By 22 June 1941 the 28 Tank Division was, to some extent, better equipped than the 23 Tank Division in the same corps. It contained more motorised transport; namely 821 motor vehicles including 50% of its authorised trucks, and around 90% of its authorised tractors. Furthermore, **the division had 317 tanks** (85% of its authorised strength) of which the predominant type was the **BT-7 and BT-7M. These tanks were much faster, more modern and generally superior to the T-26 series in the 23rd Tank Division**. In other respects the 28 Tank Division was in a similar state to the 23 Tank Division: it had around 79% of its authorised personnel, only a third of its authorised medium to heavy artillery and only 26% of its authorised armoured cars.

Very early in Operation Barbarossa the 28 Tank Division was broken up with its 28 Motorised Regiment and 55 Tank Regiment separating from the division. The 55 Tank Regiment was sent to support the 23 Tank Division while the 28 Motorised Regiment fought independently along the Baltic coast. The divisional HQ took control of the 202 Mechanised Division's 125 Tank Regiment on 26 June 1941, and in this reduced form it fought a rear-guard action across the Baltic States during July. **By 22 July 1941 the 28 Tank Division had already lost all its armour**, and the remnants of the division were reinforced with the 3 NKVD Motorised Rifle Regiment on 14 September. Systematically worn down in further battles across the Baltic States, the 28 Tank Division was finally disbanded and removed from the Soviet order of battle in November-December 1941. The surviving cadre subsequently formed the core of the new 241 Rifle Division in the 27 Army.

The **202 Mechanised Division was formed in February-March 1941, and by 22 June 1941 it was still in the relatively early stages of formation.** Although the division contained around 84% of its authorised personnel and had 961 motor vehicles (including 60% of its authorised trucks), it only had a third of its authorised tanks, medium-heavy artillery and tractors. The division was also understrength in terms of infantry guns, anti-tank guns and anti-aircraft guns. One of the interesting figures available for the 202 Mechanised Division is the availability of signal equipment and personnel. The 202 Mechanised Division had only 50% of its authorised radios and only 33% of its trained signal technicians. This was not uncommon for Red Army divisions in June 1941. **Overall, the division was not combat ready** and its HQ infrastructures were still incapable of coordinating the division's numerous elements effectively.

When the 12 Mechanised Corps went into action on 22 June 1941, the 202 Mechanised Division was scattered over a large area and struggled to consolidate its elements. This was largely due to the **lack of motorisation** (the immobility of the division's separate elements), and the **lack of signals and trained personnel** to coordinate its activities. The result was that the division's relatively weak 125 Tank Regiment separated and joined the 28 Tank Division on 26 June, and joined that unit's fate. **By mid-July 1941 the 202 Mechanised Division was realistically a non-motorised rifle unit.** This became official in late August 1941 when the 202 Mechanised Division was **redesignated the 202 Rifle Division**, with addition of the newly mobilised 1,317 Rifle Regiment.[180] (p. 571)

e. Garrisons on the Islands of Saaremaa (Osel) and Hiiumaa (Dago):

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[180] **Note: The 'new' 202 Rifle Division** is an example of a Mobilised and Deployed (MD) unit which actually only used a single newly mobilised rifle regiment. Thus, the 'resources consumed' to create the 202 Rifle Division consisted of a single new rifle regiment and Replacements (R) (to fill out and reorganise the existing division). This is simulated in the FILARM model. **A great many of the 'new' divisions mobilised by the USSR during 1941 were the result of this process. Unfortunately, many current WWII authors seem to imagine all these 'new divisions' were created (i.e. were newly mobilised) from scratch**.

Part of the responsibility of the Baltic Special Military District's 27 Army was to **garrison the large islands of Saaremaa and Hiiumaa in the Baltic.** These islands effectively enabled naval control of the entrance to the Gulf of Riga and had a strong influence on naval control of the Gulf of Finland. (p. 572)

After the USSR occupied the Baltic States in June 1940 they immediately started fortifying the Saaremaa and Hiiumaa islands with coast defence artillery and garrison troops. The main garrison unit was the 3 Rifle Brigade which was formed in late 1940. The 3 Rifle Brigade was supported by the 10 NKVD Border Guard Unit and various fortified coast defence battalions and batteries. **The extensive fortifications on Saaremaa and Hiiumaa were still under construction in June 1941**, which is why there were still 5 naval engineering battalions present. In addition to these forces, the Red Banner Baltic Fleet maintained naval aircraft and naval units on the island's naval bases. By 22 June 1941 all these forces amounted to 23,633 men. The detail personnel and equipment strength of the Saaremaa and Hiiumaa garrison's ground forces on 22 June 1941 is shown in table Baltic Islands Garr. The table excludes details of the 10 NKVD Border Guard Unit (included under the district's NKVD forces) and naval personnel not associated with the naval engineers or coastal artillery forces on the islands.

After the commencement of Operation Barbarossa, the Saaremaa and Hiiumaa garrison remained in place. Additional coastal batteries were positioned in July and August, and the **Sorve Peninsula was heavily fortified.** The batteries and fortifications were organised for all round defence and prepared for a final stand. Unlike the **Hanko Peninsula garrison, the Saaremaa and Hiiumaa garrison** was not evacuated when its position became untenable due to events on the mainland.

In September 1941 the *Wehrmacht* decided to invade the islands with an operation given the codename **Operation Beowulf**. The German 61 Infantry Division, reinforced with assault pionier troops and additional artillery, was earmarked for the attack. On 9 September 1941 the small island of Vormsi, to the east of Hiiumaa, was seized as a first step. Then on 14 September the island of Muhu (to the east of Saaremaa and linked by a causeway) was invaded from the Estonian coast. By 16 September Muhu was secured, and by 21 September all the elements of the 61 Infantry Division were on Saaremaa. However it wasn't until 5 October 1941 that the last Soviet positions on the **heavily fortified** Sorve Peninsula were overrun.

On 12 October 1941 the assault began on the island of Hiiumaa, with a feint to the south of the island and the actual landings on the west coast of the island using assault craft. The Hiiumaa defenders were gradually forced back to the Tahkuna Peninsula, on the north of the island, where the last of them surrendered on 21 October 1941. While a handful of Soviet patrol boats did attempt to escape, there was no chance of escape for the Soviet Saaremaa-Hiiumaa garrison. **Soviet losses from Operation Beowulf amounted to approximately 19,000 captured and 4,700 killed** (the entire garrison), while German killed, wounded and missing amounted to 2,850. (p. 572)

f. NKVD Ground Forces in the Baltic Special Military District:

Although not as extensive as the NKVD forces around Leningrad, the NKVD forces deployed in the Baltic Special Military District were still significant. This district encompassed the recently occupied Baltic States, whose civilian population had to be appropriately 'policed' by the Soviet regime, as well as coastal borders which required additional NKVD naval and aircraft patrol units. Furthermore the NKVD had to maintain well-armed border guard detachments along the sensitive border with East Prussia. The personnel and equipment strength of the NKVD forces deployed in the Baltic Special Military District on 22 June 1941 is shown in table Bal MD NKVD [table not shown]. (p. 574)

The most combat capable NKVD units were the **8 border guard detachments** which were (on average) at around 80% of their authorised strength, and the **1, 3 and 5 NKVD Motorised Regiments** (being used to form the **22 NKVD Motorised (Security) Division**, with its HQ in Riga). In the event, the border guard detachments on the

border with East Prussia were quickly overrun, but the small 22 NKVD Motorised Division did manage to consolidate and in late June it was assigned to the 10 Rifle Corps, 8 Army. It defended the approaches to Riga in July and fell back to Tallinin in August. At this time the division's 3 NKVD Motorised Regiment was separated to reinforce the depleted 28 Tank Division, and the remaining remnants of the division were disbanded to reinforce other units defending Tallinin. By October 1941 the division had been erased from the Soviet order of battle. (p. 575)

g. Baltic Special Military District, Front, Army and Corps Support Units:

Repeating the same **checksum reconciliation process** as used for the Leningrad Military District, and combining this with available quantitative and qualitative information on the various support units, we can deduce the most probable actual strength of the various support units in the Baltic Special Military District in June 1941. The following are some general observations regarding the various support units in the Baltic Special Military District:

● The **RVGK and corps artillery regiments** had several major problems. The biggest problem was a *chronic shortage of motorised transport* with the average artillery regiments having only around 13% of their authorised trucks and 57% of their authorised towing tractors. As most of the signals and artillery observation infrastructure for the artillery was carried in trucks, one can only imagine how these artillery regiments coordinated their activities, let alone how they maintained any effective supply. Even without any other problems, **the lack of transport, alone, would prove fatal when trying to conduct a mobile battle** against the type of attack Army Group North's panzers inevitably launched.

● The **9 Anti-Tank Brigade** was formed in April 1941, and, in terms of available guns, by 22 June 1941 it was one of the most established anti-tank brigades in the Red Army. At this time its 2 anti-tank regiments each had 3 battalions of **76mm guns**, 2 battalions of **85mm guns**, a battalion of 37mm anti-aircraft guns and a company of 12.7mm AAMGs. At least 1 regiment (the 636 Anti-Tank Regiment) was at full strength in terms of number of guns. However, like all the anti-tank brigades in June 1941, **the 9 was desperately short of motorised transport.** For example the 636 Anti-Tank Regiment had only 15 trucks and tractors to move and supply its 68 guns, while the anti-tank brigade as a whole had less than 10% of its authorised trucks and only 4 tractors! The 9 Anti-Tank Brigade was initially deployed under the 8 Army but was reassigned to the 11 Army in July. By August the 9 Anti-Tank Brigade had almost ceased to exist, and it was disbanded with the surviving cadre going into newly mobilising and smaller anti-tank units.

● The **10 Anti-Tank Brigade** was also formed in April 1941. Like the 9 Brigade, the 10 Anti-Tank Brigade had a battalion of 76mm guns replacing the 107mm gun battalion in each of its anti-tank regiments. The 10 Anti-Tank Brigade had slightly more transport with around 20% of its authorised trucks, **but it had no towing tractors at all.** Initially deployed under the 11 Army, it was reassigned to the 27 Army in early July. By the end of July 1941 the 10 Anti-Tank Brigade was on its last legs and its remnants went into Northwestern Front reserves where it was **officially disbanded in October 1941.** (p. 575)

● The Baltic Special Military District employed a **large and relatively well equipped coastal artillery force.** This was because the district was responsible for defending the **strategically important ports of Liepaja, Riga and Tallinin, as well as the Saaremaa and Hiiumaa islands.** The coast defences on the Baltic Islands are treated as part of the island garrison forces (see above). These coastal artillery forces reported to the Tallinin Naval Area Command and the Baltic Naval Area Command (both of which reported to the Baltic Fleet Command). The 7 naval infantry battalions were effectively a 'spin off' from the coastal defence requirement and were usually positioned to support the coastal artillery forces. Thus they were maintained in a relatively high state of readiness, although their lack of organic heavy equipment and transport meant this was relatively easy to do. As far as is known, almost all the Soviet coastal artillery weapons in the Baltic States were lost in 1941. (p. 576)

● The **PVO regiments** in the 6 PVO brigades (3 regional) in the district were not particularly strong. Only 82 batteries defended along the entire Northwestern PVO axis (in the Northern and Northwestern PVO zones, but excluding Leningrad). This was because the *air defence of the newly occupied Baltic States had a much lower priority compared to the more strategic targets further east in the USSR*. For all intents and purposes the PVO forces in the Baltic Special Military District **were immobile; with inadequate transport available to move them by road.** It is not known how many of the PVO's heavy AA guns defending cities in the Baltic States were evacuated by rail or sea in 1941. It is unlikely many PVO forces around Riga and Kaunas (i.e. the Rizhskii and Kaunasskii PVO Regional Brigades) would have had the time or opportunity to evacuate.

● The average strength of the machine gun-artillery battalions in the **6 fortified sectors** was relatively high. This was because the 42, 44, 46 and 48 Fortified Sectors (along the border with East Prussia) formed the northernmost part of the new Molotov Defence Line, and these were being reinforced immediately prior to Operation Barbarossa. Despite this, the average strength of the fortified sectors was slightly below those in the Western Special Military District further south, because the main effort of any enemy attack was thought to be most likely through this district. (p. 576)

h. Total Manpower and Equipment in the Baltic Special Military District, 22nd June 1941:[181]

A complication here is that, uniquely, the Baltic Special Military District **contained numerous 'non-standard' equipment types which were sourced from the Lithuanian Army, the Latvian People's Army and the Estonian People's Army**. When the USSR occupied the Baltic States in June 1940, all the equipment in these relatively small forces was added to the Red Army's inventory. **This equipment consisted of a mixture of Soviet and old Russian weapons (some dating back to the pre WWI era) as used by the Red Army, and equipment supplied (sold) by the Western powers**. After the occupation, the Soviets expected to absorb the Baltic States' armed forces into the Red Army. Accordingly, the 'Lithuanian' 29 Rifle Corps, the 'Latvian' 24 Rifle Corps and the 'Estonian' 22 Rifle Corps became part of the Red Army. These units are referred to as the Red Army's Baltic Territorial Units. . . (p. 583)

Summarising the reconciled results for the entire district, we can see that there were: **14,919 crew served MGs** (excluding 12.7mm AAMGs), 3,165 mortars, **3,958** artillery pieces (including anti-tank guns but excluding anti-aircraft, coastal and rail guns), 537 anti-aircraft artillery guns, **1,551** tanks and tankettes, and **369,702** personnel present in the Baltic Special Military District on 22 June 1941. In general this total is very consistent with other up to date published sources.

[**Small Arms in BSMD**]:

Rifles and Carbines: **374,425**
Sub-machine guns: **15,565**
LMGs & MMGs (incl. Quad MMGs): **14,919**

[**Transport in BSMD**]:

Trucks: **13,525**
Other Vehicles (all types): **5,586**
Tractors (all types, incl. Armoured): **2,978**
Horses: **38,826**[182]

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[181] **Note: The primary source for the data** in this table [not shown] is C. Crofoot, *The Order Of Battle Of the Soviet Armed Forces: 'The Sleeping Bear'*, Volume 1: 22 June 1941, Part One, ***The Nafziger Collection*** Inc, West Chester, OH, 2001, pp. 10-14.

[182] **Note:** This seems like a frighteningly small number of horses! Germans invaded with **600,000+.**

[**Artillery / AT Guns**]:

(20-45mm AT Gun): **1236**
75-76mm guns: **857**
83-122mm howitzers: **762**
152mm howitzers: **279**
152mm gun/how: **332**
203mm howitzer M1931 (B-4): **59**
Total Field Guns and Howitzers: **3,958**

[**Mortars**]:

50mm Mortar M1938-M1941: **2,081**
81mm Brandt Mortars M27/31: **196**
82mm Mortar M1936-M1941: **620**
107mm Mtn. Mortar M1938: **50**
120mm Mortar M1938: 218
Total Mortars: 3,165

[**Tanks in BSMD**]:

T-26 (incl. Flamm tanks)**: 527**
BT-7/BT7M: 691
T-37/38/40 (tankettes)**: 146**
T-28: 57
T-34: 52
KV-1: 59
KV-2: 19

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1551

(gleaned from: pp. 584-85]

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8. The Western Special Military District (Western Front from 22 June 1941)

In this section we will focus on the actual personnel and equipment strength of the land combat units deployed in the **Western Special Military District on 22 June 1941**. We will examine the strength of the individual combat units within the district, and then reconcile this data with the actual strength in the entire military district. (p. 587)

a. Rifle Divisions:

On 1 June 1941 the average personnel strength of rifle divisions in the Western Special Military District was **9,327** men and on 22 June 1941 there were **24 rifle divisions in the district.** This meant that the average rifle division had **only 64% of its authorised pre-war personnel**. On the equipment side, the rifle divisions in the Western Special Military District were well equipped; with the **glaring exception of motorised transport and, to a less extent, even horse-drawn transport.**

Table Wes MD Divs 1 shows the actual strength of the rifle divisions in the Western Special Military District on 22 June 1941. The large majority of rifle divisions in the Western Special Military District were older established Red Army rifle divisions: 18 were formed before 1939, 5 were formed in 1939 and only 1 was formed in 1940. This may explain why, in most equipment categories, these rifle divisions were so well equipped. The average rifle division's equipment inventory was very near full strength (over 90% of TOE) or was actually over strength (over 100% of TOE) in the following equipment categories: LMGs, MMGs, all types of mortars, 76-152mm artillery (including infantry guns), 45mm anti-tank guns and 76mm anti-aircraft guns. These weapons were all maintained at a high level, even in the '12' strength peacetime rifle division, because the Red Army could not (and did not plan to) commandeer this type of equipment from the civilian economy after any war started (see below).

One of the biggest misconceptions (and hence untruths) relating to Operation Barbarossa is that the rifle divisions in the Western Military Districts were critically short of anti-tank guns in June 1941. This common perception is likely attributed to the historical inability of these divisions to stop the rapid panzer thrusts in June and July 1941. However, this result was far more due to the relative immobility of the rifle divisions than the lack of anti-tank guns. On 22 June 1941 there were 2,154 45mm anti-tank guns and 1,026 76mm divisional (anti-tank capable) guns in the Western Special Military District. This number enabled the average rifle division in the Western Special Military District to have no less than 104% of its 54 authorised 45mm anti-tank guns and 95% of its 16 authorised 76mm divisional field guns on 22 June 1941.

The areas where the rifle divisions in the Western Special Military District were critically weak were: acute shortages of motorised transport (with all the accompanying weaknesses in signals, artillery support and supply infrastructures), severe shortages in horse-drawn transport, shortages of light-medium anti-aircraft weapons, shortages of trained riflemen, and shortages of trained personnel to man the heavy weapons and command the division. The rifle divisions averaged around 25% of their authorised trucks and 62% of their required towing tractors. Even the amount of horse borne transport available was limited, with the average rifle division having around half its authorised horses. In addition, the rifle divisions were vulnerable to low level air attack, possessing around half their authorised 37mm anti-aircraft guns (despite only being authorised 8 guns per division), and 3-26% of their authorised AAMGs. Table Wes MD Divs 1 also highlights the personnel shortage with the average rifle division averaging only 46% of its authorised rifle squads. Without the actual riflemen (infantry) to hold the line or launch counter-attacks, any rifle division is effectively hamstrung no matter how well equipped it might be.

In the original Soviet mobilisation plan, it was intended that the rifle divisions would fill up with the required riflemen (from the large pool of trained reservists in each district) within a few days of war starting. These were the easiest type of personnel to mobilise quickly, as opposed to the weapon and signals specialists, and technical support personnel. Furthermore the additional trucks, tractors and horse drawn transports were supposed to be rapidly commandeered from the economy for immediate use by these divisions. However, the initial German attack and subsequent speed of the German advance meant that most divisions in the Western Military Districts,

and especially those in the Western Special Military District (Western Front), went into action with strengths very close to what they had on 22 June 1941. Underscoring this is the fact that an estimated 500,000 trained reservists, who were called up in late June 1941, were taken prisoner before being taken on Red Army strength (effectively before they could get to their assigned units). The majority of these POWs were captured in the pockets created by Army Group Centre in June and July 1941, when it attacked and destroyed the Red Army's Western Front. (p. 587)

Western Special Military District Rifle Divisions (22.6.1941):

- **24** total Rifle Divisions.
- **14** formed between **1918-27.**
- **10** formed between **1931-40.**
- Peacetime strengh of divisions varies between **4800** (**143 ID**) and **11.835** (**161 RD**).
- Rifle divisions had 0 tanks.
- Horse teams: **15,235.**
- Trucks: **3432 (**average of **143** per division).
- Rifle & Light Rifle squads: **3856** and **359** respectively.[183]
- LMG: **5102**
- MMG: **3931**
- 45mm AT guns: **1354**
- 50mm mortar: **2072**
- 82mm mortars: **1348**
- 120mm mortars: **342**
- 76mm Inf G: **407**
- 76mm G: **365**
- 152mm howitzer: **357**
- 122mm howitzer: **692**

(pp. 588-89)

The following rifle divisions require special mention due to some specific and relevant circumstance.

The **24 Rifle Division** had a company of T-26s, and the 55 and 64 Rifle Divisions still had a company of tankettes, in their respective reconnaissance battalions. T**hese represented the only tanks left in the rifle divisions in the Western Special Military District as all the remainder had been removed to form the new mechanised corps.** (p. 590)

The 17, 37, 50 and 143 Rifle Divisions were all around **the '6' peacetime division strength** on 22 June 1941. They all had **fewer than 6,000 men** on strength and were almost immobile. These divisions were part of the Western Special Military District's reserves. This didn't stop the 17 and 37 Rifle Divisions from being destroyed in the first weeks of war. The 50 and 143 Rifle Divisions were initially stationed in the rear of the Western Special Military District (Western Front) and had more time to mobilise. They also managed to avoid becoming encircled, and hence lost, in the Minsk and Smolensk pockets. Still well under full strength, both these divisions survived 1941 despite extremely heavy and almost fatal attrition losses.

Of the **24 rifle divisions** deployed in the Western Special Military District (Western Front) on 22 June 1941, **16 were completely destroyed and officially removed from the Soviet order of battle in 1941.** The divisions lost were:

[183] **Note:** Number of rifle squads in Rds varied from just **30** to **259!** How was that possible?!?

● The 2, 8, 13, 27, 37, 49, 56, 85, 86 and 113 Rifle Divisions were destroyed in the Belostok and Minsk battles and resultant pockets.

● The 17 Rifle Division was destroyed in the battle for Smolensk.

● The 24, 42, 55 and 75 Rifle Divisions were destroyed in the Kiev pocket. All 4 of these divisions were decimated in the initial border battles in Western Front. The remnants managed to retreat (mainly through the Pripet Marshes) and they were all then assigned to the 21 Army. After receiving replacements, some of these divisions joined 21 Army's very expensive attack against the flank of Army Group Centre in early July. By the time the 2 Panzer Group turned south to trap the above divisions in the Kiev pocket, they were mere skeletons of their former selves. Therefore, although their final destruction is attributed to the Kiev pocket where the remnants were destroyed, the 24, 42, 55 and 75 Rifle Divisions were really 'destroyed' in the battles for Smolensk.

● The 155 Rifle Division (and possibly the 108 RD) was destroyed in the Vyazma-Bryansk pocket.

Of the remainder, most had lost almost their entire initial complement by the end of 1941, and were kept in existence by massive numbers of personnel and equipment replacements. For example, most of the **6 Rifle Division was lost in the Brest Fortress** and reported to the 28 Rifle Corps that it had only 340 men left on 5 July 1941. For most of 1941 the division fielded the equivalent of 2-3 rifle battalions. Similarly, the 121 and 143 Rifle Divisions were down to fielding 3 rifle battalions by mid-August 1941. **The 108 Rifle Division was so badly shot up in the Vyazma-Bryansk pocket that some sources classify it as being 'destroyed' prior to rebuilding**. (p. 590)

Of the original 24 rifle divisions deployed in the Western Special Military District on 22 June 1941, 3 did survive to receive a 'Guards' designation. These were the 64, 100 and 161 Rifle Divisions which were redesignated the 7, 1 and 4 Guards Rifle Divisions, respectively, **after being almost completely rebuilt in 1941**. (p. 591)

b. 4th Airborne Corps:[184]

The 4 Airborne Corps was formed in April 1941 and comprised the 7, 8 and 214 Airborne Brigades. The 7 and 8 Airborne Brigades were new formations, which had started forming in April 1941. The 201st Airborne Brigade was the veteran formation around which the 4 Airborne Corps was formed. Despite its recent formation, t**he 4 Airborne Corps was well manned and equipped.**[185] **Table 4 AB Cps** shows the actual strength of the 4 Airborne Corps in the Western Special Military District on 22 June 1941. The average airborne brigade had around 90% of its authorised personnel, 43% of its authorised trucks and was full strength or over strength in MGs and heavy weapons (with the exception of 12.7mm AAMGs). The 4 Airborne Corps was authorised a tank battalion with 48 tankettes, but the corps only had half this number available on 22 June 1941.

On 22 June 1941 the 7 and 8 Airborne Brigades were d**eployed near Borisov, and were quickly drawn into fighting for the bridges over the Beresina River.** The 214 Airborne Brigade was stationed southeast of Minsk. By 10 July the 4 Airborne Corps was under 13 Army, *fighting as very lightly armed infantry against heavily armed German infantry and panzer forces.* Predictably, the 7 and 8 brigades were destroyed by July 1941 and the corps had ceased to exist by August-September 1941 (including most of the 214 Airborne Brigade). **A new (second) 4th Airborne Corps started forming in September 1941**, and it appears to have had at least some survivors from the original 214 Airborne Brigade. (p. 591)

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[184] **Note:** Total manpower of **4 AB Corps** just **7543** on 22.6.1941. It was lightly equipped w/ MGs and mortars, also outfitted with only **44** 45mm AT guns. Did have **24** Tankettes!

[185] **Note:** But not to take on a panzer or motorized division, or even a decent infantry division!

c. 6 Cavalry Corps:[186]

The 6 Cavalry Corps comprised the veteran 6 and 36 cavalry divisions. **On 22 June 1941 the 6 Cavalry Corps was the most well prepared and trained 'mobile unit' in the Western Special Military District.** There were several reasons for this. Firstly, the cavalry was one of the premier branches of the Red Army and **a favourite of Stalin's**, so its leadership was less damaged by the crippling pre-war officer purges. Secondly, the cavalry divisions were *old and well established formations which had had plenty of opportunity to train as a unit.* For example, the **6 Cavalry Division dated back to the Russian Civil War when it was known as the Chongar Division.** Thirdly, the cavalry divisions relied to a much lesser degree on commandeered equipment from the civilian economy to become fully mobile, while the majority of their personnel were regular troops already in the divisions on 22 June 1941.

Table 6 Cav Cps [not shown] shows the actual strength of the 6 Cavalry Corps in the Western Special Military District on 22nd June 1941. The divisions in the 6 Cavalry Corps were at full strength (or even slightly over strength) in terms of authorised MGs, mortars, 76-122mm artillery, 45mm anti-tank guns and heavy anti-aircraft guns. The corps also possessed **78% of its authorised BT cavalry tanks and tankettes**, although the BT tanks were the **older BT-2/5 versions.** The motorised transport available was weaker, with the cavalry divisions averaging around 41% of their authorised trucks. However the cavalry divisions were relatively light formations compared to rifle or mechanised units, and obviously their primary mode of movement was using horses. In this regard the two cavalry divisions were relatively well equipped, with around 72% of their authorised horse-teams.

The most obvious weaknesses in the 6 Cavalry Corps' cavalry divisions on 22 June 1941 were that t**hey only possessed around two thirds of their authorised personnel,** *and were very short of light and medium anti-aircraft weapons* (i.e. all types of AAMGs and 37mm anti-aircraft guns). By their very nature, cavalry divisions were already particularly vulnerable to air-attack and the anti-aircraft defences provided were totally inadequate. **Apparently, both the 6 and 36 Cavalry Division suffered very heavy casualties from Luftwaffe attacks in June 1941.**

Despite being relatively well prepared, the 6 Cavalry Corps did not fare well in the first days and weeks of war; mostly a case of being in the wrong place at the wrong time. On 22 June 1941 the corps was stationed in the natural salient west of Belostok and within 48 hours the corps was ordered to counter-attack penetrations by the **3 Panzer Group**, in conjunction with elements from the 6 and 11 Mechanised Corps. In the ensuing battle the 6 Cavalry Corps was virtually destroyed while the remaining elements were eliminated in the Belostok pocket. The 6 Cavalry Corps was **officially deleted from the Soviet order of battle on 6th July 1941**. (p. 592)

d. 6 Mechanised Corps:[187]

The 6 Mechanised Corps started **forming in June 1940.** It included the newly formed but powerful 4 and 7 Tank Divisions, the well-equipped 29 Mechanised Division, the 4 Motorcycle Regiment, the 41 Engineer Battalion and the 185 Armoured Signal Battalion. **On paper at least, the 6 Mechanised Corps comprised one of the two most powerful armoured and mechanised corps in existence on 22 June 1941; with the other being the 4 Mechanised Corps in the Kiev Special Military District.**

The detailed strength status of the 6 Mechanised Corps, with all its component divisions and other support units on 22 June 1941, is shown in table Wes MD 6MC. A few reference sources supply slightly different figures for the 6th Mechanised Corps' strength on this date.1524 On 22 June 1941 the 6 Mechanised Corps contained 89% of its authorised personnel, 97% of its authorised motor vehicles, 90% of its authorised towing tractors and 99% of its authorised tanks (**1,021 tanks**). In other departments the 6 Mechanised Corps was also at almost full strength. This

[186] **Note:** Total manpower: **12,903**. Only possessed **36** 45mm AT guns. Had **54 BT-2/BT-5** tanks.
[187] **Note:** Total manpower: **32,382**. Also had **238** T-34s, **83** KV-1s, **31** KV-2s.

included having: 91% of its authorised artillery (including anti-tank and anti-aircraft guns), 95% of its authorised armoured cars, 89% of its authorised mortars and even 76% of its authorised motorcycles.

The most striking thing about 6 Mechanised Corps was the concentration of new tanks. It possessed **238 T-34s and 114 KV heavy tanks:** the most powerful tanks in the world in June 1941. In addition, the corps had 344 BT-7/7M tanks which were the best tanks in the Red Army after the T-34 and KV tanks. The 6 Mechanised Corps (and even more so the 4 Mechanised Corps) **makes a complete mockery of the common perception that T-34 and KV tanks were not committed in any significant numbers (and/or were not concentrated and only committed in small numbers)** until October to December 1941. This corps, alone, contained **352 of these tanks on 22 June 1941**. The presence of the powerful 6 Mechanised Corps, and other similarly powerful mechanised corps in the Western Military Districts, provides strong evidence that the Stavka intended any invasion force to be contained well within the Western Military Districts and then subject to a major mechanised force counter-attack.[188]

The **4 Tank Division** was formed in July 1940, and by early 1941 it was given a high priority to receive new tanks and equipment. By June 1941 the 4 Tank Division had close to 90% of its authorised personnel, 96% of its authorised motor vehicles, and was fully equipped with mortars, artillery and armoured cars. The division even included a **full complement of the rare 37mm anti-aircraft guns**. The division was actually over strength in tanks with 380 available (versus the 375 authorised), of which 88 were T-34 and 63 were KV heavy tanks. **This meant that the 4 Tank Division had 151 of the most powerful tanks in the world, including 2 fully equipped heavy KV tank battalions**, and was almost full strength in other areas. *In terms of tank numbers and tank technology, the 4 Tank Division was, on paper, considerably stronger than any panzer division fielded during 1941.* (p. 594)

Unfortunately the 4 Tank Division never got a chance to live up to its potential. On 22 June 1941 it was stationed near Belostok and immediately came under air attack. **The divisional commander was killed on the first day, and the command, control and support systems rapidly broke down**. The tanks and supporting arms quickly became separated, and the tanks were either c**hopped up piecemeal or were abandoned for lack of support (mainly lack of fuel and spares)**. The remainder of the 4 Tank Division disappeared into the Belostok and Minsk pockets, and was completely gone less than two weeks after the war had started. *The 4 Tank Division is another excellent example of why the number and type of tanks should never be the primary factor in calculating an armoured division's actual overall combat power or its ability to sustain prolonged combat operations.* (pp. 595-96)

The **7 Tank Division** was also formed in July 1940 and like the 4 Tank Division it was one of the best equipped units in the Red Army by June 1941. On 22 June 1941 the 7 Tank Division had around 88% of its authorised personnel, 96% of its authorised motor vehicles, 88% of its authorised towing tractors, and was almost completely equipped with mortars, artillery and armoured cars. The division also contained the massive number of **435 tanks and tankettes** (116% of TOE) and had even more modern tanks than the 4 Tank Division: it had no fewer than **150 T-34s and 51 KV heavy tanks on strength**. This meant the 7 Tank Division had 201 of the most powerful tanks in the world on strength, which was actually 19 more T-34 and KV tanks than all the tanks authorised in a June 1941 panzer division! **Similarly to the 4 Tank Division, the 7 Tank Division was also considerably stronger than any panzer division fielded in 1941** (and probably even 1942), and (on paper) this made the 6 Mechanised Corps at least as strong as any contemporary *Wehrmacht* panzer corps.

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[188] **Note:** Note, the strength of several mechanised corps in June 1941 (like the 6 MC) has also been used as evidence by several commentators (most notably **Vladimir Rezun, alias Viktor Suvorov**, in his book '*Icebreaker: Who Started the Second World War'*) to claim the Red Army was preparing to launch an invasion into Western Europe in July 1941. There is only a limited amount of circumstantial evidence to support this contention, and the overall operational-readiness state of the 6 Mechanised Corps in June 1941 does not support this hypothesis at all. **It is, however, very possible that Stalin was thinking along these lines with an operation set for mid-1942, or possibly 1943**.

In the event, the fate of the 7 Tank Division was, unfortunately, very similar to that of the 4 Tank Division. **On 22 June there was apparently no 76mm armour piercing ammunition available for its 201 new tanks, and only around 1.5 loads per tank of HE ammunition was immediately available.** In addition, the local fuel stockpiles only enabled **each diesel powered T-34 and KV tank** to have a single refuel (i.e. 2 fuel loads), while each gasoline powered vehicle could have 3 refuels. Under these circumstances, one would expect the mechanised corps HQ (and superior army HQ) to quickly organise the additional fuel, ammunition and support required; especially as the 6 Mechanised Corps and all its divisions had the transport and infrastructure to enable this (the corps had 97% of its authorised motor vehicles). However, when the main 10 Army fuel depot was bombed, no one in the division or corps seemed to know where an alternative depot was located (and yet the 7 Tank Division was still not ordered to withdraw eastwards). By 28 June the 7 Tank Division was dispersed with its rifle regiment separated, its artillery units unable to move and its divisional commander killed. With most of its tanks abandoned or overrun, one of the best equipped tank-mechanised divisions in the world disappeared from the Soviet order of battle less than 9 days after the war had started.

The **29 Mechanised Division** was formed in July 1940 from the 29 Rifle Division. By 22 June 1941 the 29 Mechanised Division was the best equipped mechanised division in the Western Special Military District. At this time it had 92% of its authorised personnel, 100% of its authorised trucks, almost all its authorised mortars and artillery, and **200 tanks** (73% of TOE, and mostly BT-7s). Therefore there were a total of 1,021 tanks in the 6th Mechanised Corps on 22 June 1941, including 6 BT-7s in the corps' armoured signal battalion. Of these, no less than 34% of the tanks were T-34 or KV tanks, and **another 34% were modern and fast BT-7/7M tanks.**

Initially located at **Slonim** near the border, the 29 Mechanised Division's fate quickly followed those of the 4 and 7 Tank Divisions. Under immediate pressure from enemy ground and air forces, the division soon ran low on fuel and supplies. The divisional HQ had lost control of the division by 1 July 1941, and by this time any remaining control came directly from the 10 Army HQ. The remains of the 29 Mechanised Division were destroyed in the Belostok and Minsk pockets in July 1941.

Following interrogation of Soviet POWs (and examining the battlefield wrecks), German intelligence soon realised that the **6 Mechanised Corps had been a potentially very powerful formation.** Both of its tank divisions had been better equipped in heavy and medium tanks than any panzer division during 1941, and the 6 Mechanised Corps had possessed far more tanks than any contemporary panzer corps. The fact that all the 6 Mechanised Corps' divisions were destroyed in a few days with very few German casualties, **is attributable to the operational surprise achieved by the *Wehrmacht* as well as the speed with which they exploited their initial advantage**. Using classic elements of the blitzkrieg concept, the entire 6 Mechanised Corps had been caught unprepared, forced off balance and then kept off balance until it was destroyed; having never had a chance to consolidate or fully prepare for war. (p. 596)

e. 11 Mechanised Corps:[189]

The 11 Mechanised Corps was one of the late forming mechanised corps which started forming in February-March 1941. The strength status of the 6 Mechanised Corps [sic], with all its component divisions and other support units on 22 June 1941, is shown in table Wes MD 11MC. One reference gives significantly different figures for the 11 Mechanised Corps' tank strength on this date. (p. 597)

Like many of the late forming mechanised corps, the 11 Mechanised Corps was in poor shape in June 1941. On 22 June 1941 the corps contained only 59% of its authorised personnel, 19% of its authorised motor vehicles, 17% of its authorised towing tractors, 55% of its authorised armoured cars, half of its authorised mortars and only 22% of its authorised artillery (including anti-tank and anti-aircraft guns). Things were almost as bad in the tank

[189] **Note:** Total manpower in this corps was **21,605.**

department: the corps had only 237 tanks on strength which was less than a quarter of its TOE. Furthermore, 160 of these tanks (68% of those available) were **old T-26 tanks** with dubious serviceability. The one positive was that the corps had had 28 T-34s and 3 KV tanks recently delivered, although they were obviously intended for crew training and familiarisation prior to further deliveries. As such, it is doubtful that these tanks or their crews were combat ready on 22 June 1941. For all intents and purposes the 11 Mechanised Corps was still in the early process of formation and **was essentially still immobile.**[190]

The **29th Tank Division**[191] started forming in February 1941. Even though the 29 Tank Division was the most established division in the 11 Mechanised Corps, by 22 June it had less than 60% of its authorised personnel, 23% of its authorised trucks, no 76mm or 152mm artillery at all, no anti-aircraft battalion and almost no tractors. The division contained only 66 tanks, including 26 T-34s and 2 KVs. The rest were old T-26 light tanks. To make matters worse the 29 Tank Division had approximately 15% of its tanks in repair workshops on 22 June 1941. The most positive aspects of the division were that it had most of its authorised riflemen and more than half its armoured cars. **Initially located near Grodno, the 29 Tank Division went into action straight away.** Quickly shot up by advancing German infantry divisions, the 29 Tank Division disappeared into the Belostok and Minsk pockets in early July, and was **officially deleted from the Soviet order of battle before 7 July 1941**.

The **33 Tank Division**[192] was formed in March 1941 and had very little time or opportunity to form. By 22 June it had 113 old light tanks and tankettes on strength, and 2 T-34s and 1 KV for training purposes. Much worse than this, however, was that the division **had only around 10% of its authorised trucks and tractors, no anti-aircraft or anti-tank artillery**, only 2 batteries of 122-152mm artillery and very little in the way of other heavy weapons. The only thing it did have in significant numbers was personnel who were still expecting to be trained; and most of these could only move on foot (leaving any supporting heavy weapons). There is little doubt that the 33 Tank Division was the least combat ready division in 11 Mechanised Corps, and, frankly, should never have gone near an active front line in its existing state. **Unsurprisingly, the 33 Tank Division was promptly annihilated and its remnants disappeared into the Belostok pocket in early July 1941**. (p. 597)

The **204 Mechanised Division**[193] was formed in March 1941 from the 9 Armoured Car Brigade. By 22 June 1941 the division **still had only 55 old T-26 tanks** (including flame tanks) and less than a third of its authorised armoured cars. The division contained round 61% of its authorised personnel, **only 10-15% of its authorised tractors and trucks**, 33-50% of its authorised 122mm-152mm artillery, and only 25% of its authorised anti-tank and light anti-aircraft artillery. **Consequently the division was mostly on foot while the artillery regiment could barely move or supply the guns that it had**. The fate of the 204 Mechanised Division paralleled the rest of 11 Mechanised Corps with the division quickly disappearing into the Belostok pocket. **The division was officially deleted from the Soviet order of battle in early July 1941.** (p. 598)

f. 13 Mechanised Corps:[194]

The 13 Mechanised Corps was formed in February-March 1941. The corps included the new 25 and 31 Tank Divisions, the new 208 Mechanised Division, the 18 Motorcycle Regiment, the 77 Engineer Battalion, the 521 Armoured Signal Battalion and the 113 Aviation Squadron. Table Wes MD 13MC shows the strength status of the

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[190] **Note:** The parlous and unformed state of the majority of mechanised corps in the Western Special Military District in June 1941 completely torpedoes the hypothesis that the Red Army was going to invade Western Europe in July 1941. This fact alone, without even considering the many other factors to do with the general state and dispositions of the Red Army, means the Red Army was in no way prepared to execute such an offensive in mid-1941. This is not to say that many of the same mechanised corps (and the other Red Army and VVS units concerned) would not have been ready for major offensive operations by mid-1942.

[191] **Note: 29 TD** had **6504** total personnel on 22 Jun ‘41.

[192] **Note: 33 TD** had **6509** total personnel on 22 Jun ‘41.

[193] **Note: 204 MD** had **7079** total personnel on 22 Jun ‘41.

[194] **Note: 13 MC** had just **17,809** total personnel on 22 Jun ‘41.

13 Mechanised Corps, with all its component divisions and support units, on 22 June 1941. One reference gives slightly different figures for the 13 Mechanised Corps' tank strength on this date. (p. 600)

According to the Western Front's deputy commander the 13 Mechanised Corps was "completely under strength" in June 1941, and he wasn't exaggerating. On 22 June the 13 Mechanised Corps contained **only 49% of its authorised personnel,** 20% of its authorised motor vehicles, 31% of its authorised towing tractors, 56-74% of its authorised mortars and artillery (including anti-tank and anti-aircraft guns), 13% of its authorised armoured cars and only **29% of its full complement of tanks**. This meant the corps' mobility was very limited: even though the corps possessed most of its artillery, moving all the guns in one lift was not possible. Furthermore the support infrastructure for its **mainly old T-26 tanks** was almost non-existent.

The **25 Tank Division** was formed from February to April 1941, and by June it was the best equipped division in the 13 Mechanised Corps. **On 22 June 1941 the division had 223 T-26s** (including flame tank versions) and 5 tankettes on strength, which represented over three quarters of the tanks in the entire mechanised corps. However a large proportion of these tanks were in need of repair. Overall, the division had around 57% of its authorised personnel and only 25% of its authorised trucks. Furthermore the reconnaissance battalion was missing most of its trucks and motorcycles, the anti-aircraft battalion was unequipped, and the artillery regiment's heavy artillery battalion had almost no tractors to tow its 152mm howitzers. To make matters worse, even though the 25 Artillery Regiment had its full complement of guns and howitzers, most of the gun-crews were away in training camps. Unfortunately for the 25 Tank Division it was directly in the path of the 2nd Panzer Group on 22 June 1941 and, as one would expect, it didn't last long. **On 4 July 1941 the 25 Tank Division had the dubious honour of being one of the first divisions officially deleted from the Soviet order of battle during WWII.**

The **31 Tank Division** was formed in February 1941 and in June 1941 it was in an even worse state than the 25 Tank Division (above). On 22 June the 31 Tank Division **had only 39 T-26 tanks available, which were being used for crew training**. The division had only around **45% of its authorised personnel, only 9% of its authorised trucks, no tractors and no anti-aircraft guns.** The best asset in the division was its 31 Artillery Regiment, which had its full complement of guns and howitzers. *But without towing tractors and trucks the artillery regiment (along with the rest of the division) was doomed*. The 31 Tank Division was virtually unformed when the Germans attacked, and consequently it was scattered and overrun almost immediately. The remainder of the division disappeared into the Belostok pocket and **was officially deleted from the Soviet order of battle on 4 July 1941.**

The **208th Mechanised Division** was formed in March 1941. By 22 June 1941 the only tanks in the division were being used for training purposes. These consisted of 15 BT-7s, 11 tankettes and a single T-26. The division also only had around 45% of its authorised personnel, 20% of its authorised trucks, 58% of its authorised tractors and 31% of its authorised armoured cars. However, the 208 Mechanised Division was better equipped to survive the initial German onslaught compared to the tank divisions in the same corps, because it had a full strength artillery regiment, anti-aircraft battalion and anti-tank battalion. **Equally as important was that the division had sufficient tractors to enable movement of its artillery weapons, although the rifle regiments were mainly on foot.** (p. 600)

Within a few days of the invasion the 208 Mechanised Division was reporting directly to the 10 Army HQ; fighting as a rifle division which better suited its equipment limitations and configuration. The division was eventually **trapped and destroyed in the Minsk pocket**, although the bulk of the division's 662 Artillery Regiment escaped the pocket before it closed and fought on with the 5 Mechanised Corps near Orsha in early July. The 662 Artillery Regiment was finally dissolved in July 1941 and used for replacements for new artillery units. (p. 601)

g. 14th Mechanised Corps:[195]

The 14 Mechanised Corps was another late forming corps which started forming in February-March 1941. The 14 Mechanised Corps was comprised of the newly formed **22 and 30 Tank Divisions**, the new 205 Mechanised Division, the 20 Motorcycle Regiment, the 67 Engineer Battalion, the 519 Armoured Signal Battalion and the 114 Aviation Squadron. Table Wes MD 14 MC shows the strength status of the 14 Mechanised Corps, with all its component divisions and support units, on 22 June 1941. A few references give slightly different figures for the 14 Mechanised Corps' tank strength on this date. (p. 602)

From this table we can see that on 22 June 1941 the 14 Mechanised Corps contained only 53% of its authorised personnel, 28% of its authorised motor vehicles, 30% of its authorised towing tractors, 54% of its authorised mortars, 71% of its authorised artillery (including anti-tank and anti-aircraft guns), 17% of its authorised armoured cars and 50% of its authorised tanks. Apart from 6 BT-7 radio tanks in the corps' armoured signal battalion and 10 tankettes, **all the tanks were T-26 light tanks**.

The **22 Tank Division** was formed in February 1941 from the 29 Tank Brigade, which supplied the **251 T-26 tanks** (including **16 flame tanks**) with which the division was equipped on 22 June 1941. By this time the 22 Tank Division also had most of its artillery weapons, but it **only had around 50% of its authorised personnel** and 24-26% of its authorised trucks and tractors. **The 22 Tank Division was so close to the border that on the first morning of the war it came under direct attack**, and consequently the bulk of the artillery regiment (one of the strongest elements of the division) was captured while still in its garrison-barracks. *Why the Soviets would deploy such an unready unit so close to the border, where it was so vulnerable and which gave the unit no time to mobilise, is a mystery.* In the ensuing German offensive the 22 Tank Division's tank and infantry elements soon became separated, with the infantry retreating into the Pripet marshes and the tanks counter-attacking 2nd Panzer Group. The division's tanks were soon shot up and the **22 Tank Division effectively disintegrated shortly after.** The remains of the division were lost in the Minsk pocket by mid-July 1941.

The **30 Tank Division** was formed in February 1941 from the 32 Light Tank Brigade. On 22 June 1941 the division had **197 T-26 tanks**, a full strength artillery regiment and most of its other heavy weapons. In other respects the division was as weak as the 22 Tank Division (above): it only had around 50% of its authorised personnel and 24-27% of its authorised trucks and tractors. This meant the 30 Tank Division could not move all its light and heavy artillery weapons in one go, the tanks had very little in the way of logistical support, and **the division's motorised rifle regiment was 'motorised' in name only**. Compounding all this was the fact that the **T-26 tanks had one of the worst reliability records of any of the Soviet tanks at this time**. When the 30 Tank Division moved to counter-attack the 2 panzer Group on the first day of the war, only 120 T-26s (61%) were operational. A day later, on 23 June, this figure had dropped to only 40 tanks. With totally inadequate motorisation and very few tractors the division could not recover its disabled tanks, could not support those tanks that remained operational, and could not move its heavy equipment (the supporting infantry were already on foot). The entire division was soon overrun with the remains of the division lost in the Minsk pocket. The 30 Tank Division was **officially deleted from the Soviet order of battle in early July 1941.**

The **205 Mechanised Division** was another very new division which had started forming in February-March 1941. By 22 June 1941 the division had around **57% of its authorised personnel, 29-25% of its authorised trucks and tractors,** a full strength artillery regiment (in terms of 120-152mm guns and howitzers), and the majority of its authorised mortars, anti-tank guns and anti-aircraft guns. In the tank department the 205 Mechanised Division was weak: it had only a single tank battalion with 56 T-26s and 5 tankettes (or **22% of TOE**). As with the corps' tank divisions, the 205 Mechanised Division could not move (or supply) all its heavy weapons in one lift, and it could barely support the few tanks it had. In the meantime both the **division's 'motorised' rifle regiments were really just depleted rifle regiments on foot**. Despite its poor overall readiness state, the 205 Mechanised Division

[195] **Note:**

went into action straight from its barracks in the first hours of the invasion. In a very short time the division had lost what vehicles it had, which effectively rendered it immobile. T**he bulk of the 205 Mechanised Division was soon caught in the Minsk pocket and was completely wiped out by early July 1941**. (pp. 602-03)

h. 17 Mechanised Corps:

The 17 Mechanised Corps was a late forming mechanised corps which started forming in February-March 1941. **The corps included the barely formed 27 and 36 Tank Divisions**, the new 209 Mechanised Division, the 22 Motorcycle Regiment and the usual support units. Table Wes MD 17MC shows the strength status of the 17 Mechanised Corps, with all its component divisions and support units, on 22 June 1941. Several references give different figures for the 17 Mechanised Corps' tank strength on this date. (p. 604)

The 17 Mechanised Corps has the distinction of probably being the most poorly equipped and least formed mechanised corps in the Red Army in June 1941. This is really saying something, considering the state of some of the mechanised corps already considered in this chapter (above). On 22 June 1941 the 17 Mechanised Corps contained only 46% of its authorised personnel, only 12% of its authorised motor vehicles and towing tractors, 7% of its authorised artillery (including anti-tank and anti-aircraft guns), 15% of its authorised armoured cars and **3% of its authorised tanks**. The corps' divisions were so unformed that it is arguable that they should not be treated (historically) as 'divisions' in the Soviet order of battle for 22 June 1941: they were really just the equivalent of reinforced rifle regiments.

One notable aspect of the 17 Mechanised Corps, along with the 20 Mechanised Corps (see below), is that they were **initially deployed well to the rear of the Western Special Military District.** The 17 was deployed just to the east of Baranovichi while the 20 was deployed around Minsk. They were loosely assigned to the 13 Army, which was to be the district's (and so the Western Front's) strategic reserve army. This is probably why these mechanised corps had a lower priority for personnel and equipment compared to the corps in the district's second echelon (further west). In addition, it is likely that the Red Army district/front command assumed the divisions in these 'reserve corps' would have longer to mobilise before being committed to any counterattacking force. In the event, Army Group Centre broke though the Western Front's first and second echelon forces so rapidly that the Soviets were forced to commit the 17 Mechanised and 20 Mechanised Corps to battle prematurely, and (more or less) in the state they were in on 22 June 1941.

The **27 Tank Division** was formed in February-March 1941, and **by 22 June the division still only had 9 BT tanks issued to one battalion for training purposes**. The division's support and maintenance elements had not been formed yet, and it contained just under **half its authorised personnel**. In addition the 27 Tank Division had no anti-tank guns, no anti-aircraft artillery, a single 122mm howitzer battery, 13% of its authorised armoured cars and only 15-19% of its authorised trucks and tractors. The only thing that saved the division from being immediately annihilated was the fact that it was stationed well to the rear of the Western Special Military District on 22 June 1941. This enabled a large portion of the division to avoid getting caught in the Minsk pocket, but by then it was so weak it was barely the strength of a rifle battalion. The remnants of the 27 Tank Division were disbanded on 1 August 1941 and the personnel used as replacements for other units.

The **36 Tank Division** was officially formed in March 1941 near Minsk, but for all intents and purposes the division was still unformed by 22 June. At this time the only armour in the division was 16 tanks and 11 tankettes used for training purposes, and 12 BA-10 armoured cars. The division contained only 4**1% of its authorised personnel**, 7% of its authorised trucks, no artillery (including anti-tank or anti-aircraft guns) and no towing tractors. Despite its initial deployment towards the rear of the Western Special Military District, the 36 Tank Division (**which could hardly move)** was still caught in the Minsk pocket and subsequently destroyed. It is probable that the division received some reinforcements prior to it getting caught in the Minsk pocket, but to what extent is unknown. (pp. 604-05)

The **209 Mechanised Division** was formed in March 1941. On 22 June 1941 the division was not in much better shape than the tank divisions in the 17 Mechanised Corps. I**t had only 46% of its authorised personnel, no tanks, 9 armoured cars, no artillery except 2 batteries of 152mm howitzers, and only around 8-10% of its authorised trucks and tractors.** Like the rest of 17 Mechanised Corps, the 209 Mechanised Division wasn't immediately overrun and destroyed due to its initial location. The division was further depleted in retreat battles until the bulk of the division was lost in the Minsk pocket. It was officially disbanded on 19 September 1941. (p. 605)

i. 20 Mechanised Corps:[196]

The 20 Mechanised Corps started forming in February-March 1941. It comprised the 26 and 38 Tank Divisions, the 210 Mechanised Division, the 24 Motorcycle Regiment, the 83 Engineer Battalion, the 534 Armoured Signal Battalion and the 120 Aviation Squadron. The detail strength of the 20 Mechanised Corps, with all its component divisions and support units on 22 June 1941, is shown in table Wes MD 20MC. A number of references give a very slightly different figure for the 20 Mechanised Corps' tank strength on this date. The 20 Mechanised Corps vied with the 17 Mechanised Corps for the distinction of being the most poorly equipped and least formed mechanised corps in June 1941. On 22 June 1941 the 20 Mechanised Corps contained 56% of its authorised personnel, **only 8-9% of its authorised towing tractors and trucks**, a third of its authorised artillery (including anti-tank and anti-aircraft guns), **and 4-9% of its authorised armoured cars and tanks**. (p. 606)

The **26 Tank Division** started forming from in February 1941, and **by 22 June it was still barely organised and in the early stages of formation**. On this date the division had less than half its authorised personnel, only 31 T-26 and 13 BT-2/5 tanks for training purposes, 7 armoured cars, only 5-6% of its authorised tractors and trucks, only 2 batteries of 122mm howitzers (most without towing tractors) and no anti-aircraft artillery. **The division was effectively a barely trained rifle regiment with some AFVs and artillery attached.** Like the 17 Mechanised Corps' divisions, it was only the initial deployment east of Minsk which saved the 26 Tank Division from immediate annihilation. The division was soon caught up in the battles around Minsk in late June 1941, and by 1 July 1941 the 26 Tank Division was already listed as 'without equipment' by the Soviet high command (which in Soviet jargon means of little to no combat value). By 7 July the 26 Tank Division was reportedly down to 3,800 men with only 5 artillery pieces left. The remains of the division were finally destroyed in the Minsk pocket (near Mogilev) and it was **officially deleted from the Soviet order of battle by mid-July 1941**.

The **38 Tank Division** was formed in February-March 1941, and by 22 June 1941 its armour still only consisted of 43 old T-26 tanks and 4 armoured cars. In addition the divisional support elements bordered on non-existent with the division only having: 48% of its authorised personnel, 6-10% of its authorised trucks and tractors, no anti-aircraft guns, 1 battalion of 122mm howitzers (i.e., no 76mm guns or 152mm howitzers, and almost no tractors) and effectively no reconnaissance battalion. Like the rest of 20 Mechanised Corps, the 38 Tank Division was inexorably drawn into the battles around Minsk, and by 7 July the division was reportedly down to around 3,000 men with only 3 artillery pieces left. The remnants of the division were destroyed west of Mogilev (within the large Minsk pocket) and it was **deleted from the Soviet order of battle by mid-July 1941.**

The **210 Mechanised Division** was formed in March-April 1941 from the 4 Cavalry Division, which had been a well-established Don Cossack cavalry division dating back to the 1920s. Thus, despite having only 6 old T-26 tanks on strength, on 22 June 1941 **the 210 Mechanised Division was easily the most well established, well equipped and well led division in the 20 Mechanised Corps**. At this time the division had around 75% of its authorised personnel and its 2 rifle regiments had most of their heavy weapons. However there is a big difference between a relatively lightly armed cavalry division and a Soviet 1941 mechanised division, and the 210 Mechanised Division was still very short of equipment. **It still had no armoured cars, only 6-8% of its required**

[196] **Note:** Total manpower of **20 MC** was **20,391.**

tractors and trucks, only 2 partially equipped 122mm howitzer battalions with hardly any tractors (i.e., no 76mm guns or 152mm howitzers), only 4 light anti-aircraft guns and half its authorised anti-tank guns. The 210 Mechanised Division also became involved in the desperate battles around Minsk, and by 7 July it was listed as having only 5,000 men and 9 artillery pieces left. On 10 July 1941 the decimated remains of the 210 Mechanised Division was given its old title back, and **it was redesignated the 'new' 4th Cavalry Division.** (p. 606)

j. NKVD Ground Forces in the Western Special Military District:

The personnel and equipment strength of the NKVD ground forces deployed in the Western Special Military District on 22 June 1941 is shown in tables Wes MD NKVD. Although the Western Special Military District did not include any coastal areas, its 'sensitive' borders to the west, as well as the railway network in occupied Poland and Belorussia, were well garrisoned with NKVD troops. (p. 608)

The **7 NKVD border guard detachments were the most combat capable NKVD troops in the district on 22nd June 1941**. They averaged around 88% of their authorised personnel strength, had all their heavy weapons, and had 47-74% of their authorised trucks and horse-drawn transport. These units were the first Soviet troops the invading German Army Group Centre would make contact with. **Their purpose was to patrol the new border in occupied Poland, act as a type of trip-wire defence** to delay any enemy incursion whilst alerting the Red Army forces deployed further east, and then withdraw to provide rear-area security to the defending Red Army troops. **In the event, the German panzer and motorised troops simply bypassed most of the troops in the 17, 86, 87 and 88 NKVD Border Guard Detachments and left the following infantry divisions to eliminate any threat they may have posed**. Only the 17 NKVD Border Guard Detachment survived for any significant period; major elements of this unit withdrew into the fortress at Brest and helped hold parts of the fortress until 30 June.[197]

The Western Special Military District's **rail security was administered by the 3 Rail Security Division HQ in Mogilev, which controlled the 53, 73, 76 and 79 Rail Security Regiments.** In addition the 60 and 58 Rail Security Regiments were deployed around Brest Litovsk and Belostok, respectively, reporting to the 9 Rail security Division HQ in Vilnius (the HQ being in the Baltic Special Military District). It is highly probable, but unconfirmed, that the 60 and 58 Rail Security Regiments were destroyed on the Belostok-Minsk pockets.

k. Western Special Military District (Front, Army and Corps Support Units):

The following are some general observations regarding the various support units in the Western Special Military District:

The **RVGK and corps artillery regiments were generally in a reasonable state of readiness with regards to weapons, but were in an average to poor state with regards to motorised transport and support infra-structure**. This is not really surprising given that the Soviets were attempting to fully motorise all their RVGK and corps artillery regiments, while at the same time trying to complete the formation of 6 full mechanised corps in the same military district. The artillery regiments averaged 67-83% of their authorised personnel and 67-88% of their authorised towing tractors, but had **only around 24% of their required trucks**. As the signals, supply and artillery observation infrastructure for the artillery regiments was carried in trucks, the lack of transport made these units tactically and operationally vulnerable. (p. 608)

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[197] **Note:** Some (mainly Russian) commentators claim these 8 days caused significant delay to Army Group Centre. However, apart from heavier than usual casualties, mainly to the attacking 45 Infantry Division, the effect on Army Group Centre's logistics plan was negligible. The strategic objectives around the city of Brest, namely control of the Bug River bridges, and the railway and main-road to the East, had been accomplished on the evening of 22 June 1941. Unfortunately this is not simulated in many Barbarossa simulations: in these the Axis forces have to capture the Brest Fortress to be able to convert the railway line going east to European gauge. **In fact, the Germans began converting the railway in and around Brest immediately.**

Exacerbating the situation was the **dubious quality and reliability of the available towing tractors. Exact figures are unknown, but many tractors were obsolescent and slow, or/and were in need of major repair and overhaul.** The artillery regiments were generally unable to do this type of work themselves because they lacked this level of maintenance (support) infrastructure. The reader should bear in mind that **the RVGK and corps artillery regiments did not have any alternative horse-drawn transport available**. This was because the Soviets were making a concerted effort to modernise their artillery and had abandoned horse transport altogether for corps artillery units. However, horse transport is far better than no transport, and it would have been better for the RVGK and corps artillery regiments to have maintained some horse transport capability; at least until sufficient motorised transport became available. (p. 610)

● In addition to transport problems, the 15 corps artillery regiments had weapon availability problems. Around half of the 122mm guns authorised in the TOE were actually old 107mm M1910/30 guns as opposed to new 122mm M1931 (A-19) and M1931/37 (A-19) guns. Furthermore, the corps artillery regiments **did not have sufficient old 107mm or new 122mm guns** to make up the numbers, so the corps artillery regiments were below their authorised weapon level (around 75% of TOE). The RVGK artillery regiments were well supplied with 152mm gun/howitzers, 203mm howitzers, 280mm BR-5 mortars and 120mm mortars.

● The **6 Anti-Tank Brigade** was formed in April 1941. By 22 June 1941 the brigade had less than half its authorised personnel, 68% of its authorised number of anti-tank and anti-aircraft guns (with no 85mm or 107mm guns), **only 21% of its authorised trucks and no towing tractors at all.** Unable to move in front of the panzer thrusts to perform its primary mission, nor able get out of the rapidly closing Belostok pocket, the 6 Anti-Tank Brigade was quickly overrun and destroyed in the first week of war.

● The **7 Anti-Tank Brigade** was formed in April 1941 and, **like the 6 Anti-Tank Brigade, it was still forming when the Germans attacked.** By 22 June 1941 the brigade had around 4**4% of its authorised personnel, 62% of its authorised number of anti-tank** and anti-aircraft guns, **only 22% of its authorised trucks and no towing tractors.** The 7 Anti-Tank Brigade was in a good position to engage the panzer divisions of [Hoth's] 3rd Panzer Group on 22 June 1941, **but in its immobilised and weakened state it was completely destroyed in just a few days.**

● The **8 Anti-Tank Brigade** was also formed in April 1941. By 22 June 1941 the brigade had only 3 battalions organised out of the 12 battalions authorised. This meant the brigade had a little over a fifth of its authorised personnel, only **30% of its authorised number of anti-tank** and anti-aircraft guns, only 15% of its authorised trucks and no towing tractors. The 8 Anti-Tank Brigade was deployed in the rear of the Western Special Military District on 22 June 1941, which meant it lasted a little longer than the other anti-tank brigades. The brigade was initially assigned to the 13 Army and then 21 Army in late June. On 10 July 1941 the remains of the 8th Anti-Tank Brigade were **disbanded to produce replacements for other units**.

● The **PVO regiments** in the 7 PVO brigades (5 regional) in the district's Western PVO zone contained 69 batteries. This made these PVO regiments considerably stronger than those in the Northwestern PVO zone (Baltic Special Military District) and comparable in strength to the PVO regiments in the western part of the Kiev PVO zone (Kiev Special Military District, but excluding Kiev itself). **However the importance of strategic targets in the Western Special Military District was not comparable to those in the heart of the USSR**. Thus the PVO regiments in the Western PVO zone were **considerably weaker than those defending Leningrad, Moscow and Kiev.** The PVO forces in the Western Special Military District were **not particularly mobile**. It is not known how many of the PVO's heavy anti-aircraft guns defending cities in the Western Front were evacuated by road or rail

in 1941. But, given that most of the more mobile Red Army units failed to escape the Belostok and Minsk pockets, it is unlikely the PVO forces defending these cities escaped destruction.[198]

● The average strength of the machine gun-artillery battalions in the **8 fortified sectors** in the Western Special Military District were the second highest on any border in the western USSR (only exceeded by those in the Kiev Special Military District). **This was because the fortified sectors along the border with East Prussia and German occupied Poland had been reinforced immediately prior to Barbarossa (i.e., the new Molotov Defence Line)**, and were still in the process of being reinforced on 22 June 1941. The Soviets had reasoned that the main effort of any major enemy attack would most likely occur through these front sectors. (p. 610)

Table Wes MD Sup Units 2
Western Special Military District RVGK and Corps Artillery Units
Types of formations:
a. Corps artillery regiments: 107mm (**90**), 122mm (**45**), 152mm (**360**) guns
b. RVGK cannon regiments: 122mm gun (**123**)
c. RVGK howitzer regiments: 152mm gun/howitzer (**144**)
d. RVGK super hvy howitzer regiments: 203mm howitzers (**96**)
e. **32 RVGK High Power Artillery Battalion**: 280mm mortar (**6**)
f. **24 Mortar Battalion:** 120mm mortars (**42**)
(p. 612)

Table Wes MD Sup Units 3
Corps RVGK Anti-Tank Brigades:
a. **6 RVGK AT Bde:** 76mm (field) gun (**84**)
b. **7 RVGK AT Bde:** 76mm (field) gun (**72**); 85mm AA/ATG (**8**)
c. **8 RVGK AT Bde:** 76mm (field) gun (**36**)
(p. 613)

Table Wes MD Fort Sec
Western Special Military District, Fortified Sectors (22.6.1941
(**68, 62, 66, 58, 61, 63 , 64 & 65** Fortified Sectors)[199]
a. Total manpower: **43,254** (average: **5407** personnel)
b. LMG & MMG: **1058** and **1196**, respectively (average: **132** & **150** per fortified region)
c. 82mm mortar: **46** (average **6** per region)
d. 45mm AT gun: **92** (average **12** per region)
e. 76mm IG/Cannon: **184** (average **23** per region)
f. 122mm howitzer: **92** (average **12** per region)
g. Trucks: **149** (average **19** per region)[200]
(p. 615)

l. Total Manpower and Equipment in the Western Special Military District (22.6.1941)

Summarising the reconciled results for the entire district, we can see that there were **27,574 crew served MGs** (excluding 12.7mm AAMGs), **6,610** mortars, **6,437** artillery pieces (including anti-tank guns but excluding anti-

[198] **Note:** The Soviets lost **2,800 76-85mm and 1,300 25-40mm anti-aircraft guns in 1941**. This huge total must include large numbers of PVO units overrun in 1941 because this number of lost anti-aircraft guns cannot be attributed solely to losses amongst Red Army and VVS ground units. G.F. Krivosheev , et al, Greenhill Books, London, 1997. p 248, table 95.
[199] **Note:** Total of **46** MG/Artillery Battalions divided among the 8 fortified regions.
[200] **Note:** Appears these three fortified sectors had virtually *no mobility.*

aircraft, coastal and rail guns), 1,124 anti-aircraft artillery guns, **2,958** tanks and tankettes, and **671,165** personnel present in the Western Special Military District on 22 June 1941. These figures are generally consistent with other up to date published sources.[201] (p. 616)

Table Wes MD Total

Western Special Military District, Total Manpower and Equipment (22.6.1941)

a. Total personnel: **671,165** (including **133,010** rear area/training)
b. Allocated to combat units: **538,155**
c. Horse teams/total horses: **19,613 / 68,648**[202]
d. 45mm AT gun: **2154**
e. 76mm Inf Gun: **657**
f. 76mm Gun: **1026**
g. 152mm howitzer: **645**
h. 122mm howitzer: **1027**
I. 152mm gun/howitzer: **527**
j. 203mm howitzers: **119**
k. T-26 tanks (incl. Flamm): **1389**[203]
l. BT-2 / BT-5: **251**
m. BT-7 / BT-7M: **410**
n. T-34: **266**
o. KV-1: **86**
p. KV-2: **31**
q. T-37/38/40: **462**
r. Total tanks/tankettes: **2958**
s. Trucks: **24,925** (allocated to combat units: **17,831**)
t. Tractors: **5706** (allocated to combat units: **4986**)
(p. 617)

Table Wes MD Total 1

Western Spec. Military District, Detailed Breakdown of Available Land Based Equipment (1 & 22.6.1941)

Small Arms:
a. Rifles and Carbines: **773,445**
b. Sub-machine guns: **24,237**
c. LMGs & MMGs (incl. Quad MMGs): **27,574**
(p. 618)

* * *

[201] **Note:** E.g., D. M. Glantz, *Barbarossa*, Tempus Publishing Ltd, Stroud, UK, 2001, p. 216, notes 2, note 7. Glantz gives the Western Special Military District strength on 22 June 1941 as **671,165** men (including 71,715 in training), 14,171 guns and mortars, 2,900 tanks (2,192 operational). His reference is: *Boevoi i chislennyi sostav vooruzhennykh sil SSSR v period Velikoi Otechestvennoi voiny* (1941-1945 gg.): *Statisticheskii sbornik* No.1 (22 iiunia 1941 g), 16-17. (The combat and numerical composition of the USSR's armed forces in the Great Patriotic War (1941-1945); Statistical collection No 1 (22 June 1941) (Moscow: Institute of Military History, 1994), 16-17).

[202] **Note:** Seems like a very small number of horses (result of Holodomor in part at least?).

[203] **T-26s** were slight majority of tanks in WSMD; they were older and not as good as the **BT-7** & **BT-7M** (so, Nigel).

9. The Kiev Special Military District (SW Front from 22.6.1941)

In this section we will focus on the actual personnel and equipment strength of the land combat units deployed in the Kiev Special Military District on 22 June 1941. We will examine the strength of the individual combat units within the district, and then reconcile this data with the actual strength in the entire military district. (p. 619)

a. Rifle Divisions:

On 1 June 1941 the **average personnel strength of the rifle divisions in the Kiev Special Military District was 8,792 men,** and on 22 June 1941 there were **26 rifle divisions** in the district. Thus the average rifle division had around **61%** of its authorised pre-war personnel, which was slightly lower than the average rifle division in the Western Special Military District (at **64%**).

The amount of equipment actually present in the rifle divisions in the Kiev Special Military District varied widely. Rifle divisions near the borders and assigned to the **5, 6, 12 and 26 Army HQs** *were generally older established divisions, and in most cases were very well equipped* (with the usual exception of motorised transport and, to a less extent, horse-drawn transport). Rifle divisions assigned to the Kiev Special Military District reserves (not initially assigned to the 5, 6, 12 or 26 Armies) were usually new divisions established from 1940 to 1941, and generally had fewer personnel and less equipment. In the event, most of the 'reserve' divisions had days, and in many cases one to two weeks, to mobilise and fill up their ranks with reservists before being committed to battle against the German Army Group South.

Table Kiev MD Divs 1 shows the actual strength of the rifle divisions in the Kiev Special Military District on 22 June 1941. From this table we can see that of the 26 rifle divisions in the district, 16 were established before 1940. In addition from table Soviet Deployment Matrix it is apparent that of the 10 divisions established in 1940-41, 9 were initially deployed in the Kiev Special Military District reserves and were not yet assigned to an army HQ. Furthermore, **8 of these 'reserve' rifle divisions were very new: they had all started forming in March-April 1941.**

An analysis of the equipment available shows that, on average, the rifle divisions possessed from **90%-106%** of their authorised LMGs, MMGs, mortars, 76mm infantry guns, heavy anti-aircraft guns and anti-tank guns. Furthermore they had almost all their authorised artillery with 92% of 155mm howitzers, 97% of 122mm howitzers and 85% of 76mm field-guns. **As in the Western Special Military District, all this equipment was maintained at a high level even in the '12' strength peacetime rifle divisions, because the Red Army did not plan to commandeer this type of equipment from the civilian economy in the event of war**. It is especially noteworthy that the **every rifle division had over 50 or more 45mm anti-tank guns, which were quite capable of stopping any German tank in 1941.** The failure of the Soviet rifle divisions to stop German armour in 1941 was not due to any shortages of effective anti-tank guns or artillery, **which is one of the popular misconceptions relating to Operation Barbarossa.** To reinforce this point it is worth noting that on 22 June 1941 there was the huge number of **2,276 45mm anti-tank guns and 1,327 76mm divisional field-guns in the Kiev Special Military District**. By comparison the combined forces of the German Army Group South only contained 962 fully tracked armoured fighting vehicles (AFVs) of all types. This includes the very light Pz Is, all command tanks, all engineer/pionier vehicles, and all AFVs using old obsolete chassis as tank destroyers or self-propelled guns.

The areas where the rifle divisions in the Kiev Special Military District were weak were: all forms of transport and especially motorised transport, light to medium anti-aircraft weapons and **infantry (rifle squads).** The average rifle division only had around **31% of the authorised trucks, 58% of the required towing tractors,** 34% of the authorised 37mm anti-aircraft guns (and they were only authorised 8 guns per division), 2-9% of the authorised heavy AAMGs and quad AAMGs, and 40-45% of their full complement of rifle-infantry. Noticeably, however, the 14 rifle divisions assigned to army HQs at the western border possessed significantly more rifle-infantry, motorised transport and horse drawn transport than the newer rifle divisions further east (in reserve). (p. 619)

Kiev Special Military District Rifle Divisions (22.6.1941)

a. Total strength of: **228,586**
b. Divisions ranged in size from: **6440** to **10,050**
c. 45mm AT guns: **1415**
d. 76mm Inf G & Guns: **498** & **354**, respectively.
e. 122mm & 152mm howitzers: **806** & **286**
f. 50mm, 82mm & 120mm mortars: **2175**, **1323** & **304**, respectively
g. Rifle squads & light Rifle squads: **3790** & **397**, respectively.
h. Trucks: **4595** (average of **177)**[204]

It is again instructive to apply the combat unit 'size' equation and Minimum Divisional Size (MDS) value to the average rifle division in the Kiev Special Military District on 22 June 1941. Applying this equation to the average rifle division strength in table Kiev MD Divs 1, **we find that the average rifle division was at 93% of the MDS value on 22 June 1941.** Therefore, even at reduced peacetime strength, the average rifle division in the Kiev Special Military District was close to what could reasonably be called a divisional sized combat unit in 1941. Although these divisions only averaged around **8,800 men each**, and despite severe transport shortages, the divisions still had most of their weapons and other equipment on strength. As already observed, the 14 rifle divisions close to the front and assigned to army HQs were stronger than the average in the district. The average rifle division assigned to the 5, 6, 12 or 26 Army had a MDS value of 103%: these divisions were easily divisional sized combat units even before they received replacements to bring them up to their full strength (i.e. a full TOE MDS value of 135%). These were the divisions which came into contact with Army Group South on 22 June 1941. (p. 622)

As Operation Barbarossa unfolded the rifle divisions in the Kiev Special Military District (Southwestern Front) reserves had more time to mobilise than the equivalent rifle divisions in the Western Front reserves. This was because the Soviet forces in Southwestern Front were stronger than those in Western Front (especially the number and strength of the mechanised corps), while the German Army Group South's forces were much weaker than Army Group Centre's forces. **Despite all this, the original Soviet mobilisation plan (to fill up divisions with the required riflemen and additional transport within a few days) could barely keep pace with events.** The speed of Army Group South's advance, and the corresponding devastating attrition rate, **ensured that none of the rifle divisions deployed in the Kiev Special Military District on 22 June 1941 ever got close to their full strength.**

The following rifle divisions require special mention due to some specific and relevant circumstance:

The 45, 87 and 124 Rifle Divisions still had a company of tankettes in their respective reconnaissance battalions. *This represented the only tanks in the rifle divisions in the Kiev Special Military District. All the remainder had been removed to form the new mechanised corps*, of which 8 were in the same district.

The 173 and 130 Rifle Divisions were formed in 1940, and they each had over 7,100 men by June 1941. Both divisions were reasonably well equipped and established.

The 193, 195, 200, 228, 190, 197, 199 and 189 Rifle Divisions were all formed in March-April 1941. **These divisions were all still in the early stages of forming and were close to the '6' peacetime division strength on 22 June 1941.** They were all deployed in the Kiev Special Military District Reserves.

[204] **Note:** However, 11 of the RD's had less than **100** trucks.

Of the 26 rifle divisions deployed in the Kiev Special Military District (Southwestern Front) on 22 June 1941, **a staggering 21 were completely destroyed and officially removed from the Soviet order of battle during 1941.** Most were finally wiped out in the Uman pocket in August 1941 and the Kiev pocket in September 1941. The divisions lost were:

- The 80, 139, 141, 173, 140, 190, 197 and 189 (8 divisions) were destroyed in the Uman pocket.
- The 62, 87, 124, 41, 97, 159, 193, 195, 200, 146 and 228 (11 divisions) were destroyed in the Kiev Pocket.
- The 164 and 130 were destroyed during the 1 Panzer Group's offensive into the South Front's flank in October 1941.

Of the remaining 5 rifle divisions, 1 was disbanded and 4 were virtually destroyed before being brought back up to a semblance of their pre-war strength. For example, the 135 Rifle Division reported a mere 400 men on strength on 22 July 1941 and its HQ was disbanded in late October 1941. Similarly, the 199 Rifle Division reported only 1,900 men on strength on 29 July 1941, while the 169 Rifle Division reported only 603 men on strength on 16 August 1941.[205] (p. 622)

b. Mountain Rifle Divisions:

On 22 June 1941 there were 5 mountain rifle divisions deployed in the 12 Army and a single mountain rifle division (the 72) deployed in the 26 Army. The 12 Army was positioned to defend the mountainous terrain along the borders with Hungary and Rumania in the Kiev Special Military District. All the mountain rifle divisions in the district, except the 192 Mountain Rifle Division, were converted from regular rifle divisions in 1940-41. For this reason, by June 1941 the mountain rifle divisions were at least as well equipped as the regular rifle divisions in the Kiev Special Military District. (p. 623)

It has to be said, however, that **for the most part these division's mountain-warfare experience, training and 'mountain equipment' was rudimentary** compared to most Western mountain units of the period. In particular, the Soviet 1941 mountain rifle divisions in the western USSR were not really comparable to the German *Gebirgs* (mountain) divisions with their specialised mountain training and equipment. The Hungarian and Rumanian mountain brigades were also amongst the best equipped and most well trained units in their respective forces at this time. . .

The lack of available horses-transport was particularly damaging because mountain rifle divisions were already authorised far fewer trucks and tractors than rifle divisions. This was because the mountain divisions were supposed to **utilise pack horses, carts and wagons** to a much higher degree than regular rifle divisions. In the event, all the mountain rifle divisions were forced into the open terrain of the southern Ukraine where they spent **most of their time fighting as regular rifle forces**. Fortunately for the mountain rifle divisions, the 12 and 26 Armies were well to the south of the initial attacks by Army Group Centre, and they faced the less formidable Hungarian and Rumanian forces. This enabled them to survive June and July 1941 by conducting a fighting withdrawal. However, when the German 17 Army and 1 Panzer Group turned south towards the end of July, **5 out**

[205] **Note: These figures should be treated with caution** because 'reported strength' may only be the strength of the combat elements of the division, and may not include the support, transport and/or signals infrastructures. However the figures do serve to illustrate that many divisions were reduced to a cadre around which the divisions were rebuilt. (Note: For the Soviets to delete a division or brigade entirely from their order of battle in WWII, there invariably wasn't much left of the unit (including any support elements). **In fact, it was division's support (including C&C), transport and signals infrastructures that were by far the hardest to replace**. This was because these elements required personnel with specialised training and experience, as well as a lot of specialised equipment. If a division lost its rear-area support elements as well as its combat elements (which usually happened when the division was cut-off and 'pocketed'), then disbanding whatever remained was usually the best option. **This was also why losing complete divisions in a surrendering pocket was far more devastating to a country's overall war-effort than 'losing' the same divisions due to them being 'worn down' by attrition from prolonged combat.**

of the 6 originally deployed mountain rifle divisions in the Kiev Special Military District were destroyed in the Uman pocket (along with the bulk of the Soviet 6, 12 and 18 Armies). The divisions destroyed were the 44, 58, 60, 72 and 192 Mountain Rifle Divisions. Parts of the 676 Rifle Regiment, 192 Mountain Rifle Division survived to join the **15 Mechanised Division (when that division became the 15 Rifle Division in mid-August 1941).** (p. 624)

c. 1st Airborne Corps:

The 1 Airborne Corps was formed in April 1941 and comprised the 1, 204 and 211 Airborne Brigades. The 1 Airborne Brigade was a very new formation which had started forming in April 1941. The 204 and 211 Airborne Brigades were veteran formations formed in 1938. As a result the 1 Airborne Corps had a considerably higher proportion of parachute trained troops compared to other airborne corps in the Red Army in June 1941. Table 1 AB Cps shows the actual strength of the 1 Airborne Corps in the Kiev Special Military District on 22 June 1941. The average airborne brigade had around 94% of its authorised personnel, 43% of its authorised trucks, and was at full strength or over strength in terms of MGs and almost all types of heavy weapons (the only exception was 12.7mm AAMGs, which were very scarce). **The 1 Airborne Corps was also authorised a tank battalion with 48 tankettes, and the corps had 24 tankettes** (50% of TOE) available on 22 June 1941. (p. 625)

On 22 June 1941 the **1 Airborne Corps was in the Kiev Special Military District reserves near Kiev**. It was **soon committed to battle as infantry** and was in action by early July 1941. Whilst being assigned to the 5 Army, the 1 Airborne Corps and its 3 brigades were **caught in the Kiev pocket** where they were lost. The 1 Airborne Corps was officially disbanded in August, but elements of the 1 and 204 Airborne Brigades are known to have still been fighting in the Kiev pocket east of Kiev in September 1941. **All 3 airborne brigades were reformed in September-October 1941 along with a new 1 Airborne Corps HQ**, and apparently they had at least some surviving cadre from the original 1 Airborne Corps. (p. 625)

d. 5th Cavalry Corps:

The 5 Cavalry Corps comprised the veteran 3 and 14 Cavalry Divisions, and on 22 June 1941 the corps was a well prepared and trained mobile unit. Both the cavalry divisions were old and well established divisions, and both were capable of offensive operations in the best traditions of Russian cavalry.

Table 5 Cav Cps shows the actual strength of the 5 Cavalry Corps in the Kiev Special Military District on 22 June 1941.[206] The cavalry divisions averaged around 75% of their full complement of personnel, and both divisions were at full strength in terms of authorised MMGs, mortars, 76-122mm artillery, heavy anti-aircraft guns and anti-tank guns. However the **divisions only had 73 BT tanks between them** (57% of TOE), and, most critically, they averaged only **22% of their authorised trucks**. Fortunately the cavalry divisions had almost two thirds of their required horses, which was their primary method of transport, and all their authorised tractors. Both divisions remained relatively weak in the area of air-defence against low level attacks: they averaged only 7-23% of their authorised heavy AAMGs and quad MMGs, and 50% of their authorised light anti-aircraft artillery.

On 22 June 1941 only the 3 Cavalry Division was near the frontier, and the division's **44 Mechanised Regiment (with its tank battalion)** tried to counter-attack on the very first day of the war. Apparently none of the BT tanks that took part in this attack survived! Initially fighting under the 6 Army HQ, the division didn't rejoin the 5 Cavalry Corps HQ until July. The 14 Cavalry Division was stationed at Krements on 22 June, but was soon committed to defending the northern flank of 6 Army. The 5 Cavalry Corps and its divisions then fought a costly delaying action across the Ukraine throughout July 1941. **It is a tribute to the preparedness, skill and mobility of these cavalry divisions that they survived as divisional entities**, when most of the much larger and more heavily armed tank and mechanised divisions (around them) were being obliterated.

[206] **Note:** Strength of 5 Cavalry Corps: **14,675.**

e. 4 Mechanised Corps:[207]

The 4 Mechanised Corps started forming in June 1940. **It comprised the powerful 8 and 32 Tank Divisions**, the well-equipped 81 Mechanised Division, the 3 Motorcycle Regiment, the 48 Engineer Battalion, the 184 Armoured Signal Battalion and the 104 Aviation Squadron. In terms of available equipment, **the 4 Mechanised Corps was one of the two most powerful armoured or mechanised corps in existence on 22nd June 1941.** This was largely due to the corps containing no fewer than **313 T-34 and 99 KV tanks**; a total of 412 of the most heavily armed and armoured tanks in the world. This was in addition to another 480 light and medium tanks in the corps, including 68 large T-28 tanks and 255 BT-7/7M tanks. This meant the number of tanks in the **4 Mechanised Corps alone (with 892 tanks) was close to equalling the total number of fully tracked armoured fighting vehicles (AFVs) in the entire German Army Group South (with 962 fully tracked AFVs of all types) in June 1941**. (p. 627)

Equally important is that the 4 Mechanised Corps was the only mechanised corps that actually went through divisional sized manoeuvres, and these started well before Operation Barbarossa in the fall of 1940. In this respect the corps' **8 Tank Division** was probably the best trained tank division in the Red Army in June 1941. When one considers that the 4 Mechanised Corps was only 1 of 8 mechanised corps in the Kiev Special Military District with a massive total of **5,465 tanks**, and that only 446 of the total German AFVs were Pz IIIs (50mm), Pz IVs or StuG III assault guns (all of which were the only German AFVs with any reasonable chance against a T-34 or KV tank), one wonders how the 1 Panzer Group made any progress at all. Using most current theories of modern warfare (especially those that mistakenly measure an armoured division's 'combat power' based on the number of operational tanks), Army Group South should have been the defending force, and, even then, 'holding on by its fingernails'. (pp. 627-28)

The detailed strength status of the 4 Mechanised Corps on 22 June 1941, with all its component divisions and other support units, is shown in table Kiev MD 4MC. Several important reference sources supply different overall tank figures for the 4 Mechanised Corps' strength on this date. On 22 June 1941 the 4 Mechanised Corps contained 77% of its authorised personnel, 58% of its authorised motor vehicles, 84% of its authorised towing tractors, 72-75% of its authorised mortars and artillery, 68% of its authorised armoured cars and **87% of its authorised tanks. The 4 Mechanised Corps is one of several mechanised corps deployed in the Western Special Military Districts in June 1941 that totally destroys the popular myth that T-34 and KV tanks were not committed in any significant numbers until late 1941.**[208] This corps alone contained **412 of these tanks** on the first day of the invasion, which accounted for 53% of the **774 T-34s and KVs** in the Kiev Special Military District. In fact, the 4 Mechanised Corps had 57 more T-34 and KV tanks than the entire Army Group South had Pz IIIs (50mm) and Pz IVs!

Moreover, the presence of such immensely strong armoured forces, like those in the **4, 8 and 15 Mechanised Corps in the Kiev Special Military District (Southwestern Front), provides very strong evidence that these corps were intended for major counter-attack operations according to the Soviet pre-war plan**. These forces were far too large and valuable to be squandered in simple delaying or screening (defensive) operations. Along with all the other very large forces in Southwestern Front, the mechanised corps weren't meant to simply 'delay' any German attack: **they were intended to destroy any such attack before enabling the Red Army to go on an operational and strategic counter-offensive, preferably into south-eastern Poland, Hungary and Rumania.** (p. 628)

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[207] **Note:** Total personnel = **28,098**. Tanks included: **313** T-34s, **76** KV-1s, **23** KV-2s.

[208] **Note:** It remains a travesty of history that so many so-called 'documentaries' and poorly researched accounts of WWII still make this ridiculous statement. In actuality, T-34s and KVs were encountered in large numbers from the first day of the war in East.

The **8 Tank Division** was formed in July 1940, and immediately had priority for new tanks and equipment. By 22 June 1941 the division had around 82% of its authorised personnel, 82% of its authorised trucks, and was completely equipped with MMGs, mortars, 76 to 152mm artillery, anti-tank guns, **and (very importantly) towing tractors**. The division even had most of its light 37mm anti-aircraft guns and quad MMGs for defence against low level air attacks. In the tank department the 8 Tank Division was especially strong: it contained **325 tanks including 50 KVs, 140 T-34s and 68 T-28s.** Considering that the 8 Tank Division had **190** of the most powerful tanks in the world along with most of its supporting arms and infrastructure, and was probably the best trained tank division in the Red Army in June 1941, **then theoretically it should have easily stopped any of the 5 panzer divisions in Army Group South in June 1941**. The 8 Tank Division didn't get close to managing this, but it did participate in many of the great armoured battles across the Ukraine in June and July 1941. By late July 1941 it had lost the large majority of its original armour and equipment, and was pulled into the front reserves near Dnepropetrovsk in August. This meant the 8 Tank Division missed being encircled in the Uman pocket and continued fighting under 6 Army (**after the 4 Mechanised Corps HQ was disbanded**). By mid-September 1941 the decimated division was withdrawn and disbanded to form the cadres for the new 130 and 131 Tank Brigades. (pp. 629-30)

The **32 Tank Division** was formed in March-April 1941 from the 3h Light Tank Brigade. Although it received immediate priority for equipment, its combat readiness was considerably lower than that of the 8 Tank Division in the same corps. Nevertheless, in terms of tanks the 32 Tank Division was still one of the best equipped units formed in 1941, one of the best equipped in the Red Army, and certainly better equipped than any tank division in the world outside the Red Army. On 22 June 1941 the 32 Tank Division had **361 tanks (96% of TOE) including 173 T-34s and 49 KVs.** However the rushed formation of the 32 Tank Division in only a couple of months meant it was far weaker than it first appears. (p. 630)

It is instructive to examine the figures for the 32 Tank Division because **it is an excellent example of what was wrong with so many Soviet tank divisions and mechanised corps in 1941**; i.e., it had little to do with lack of the superior T-34 and KV tanks, or even lighter tanks comparable to the German ones. On 22 June 1941 the 32 Tank Division only had around **60% of its authorised personnel** (but only 50% of its officers and 43% of its required NCOs), **only 26% of its authorised trucks**, around half its required towing tractors, and 0-67% of its authorised mortars, artillery and anti-tank guns. **This meant the tanks would be virtually unsupported even if the division managed to consolidate for an attack and sufficient tanks remained operational. It gets worse**. The 32 Tank Division had **only 20% of the required tractors in its artillery regiment**, 47% of its armoured cars, 30% of the required radios, 50% of the required telephones, 13% of its required repair facilities, 2% of its required reserve supplies, **10% of its required repair equipment and spare parts,** and 50% of its engineer support (the pontoon battalion had only 28% of its equipment). In addition, **because the T-34 tanks had only recently arrived, there had been little time to train on them and their crews (particularly drivers) were relatively untrained.**

Despite this list of shortages the **32 Tank Division held together through the tank battles in the western Ukraine in June and July 1941**, which was far more than the better prepared T-34 and KV equipped tank divisions in the 6 Mechanised Corps in Western Front managed to achieve. This was likely due to the fact that the force imbalance between Army Group South and Southwestern Front was much more in the Soviets' favour than the force imbalance between Army Group Centre and Western Front. **The 32 Tank Division's losses were still extreme however, and by the 31 July 1941 it had lost 307 (85%) of its original tanks as well as a similar proportion of its original personnel and equipment**. In August the 4 Mechanised Corps headquarters and the 32 Tank Division were disbanded. The surviving personnel from the latter were used as cadre for the new 1 and 8 Tank Brigades.

The **81 Mechanised Division** was formed in January 1940 from the 81 Rifle Division. Using its legacy as an established division, **the 81 Mechanised Division soon became one of the best equipped and most well trained units in the Kiev Special Military District.** By 22 June 1941 it had around 89% of its authorised personnel, 59% of its authorised trucks, 89% of its authorised towing tractors and all its authorised 76-152mm artillery. The

division also had around half its authorised anti-tank and light anti-aircraft guns, and **206 mostly good BT-7/7M tanks.** Fighting with the 4 Mechanised Corps, the 81 Mechanised Division frequently used its motorised rifle regiments to support the tanks of the 8 and 32 Tank Divisions. This probably contributed greatly to the latter division's survival in June and July 1941. **Having lost all its tanks and most of its transport, the 81 Mechanised Division reverted to its original form and was redesignated the 81 Rifle Division on 29th July 1941.** This was accomplished by converting the division's 53 Tank Regiment (81 MD) to be the 53 Rifle Regiment (81 RD). (p. 630)

f. 8 Mechanised Corps:[209]

The 8 Mechanised Corps started forming in June 1940, and included the strong **12 and 34 Tank Divisions**, the well-equipped 7 Mechanised Division, the 2 Motorcycle Regiment, the 45 Engineer Battalion, the 192 Armoured Signal Battalion and the 108 Aviation Squadron. On balance, the 8 Mechanised Corps was the second most powerful mechanised corps in the Kiev Special Military District on 22 June 1941. This was largely due to the corps containing **858 tanks; of which 100 were T-34 tanks, 71 were KV heavy tanks, and 47 were the large and rare T-35 heavy tanks**. As with the 4 Mechanised Corps (above), this meant the number of tanks in the 8 Mechanised Corps (alone) was comparable to the total number of fully tracked armoured fighting vehicles (AFVs) of all types in the entire German Army Group South. (631)

The strength status of the 8 Mechanised Corps, with all its component divisions and other support units, on 22 June 1941 is shown in table Kiev MD 8MC.[210] Several reference sources supply different overall tank figures for the 8 Mechanised Corps' strength on this date. On 22 June 1941 the 8 Mechanised Corps contained 79% of its authorised personnel, 66% of its authorised motor vehicles, 109% of its authorised towing tractors, 72-80% of its authorised mortars and artillery (including anti-aircraft and anti-tank guns), 67% of its authorised armoured cars and 83% of its authorised tanks (including **218 of the most modern and/or powerful tanks in the Red Army**). Obviously, by June 1941 the **8 Mechanised Corps represented one of the strongest mechanised corps deployed in the Western Special Military Districts**. Consequently it was one of several mechanised corps designated in the Soviet pre-war plan to counter-attack and isolate any invading mechanised spearheads; and this, in fact, is exactly what the 8 Mechanised Corps attempted to do on 26 June 1941. On this day the entire corps attacked into the flank of the 1 Panzer Group as the first stage of attempting to isolate large elements of it.

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[209] **Note:** Total corps personnel: **28,713**. Among tanks were: **100** T-34s, **56** KV-1s, and **15** KV-2s. Also possessed nearly **300 BT-2s, 3s, & 7s.**

[210] **Note:** Principal references (compiled from): C. C. Sharp, 'T*he Deadly Beginning', Soviet Tank, Mechanised, Motorised Divisions and Tank Brigades 1940-1942*: Soviet OOB WWII Volume I, George F. Nafziger, West Chester, OH, 1995, pp. 12, 24, 35 and 53. D. M. Glantz, *Stumbling Colossus*, University Press of Kansas, Lawrence, Kansas, 1998, pp. 135, 139 and 155, table 5.5. Glantz, Col. D, M., paper 'Red Army Ground Forces in June 1941', Glantz 1997, pp. 27-28. *The Initial Period of War on the Eastern Front: 22nd June-August 1941, Proceedings of the Fourth Art of War Symposium, Garmisch, October 1987*, Glantz, D.M. (ed.), Frank Cass & Co Ltd, London, 1997, p. 38. S. J. Zaloga, J. Kinnear, P. Sarson, *KV-1 and 2 Heavy Tanks 1941-1945*, Osprey Military, London, 1995, p. 16. S. J. Zaloga, P. Sarson, *T-34/76 Medium Tank 1941-1945*, Osprey Military, London, 1994, p. 9. V.J. Kamenir, ***The Bloody Triangle: The Defeat of Soviet Armor in the Ukraine, June 1941, Zenith Press, Minneapolis, MN, 200***8, pp. 41-42. M. I. Meltjukhov, *Upushchennij shans Stalina Sovetskij sojyz i borba za Evropu: 1939 -1941 (dokumenty, fakty, Suzhdenija*), (Lost Chance, Stalin's Soviet Union and the struggle for Europe: 1939 -1941 (documents, facts, judgments), Veche, Moscow, 2000. (Individual division data) I. Moshchanskiy, ***Operatsia Barbarossa. Tankovye Boi na Zapadno Ukraine, (Operation Barbarossa. Tank Battles in the Western Ukraine), Armoured Museum, Military Chronicle Vol. 3, Moscow, 2002***. A. Isaev, 1941. ***Boi na Ukraine, (1941; Fighting in the Ukraine***), Frontline Illustration No, 4, Moscow, 2004. T. Abashidze, I. Moschansky, ***Kievskaya Strategicheskaya Oboronitelnaya operatsia. I. Tragedia pod Umanju***, (***Kiev Strategic Defensive Operation, Part I. Tragedy near Uman***), Moscow, 2003. E. Drig, ***Mekhanizirovannye korpusa RKKA v boyu (Mechanized Corps of the Red Army in Battle), AST, Moscow, 2005***. ***TsAMO (Central Archive of the Russian Ministry of Defence***, Podolsk), RF, f. 38, op. 11360, d.2. (Flame tank data) M. Kolomiets, M. Svirin, ***T-26: Mashiny na ego baze*** (Machines based on the T-26), Part 2, Frontline Illustration No. 4, Moscow, 2003

However, the running battle with the 1 Panzer Group (along with its supporting 6 Army) proved incredibly costly and the **corps was rapidly decimated: by 1 July 1941 the 8 Mechanised Corps was already down to around 15% of its original strength.** On 2 July 1941 the corps' 12 Tank and 7 Mechanised Divisions reported that they were already down to a combined total of 207 tanks and tankettes (including non-operational AFVs), and 21 armoured cars.[211] This meant that these 2 divisions, alone, **lost 61% of their tanks, including 69 T-34s and 18 KV tanks, in the first 10 days of war.** The 8 Mechanised Corps then fought a series of delaying actions across the Ukraine, and by 17 July the entire corps could field only 57 tanks and 34 armoured cars. (p. 631)

The remnants of the 8 Mechanised Corps HQ, along with most of its smaller support elements, were disbanded and removed from the Soviet order of battle in early August 1941. (p. 632)

The 12 Tank Division started forming on 15 July 1940 using equipment and personnel from the 14 Tank Brigade. The new division was given priority for tanks and equipment, and by October 1940 it already had almost 300 tanks. The first 18 KV tanks and a battalion of 50 T-34s were delivered to the division in the spring of 1941. By 22 June 1941 the 12 Tank Division had almost 87% of its authorised personnel, **81% of its authorised trucks (which was unusually high**), and was almost completely equipped with MMGs, mortars, anti-tank guns and 76-152mm artillery. Very importantly, and unusually, the **12 Tank Division was actually over-strength in towing tractors.** The division also had around half its authorised light 37mm anti-aircraft guns and all its **quad AAMGs.**[212] (p. 633)

The **12 Tank Division** was very well equipped with tanks. It had the huge number of **396 tanks, including 100 T-34s and 61 KV tanks**, which was actually 106% of the TOE. As the Soviet pre-war tank divisions were already very tank heavy formations (even when at full support strength), and as the 12 Tank Division only contained around 75-78% of its authorised riflemen, **this meant the division's tanks were very likely to be committed without adequate infantry support.** This was assuming the division's C&C (Command and Control) infrastructure and signals all worked adequately. Equally critical was the fact that the KV and T-34 tank crews were still **largely untrained. For example, the majority of KV and T-34 tank drivers only had 3-5 hours of service driver training.**

The 12 Tank Division spearheaded the attack against 1 Panzer Group on 26 June 1941. It was severely mauled in the process, losing most of its artillery (apparently to German air attack) and many tanks. **Within a few days the cohesion of the division was lost** and it spent July operating in small combat groups. The bulk of the remaining division was **finally lost at Uman**. **After the 8 Mechanised Corps HQ was disbanded in August**, the remains of the 12 Tank Division were withdrawn to Kharkov and then disbanded on 7 September 1941. **Some of the surviving personnel were used as cadre for the new 33 Tank Brigade, and possibly the 129 Tank Brigade.**

The **34 Tank Division** was formed in March-April 1941 from the 14 Tank Brigade and the 5 Heavy Tank Brigade. Before the mechanised corps had started forming the **5 Heavy Tank Brigade had been the only Red Army unit equipped with the T-35 heavy tank.** This meant the 34 Tank Division still had **328 tanks and tankettes** (87% of TOE) by 22 June 1941, despite being one of the 'late forming' Soviet tank divisions. **The tanks included 10 KV and 47 T-35 heavy tanks** (excluding an additional 4 T-35s in the district's rear area, which were in a **category 4 state of repair**). The fact that the division was still in the process of forming is indicated by other figures. On 22 June 1941 the 34 Tank Division had approximately 64% of its authorised personnel, only 43% of its authorised trucks and just over half of its required tractors. The division was also very vulnerable in other areas: **it had only around half its authorised rifleman**, about two thirds of its authorised MMGs and mortars, only 4 batteries of 122-152mm artillery (vs. 6 batteries authorised) and only a third of its authorised light 37mm anti-aircraft guns.

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[211] **Note:** E. Drig, ***Mekhanizirovannye korpusa RKKA v boyu (Mechanized Corps of the Red Army in Battle***), AST, Moscow, 2005. The 207 tanks included 43 KVs, 31 T-34s, 69 BT-7, 57 T-26s and 7 T-40s.

[212] **Note:** Each of the 3 divisions in **8 MC** were equipped with **12** Quad AAMGs, for a total of **36** in the corps. Red Army seems to have had many more of these quad AA guns than the Germans did (*Vierlingsflak*)

Even more critical than simple shortages, was the fact that 34 Tank Division had had no time to execute manoeuvres as a unit, even at the battalion level. Therefore even if the C&C and signals had been in place (which they weren't), and even if the transport had been available for the division's elements to operate together (which it wasn't), then the division still lacked the necessary experience and training required. Consequently the **34 Tank Division was totally unprepared when it was thrown into action** with the rest of the 8 Mechanised Corps on 26 June 1941. In short order the German anti-tank gunners almost wiped out the division's two tank regiments, which was made especially easy as they were **committed with practically no combined arms support.** For a short period the division HQ also controlled tanks attached from the 12 Tank Division to build up numbers, but these were soon also lost. The bulk of the **34 Tank Division was finally lost near Dubno**, and by August the division had been **deleted from the Soviet order of battle**. One source indicates that *surviving personnel might have gone into the newly forming 2 and 16 Tank Brigades.*

The **7 Mechanised Division** was formed in July 1940 from the established 7 Rifle Division. This gave the 7 Mechanised a very good 'start in life', so that by 22 June 1941 **it was fully equipped in many respects and even reasonably well trained.** By this time the division contained around 88% of its authorised personnel, 70% of its authorised trucks, **an amazing 149% of its towing tractors**, and was fully equipped with MMGs, 50mm mortars, 76-152mm artillery and 76mm anti-aircraft guns. It also had 50-75% of its authorised light anti-aircraft guns and anti-tank guns, and **134 tanks and tankettes**. All things considered, especially training and support, the 7 Mechanised Division *was likely the toughest and most resilient division in the 8 Mechanised Corps at the start of the war*. (p. 633)

On 26 June 1941 the 7 Mechanised Division joined the attack by the 8 Mechanised Corps against 1 Panzer Group. In all probability, it was the supporting elements from the 7 Mechanised Division which prevented the 12 and 34 Tank Divisions from being completely annihilated in this attack. In the ensuing last days of June the division took very heavy casualties, and by mid-July 1941 it was already down to the strength of a rifle brigade without tanks. **In August the 7 Mechanised Division reverted to its original form and was redesignated the 7 Rifle Division** while being assigned to 26 Army. This was accomplished by adding the 405 Rifle Regiment to the division to replace the destroyed 23 Tank Regiment. Unfortunately this didn't save the division as it then became t**rapped in the Kiev pocket** and was subsequently destroyed in late September 1941. (p. 634)

g. 9 Mechanised Corps:[213]

The 9 Mechanised Corps was formed in November-December 1940. By June 1941 it had the newly formed 20 and 35 Tank Divisions, the 131 Mechanised Division, the 32 Motorcycle Regiment, the 2 Engineer Battalion, the 153 Armoured Signal Battalion and the 109 Aviation Squadron. The detailed strength of the 9 Mechanised Corps, with all its component divisions and other support units, on 22 June 1941 is shown in table Kiev MD 9MC. **A few sources provide slightly different tank-strength figures for the 9 Mechanised Corps on this date. Like many of the late forming mechanised corps, the 9 Mechanised Corps was not combat ready by June 1941.** On 22 June 1941 the corps contained 74% of its authorised personnel, only 22% of its authorised motor vehicles, 41% of its authorised towing tractors, 57% of its authorised mortars and artillery (including anti-tanks and anti-aircraft guns), and 29% of its authorised armoured cars and tanks (**298 tanks**). **The acute shortage of motorised transport was especially critical.** This meant the 9 Mechanised Corps had poor mobility as a complete entity and had very few mobile combat-support structures in place. For example, on 28 April 1941 the corps commander reported that the 9 Mechanised Corps' units had only 22% of their required 'material support technicians'. (p. 634)

Fortunately for 9 Mechanised Corps it was initially deployed well to the rear (between Novgorod and Shepetovka) as part of the 5 Army's reserve. Therefore, even though the corps was ordered to start moving towards **Lutsk** almost immediately, its initial deployment allowed the 9 Mechanised Corps to have at least a few days to 'prepare' before it was committed to battle. (p. 634)

[213] **Note:** Total personnel strength of **9MC: 26,833.** It only possessed **T-26** and **BT** tanks.

The **20th Tank Division** started forming in December 1940. The division never received any new modern tanks, and on 22nd June 1941 it still only had 2 tank battalions with a total of 41 BT-5 and T-26 tanks. Although the division had 82% of its authorised personnel, it still only had 25% of the required NCOs and 50% of the required officers and technicians. Probably even worse than this was the fact that the division had only 16% of its authorised trucks and 45% of its authorised tractors. This meant the bulk of the division's equipment struggled to move at all, and the 'motorised' rifle regiment was actually on foot. This was especially unfortunate as the 20th Tank Division was at full strength in terms of MMGs, anti-tank guns and 76-152mm artillery. The 20th Tank Division fought across the Ukraine from June to August 1941, more as a rapidly decreasing rifle unit than a tank or motorised unit. By 25th August 1941 it was down to a reported strength of 2,400 men, 18 guns and mortars, and no tanks. 1595 The remains of the 20th Tank Division became trapped in the Kiev pocket in September 1941 and were subsequently lost. (pp. 634-35)

The **35 Tank Division** started forming in March-April 1941 which was only two months before Operation Barbarossa started. Apart from the number of available tanks, the division was in even worse shape than the 20 Tank Division (above). By 22 June 1941 the **35 Tank Division had 142 T-26 tanks in 3 tank battalions**, but in all other areas the division had had very little opportunity to form. As a consequence, when the Germans invaded the 35 Tank Division only had around **64% of its authorised personnel, only 60% of the required NCOs and only 33% of the required officers. Even more catastrophic was the fact that the division had almost no significant motorised transport (8% of TOE) and only 7 tractors in the entire division!** This meant it could barely move the 10 122mm and 152mm howitzers it did have in its howitzer regiment (it was authorised 24 122-152mm howitzers). The division was also very short of MMGs, mortars, 76mm infantry guns and 37mm anti-aircraft guns. (p. 636)

Given the above, there is little doubt that any of the invading German divisions would have obliterated the 35 Tank Division in short order on 22 June 1941. Luckily the division was initially deployed in 5 Army reserves so it had a little time to get organised. It appears the 35 Tank Division (or at least the bulk of the division) did not initially move westward with the 20 Tank Division and the 131 Mechanised Division. Presumably this was to enable the division to attain at least some degree of motorisation before going into combat. The 35 Tank Division fought in the tank battles west of Kiev in July and August 1941, and, unsurprisingly, **by 25 August it was down to a reported strength of around 2,000 men, 12 artillery pieces and no tanks.** In September the remains of the division were disbanded with the survivors going into the newly mobilising tank brigades. These survivors must have been few because the division is also listed as having been destroyed in the Kiev pocket.

The 131 Mechanised Division was formed in December 1940 from the established 131 Rifle Division. Despite being severely understrength in June 1941, due to its pedigree the division was still probably the most combat ready formation in the 9th Mechanised Corps when the Axis forces invaded. At this time the 131 Mechanised Division had 3 tank battalions in its tank regiment with **115 (mostly BT) tanks on strength**. However they were apparently **not in a good state of repair:** one report states only 41% of the available tank strength was operational on 22 June 1941.[214] Overall, the 131st Mechanised Division contained around 81% of its authorised personnel, 39% of its authorised trucks and 66% of its authorised towing tractors.

Unfortunately the division's artillery regiment did not have its full complement of artillery: it had no 76mm divisional guns and only 3 batteries of 122-152mm howitzers (i.e., 12 gun/howitzers vs. the 36 76-152mm artillery pieces authorised). This might have been just as well because the division would have struggled to move and support all its authorised artillery anyway. As one might expect from an ex rifle division, the 131 Mechanised Division had almost all its authorised LMGs, MMGs, light mortars, 76mm infantry guns and anti-tank guns. **In terms of air defence the 131 Mechanised Division was (like almost all Soviet 1941 divisions) relatively**

[214] **Note:** C. C. Sharp, '*The Deadly Beginning', Soviet Tank, Mechanised, Motorised Divisions and Tank Brigades 1940-1942*: Soviet OOB WWII Volume I, George F. Nafziger, West Chester, OH, 1995, p. 59.

vulnerable. It had none of its authorised **76mm anti-aircraft guns**, around two thirds of its authorised light **37mm anti-aircraft guns** and 80% of its authorised quad MMGs.

The 131 Mechanised Division was ordered to move westwards with the 20 Tank Division almost immediately. In late June 1941 it participated in several 5 Army counterattacks, and fought a series of expensive delaying actions against the advancing the German 1 Panzer Group and the 6 Army. The **131 Mechanised Division must have lost most of its tanks and motorisation very quickly in the ensuing battles across the western Ukraine. This is because the division was already being redesignated as the 131 Rifle Division on 3 July 1941.** In order to accomplish this, the new 743 Rifle Regiment was added from reserves to replace the division's defunct 58 Tank Regiment.

The 9 Mechanised Corps HQ had been disbanded by late July 1941, a**nd on 8 August the 'new' 131 Rifle Division was assigned to the 31 Rifle Corps in 5 Army.** By 25 August 1941 the division was down to a reported strength of 4,500men, 40 artillery pieces of all types (including anti-tank, anti-aircraft and infantry guns), 17 mortars and 70 MMGs. This was actually very respectable for a Soviet division which had been in action against the German Army for almost two months in 1941! Unfortunately, the 131 Mechanised/Rifle Division's respectable record came to an abrupt end when it was **caught and completely destroyed in the Kiev pocket in September 1941.** (p. 636)

h. 15 Mechanised Corps:[215]

Based on the available equipment and personnel, the 15 Mechanised Corps could be considered the third most powerful mechanised corps in the Kiev Special Military District on 22 June 1941. The 15 Mechanised Corps started forming in February-March 1941. It comprised the **powerful 10 Tank Division**, the newly formed 37 Tank Division, the 212 Mechanised Division, the 25 Motorcycle Regiment, the 65 Engineer Battalion, the 544 Armoured Signal Battalion and the 115th Aviation Squadron. (p. 637)

Details of the strength of the 15 Mechanised Corps on 22 June 1941, with all its component divisions and other support units, is shown in table Kiev MD 15MC. **Several reference sources supply different overall tank figures for the 15th Mechanised Corps on this date**. The corps' strength largely stemmed from it having 92% of its authorised personnel and **733 tanks and tankettes** (71% of TOE). The tanks included **72 T-34s, 64 KV** heavy tanks, **51 T-28** medium tanks, and **471 relatively modern and fast BT-7/7M tanks.**

Similarly to the 4 or 8 Mechanised Corps (above), this meant **the number of tanks in the 15 Mechanised Corps (alone) was approaching the total number of fully tracked AFVs in the entire German Army Group South**. In this case the 15 Mechanised Corps had only 229 fewer tanks and tankettes than the all the fully tracked AFVs (including light self-propelled types) in Army Group South.[216] It is very clear that the major weaknesses in the 15 Mechanised Corps did not stem from the number, type or modernity of available tanks, but was due to other causes.

The 15 Mechanised Corps is somewhat unique because a very detailed report on the corps' status was prepared just prior to Operation Barbarossa. The data from this report, relating to personnel in the corps, is shown below. (p. 637)

Of particular note in the above table [not shown here] is the proportion of officers, NCOs and other ranks present. The absolute strengths are less significant because the 15 Mechanised Corps had 92% of its authorised personnel

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[215] **Note:** Personnel in **15 MC = 33,395.** Tanks include: **471 BT-7/BT 7M**; **72** T-34s; **45** KV-1s; and **19** KV-2s on 22 June 1941.

[216] **Note:** Army Group South had **962 fully tracked AFVs of all types available from 22nd June to 4th July 1941**. Refer Volume IIB 3. 'The Total Personnel and Equipment in a Deployed (D) State in the Reich from 22nd June to 4th July 1941'.

on 22 June 1941 (**compared to 71% in the average mechanised corps fielded in the Western Special Military Districts**). Despite being near its full overall personnel strength, the report shows that the 15 Mechanised Corps' **support units had less than half their required officers and NCOs** (some as low as 17%), while the 3 divisions had only 41% to 87% of their required officers and NCOs. **These personnel shortages in higher ranks were typical of almost every mechanised corps fielded by the Red Army in 1941**, and in some cases they were considerably worse. (p. 638)

The consequences to the Red Army of the acute shortage of trained officers and NCOs are difficult to overstate. Without the required trained officers and NCOs, any command and control mechanisms would have been very fragile, and the cohesion of every unit would have been easily disrupted (including the individual regiments and battalions within the divisions). When coupled with other critical factors which were present, it becomes clearer why so many of the apparently powerful pre-war mechanised corps were either worn down in very short order or were simply obliterated in a matter of days. These 'other critical factors' included: the understandable reluctance of Red Army officers at almost every level to show battlefield initiative and question poor command decisions (which was almost entirely due to the recent and still ongoing officer 'purges', and this threat remained very real), the severe shortages of signals equipment and trained signals staff at every level of command, and the systemic shortages of all types of transport (especially motorised transport).

The 15 Mechanised Corps was, unfortunately, **just another example of the critical shortage of motorised transport within the Red Army**. The corps contained only 41% of its authorised motor vehicles and 50% of its authorised towing tractors. This meant the corps had limited mobility and **the motorised supporting infrastructures (particularly those need to maintain, supply and recover tanks, and move and supply artillery)** were largely absent. In other areas the 15 Mechanised Corps' equipment was barely adequate: it had 66% of its authorised mortars, 49% of its authorised artillery (including anti-aircraft and anti-tank guns) and 69% of its authorised armoured cars. (p. 638)

The **10 Tank Division** was formed in July 1940. It was originally part of the 4 Mechanised Corps, and, in conjunction with the 8 Tank Division, it participated in the only full scale mechanised corps manoeuvres that occurred before June 1941. The 10 Tank Division therefore had priority for tanks and equipment, and by **1 October 1940 it already had almost 300 tanks.** In February 1941 the 10 Tank Division was assigned to the 15 Mechanised Corps and started receiving new T-34 and KV tanks. By 22 June 1941 the 10 Tank Division had 87% of its authorised personnel (with the personnel-rank distribution shown in the above table), 59% of its authorised trucks, 86% of its authorised tractors, two thirds of its authorised mortars, all of its authorised 76-152mm artillery, a third of its authorised light 37mm anti-aircraft weapons (but all its quad MMGs), and three quarters of its authorised armoured cars. In the tank department the 10 Tank Division was particularly strong: it had **363 tanks** available (97% of TOE), including **63 KV tanks, 38 T-34 tanks, 51 T-28 tanks and 181 BT-7/7M tanks.** Overall, the 10 Tank Division was a powerful unit and relatively mobile compared to most Red Army 1941 tank or mechanised divisions. **It was also relatively experienced, had good leadership** (with 87% of its required officers) and was well trained, especially as it had actually participated in full scale manoeuvres. (p. 640)

The 10 Tank Division participated in the major tank battles with the 1 Panzer Group in June and early July 1941, **with the KV heavy tanks giving the Germans a particularly hard time.** However, the attrition rate must have been phenomenal because by **6 July 1941 the 10 Tank Division reported that it had a 'combat strength' of only 20 tanks** (including 2 KVs and 3 T-34s) and 21 armoured cars. This almost unbelievable attrition rate did not decrease. By 12 July the division's total strength (including rear services and non-operational equipment) comprised: 4,650 men, 6 BT tanks, 17 armoured cars, 545 wheeled vehicles, 17 tractors, 21 45mm anti-tank guns, 4 37mm anti-aircraft guns and 4 122mm howitzers.[217] In early August 1941, what was left of the 15 Mechanised Corps HQ was disbanded, and the 10 Tank 'Division' became part of the mobile reserve for the 40 Army. On 31

[217] **Note:** E. Drig, *Mekhanizirovannye korpusa RKKA v boyu* (Mechanized Corps of the Red Army in Battle), AST, Moscow, 2005. Also, D. M. Glantz, Stumbling Colossus (ibid), p. 158, table 5.10.

August its strength was now reported as only 750 men and 14 tanks. **In early September 1941 the more or less destroyed division was disbanded, and any survivors went into the newly forming 133 (and possibly 131st) Tank Brigades.**

The **37th Tank Division was a late forming division which started forming in March 1941**. This meant it never had the opportunity to become as established as the 10 Tank Division, but being part of the 15 Mechanised Corps meant it was still given high priority. Consequently the 37 Tank Division was soon brought up to full personnel strength (with 10,900 men) and 84% of its authorised tank strength (which included **34 of the new T-34 tanks and 258 BT-7/7M tanks**). Unfortunately this was where the good news on the 37 Tank Division pretty much ended. On 22 June 1941 the division possessed only around 25-27% of its authorised trucks and tractors, two thirds of its authorised MMGs and mortars, 33-58% of its authorised medium to heavy artillery, 0-33% of its anti-tank and light anti-aircraft guns, and 47% of its authorised armoured cars. Furthermore, even though the 37th Tank Division possessed its full complement of personnel there were still major problems in this area. As we have seen (above) these personnel constituted 41% of the required command staff, 48% of the required NCOs and 111% of the required enlisted men. **Of the enlisted men, 60% were without general or specialised training had only joined the army in May 1941**. **The 37 Motorised Rifle Regiment was so new (and so untrained) that 600 riflemen in the regiment were still unarmed**. All this meant that the 37 Tank Division was a large but effectively untrained unit, which was also desperately short of officers and NCOs. (p. 640)

When the *Wehrmacht* struck on 22 June 1941 the 37 Tank Division **was poorly deployed. The motorised rifle regiment was located 150km from the tank regiments and was without transport so they could not support the tanks even if they had had the training to do so.** The division's pontoon battalion was separated from the division (it was located on the Dniester River south of Lvov) and never re-joined the division. Despite all this, the 37 Tank Division went into battle in June and, unsurprisingly, the Germans proceeded to chop the division to pieces. By 6 July 1941 the 37 Tank Division reported that it had a 'combat strength' of only 10 tanks (including 2 T-34s) and 5 armoured cars. By 12 July the division's total strength (including rear services and non-operational equipment) comprised: 2,021 men, 1 T-34 tank, 2 BT tanks, 10 armoured cars, 144 wheeled vehicles, no tractors, 12 45mm anti-tank guns, 2 37mm anti-aircraft guns and 1 76mm field gun. In early August the divisional remains were withdrawn and then disbanded, with surviving cadre going into the newly forming 3 Tank Brigade. These survivors must have been very few **because the division is also listed as having been destroyed in the Uman pocket.** (p. 641)

The **212 Mechanised Division** was also very new: it was formed from scratch in March-April 1941. It rapidly expanded and by 22 June 1941 it contained around 90% of its authorised personnel, 28-33% of its authorised trucks and tractors, 33-100% of its authorised mortars and MMGs, 78% of its authorised 76-152mm artillery, 0-50% of its anti-tank and light anti-aircraft guns, 90% of its authorised armoured cars, **and (only) 20% of its authorised tanks.** The most crippling features of the division were that it had **only 56-60% of its required officers and NCOs, its enlisted men were mostly untrained and it was acutely short of motorised transport**. **The shortage of motorised transport was so severe that the division's 587 and 669 Motorised Rifle Regiments were virtually without transport,** while the artillery regiment could only move one battalion without any rear services.

The 212 Mechanised Division still went into action in June 1941 with the rest of 15 Mechanised Corps, and suffered accordingly. By 6 July 1941 the 212 Mechanised Division reported that it had lost all its tanks and had only 1 operational armoured car left.[218] By 12 July the division's total strength (including rear services) comprised:

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[218] **Note:** ***Doklad Komandira 15-go Mekhanizirovannogo Korpusa Nachal'niku glavnogo Avtobronetankovogo Upravleniya Krasnoi Armii o boyevykh Dejstviyakh Korpusa s 22 Iyunia po 12 Iyulia 1941 goda***, (Report of the 15 Mechanized Corps Commander to the Head of the Main Armoured Directorate of the Red Army fighting the Corps [?], from 22 June to 12 July 1941), **Collection of combat documents - Volume 36, Military Publishing House of the Ministry of Defense, Moscow, 1958.**

745 men, 2 armoured cars, 16 wheeled vehicles, no tractors, 2 45mm anti-tank guns, 1 37mm anti-aircraft gun and 1 122mm howitzer. The 212 Mechanised Division had been all but destroyed. **On 29 July 1941, what was left of the 212 Mechanised Division was redesignated the 212 Rifle Division** by adding the newly mobilised 692 Rifle Regiment from reserves. During August and September the division's original regiments were built up using replacements and mostly commandeered horse-drawn transport. The conversion to a rifle division was tantamount to simple name change, because the 212 'Mechanised' Division had already always had about the same level of motorisation as the average contemporary rifle division (but, unfortunately, without the compensatory horse-drawn elements). (p. 641)

i. 16 Mechanised Corps:[219]

The 16 Mechanised Corps started its formation in February-March 1941. It included the 15 and 39 Tank Divisions, the 240 Mechanised Division, the 19 Motorcycle Regiment, the 78 Engineer Battalion, the 546 Armoured Signal Battalion and the 116 Aviation Squadron. The strength of the 16 Mechanised Corps, with all its component divisions and other support units, on 22 June 1941 is shown in table Kiev MD 16MC. A few sources supply different overall tank figures for the 16 Mechanised Corps on this date. On 22 June 1941 the 16 Mechanised Corps contained 74% of its authorised personnel, 36% of its authorised motor vehicles, 59% of its authorised towing tractors, 65% of its authorised mortars, 40% of its authorised artillery (including anti-tank and anti-aircraft guns), 46% of its authorised armoured cars and 59% of its full complement of tanks. Overall, this meant the corps' had limited mobility and resilience, but it still possessed significant offensive capability. Its greatest assets were its riflemen (working mainly as foot infantry) and the **608 available BT, T-26 and T-28 tanks**. (p. 642)

Fortunately for the 16 Mechanised Corps it was deployed well to the south of the main initial thrusts by the 1 Panzer Group. It was assigned to 12 Army defending the borders with Hungary and northern Rumania, and was deployed just north of **Kamenets Podolsk**. This meant the 16 Mechanised Corps was not embroiled in the initial (disastrous for the Red Army) border battle in the Ukraine, and ensured the divisions within the corps had at least a short time to organise prior to going to war.[220]

The **15th Tank Division** was formed in July 1940 as part of the 8 Mechanised Corps. As it was originally part of a mechanised corps with a relatively high priority for equipment, the 15 Tank Division was soon up to strength with almost 300 tanks by October 1940. In February 1941 the 15 Tank Division was assigned to the new 16 Mechanised Corps. By 22 June 1941 the division had 3**47 tanks (93% of TOE)** which represented the majority of tanks in the mechanised corps. **Unusually, 75 of the division's tanks were large T-28 medium tanks.** The division also had around 83% of its authorised personnel, 45% of its authorised trucks, 67-100% of its authorised mortars and MMGs, two thirds of its authorised 122-152mm artillery, and half its authorised armoured cars. **Curiously, the division had close to its full complement of tractors, so it could at least move its heavy weapons along with its tank formation**s (unlike many of the pre-war tank and merchandised divisions). All this meant that the 15 Tank Division was easily the strongest division in the 16 Mechanised Corps in June 1941. (p. 642)

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[219] **Note:** Total personnel: **26,920**. T-26 (**275**), BT-2/5 (**112**), BT-7/7M (**146**), T-28 (**75**).

[220] **Note: The Red Army mechanised corps committed to the 'border battle' in the western Ukraine, in June and early July 1941, were the 4th, 8th, 9th, 15th, 19th and 22nd Mechanised Corps**. Due to the very large number of Red Army tanks present in these corps (but definitely not due to the relatively small numbers of tanks in the German 1 Panzer Group), this battle is often touted as the second largest tank battle of WWII (after the Battle of Kursk). This is, in fact, a justifiable claim. **All 6 mechanised corps involved in this battle were either decimated or effectively 'wiped out' as significant combat formations.** Recommended accounts of the scale and ferocity of this battle are: V. J. Kamenir, *The Bloody Triangle: The Defeat of Soviet Armor in the Ukraine, June 1941*, Zenith Press, Minneapolis, MN, 2008. Also, The *Initial Period of War on the Eastern Front: 22nd June-August 1941, Proceedings of the Fourth Art of War Symposium, Garmisch, October 1987*, Glantz, D.M. (ed.), Frank Cass & Co Ltd, London, 1997, pp. 248-339, (The Border Battles on the Lutsk-Rovno Axis: 22 June -1 July 1941).

The 16 Mechanised Corps avoided the initial border battles, but by early July the 15 Tank Division was fighting a series of rear guard actions across the central Ukraine. It was initially with the 12 Army in the Southwestern Front, and later with the newly formed 18 Army and then the 6 Army under the Southern Front. By 15 July 1941 the 15 Tank Division was down to a strength of 2,066 men, 87 tanks, 35 artillery pieces (of all types) and 162 motor vehicles. The 15 Tank Division thus survived July 1941 in a fighting retreat, but what was left of the division (including its rear support elements) was **destroyed in the Uman pocket in August along with most of the 6th Army.** Apparently some surviving remnants of the division survived and went into the new 4 Tank Brigade in September 1941.

The **39 Tank Division** was formed in March-April 1941 and was only 2-3 months old when the Germans struck. Despite this, the division was still able to muster **261 tanks** (70% of TOE) on 22 June 1941, although they were all **older T-26 or BT-2/5 tanks**. In other areas the 39 Tank Division was not as strong, but it still had a respectable strength; at least on paper. The division could field around 75% of its authorised personnel (most of which were new recruits), only **28-60%** of its authorised trucks and tractors, 67-100% of its authorised mortars and MMGs, two thirds of its authorised 122-152mm artillery and 43% of its authorised armoured cars. **As with so many of the Soviet tank divisions fielded in June-July 1941, the 39 Tank Division's greatest weaknesses were the lack of motorised transport** (along with the corresponding vital supporting infrastructures) **and the lack of trained personnel (especially officers and NCOs).**

As the 16 Mechanised Corps was to the south of the initial tank battles in the Ukraine, the corps and its divisions survived into July 1941 relatively intact. The 39 Tank Division retreated back through the Donbas (initially with the 12 Army, and later with the newly formed 18 Army under the Southern Front), but was soon in a severely depleted state. On 7 July 1941 39 Tank Division was reassigned to 18 Mechanised Corps (which was originally assigned to the Odessa Military District/Southern Front) in exchange for the 44 Tank Division. The decimated division was soon pulled back into the 18 Army reserves **when the 18th Mechanised Corps HQ was disbanded**, but this didn't prevent the bulk of the division **being lost around Uman** in early August 1941. By mid-August the remnants of the division had been disbanded.

The **240 Mechanised Division** was formed in March-April 1941, and, like the 39 Tank Division in the same corps, was only 2-3 months old when it was forced to go to war. On 22 June 1941 the division was easily the weakest division in the 16 Mechanised Corps: **it possessed no tanks at all,** around 70% of its authorised personnel, a dismal 27-35% of its authorised trucks and tractors, 11% of its authorised 76mm-152mm guns and howitzers (i.e., **it had only a single battery of 152mm howitzers**), and a quarter of its authorised anti-tank guns and light anti-aircraft guns. The fact that 240 Mechanised Division was deployed well to the south of the main German effort is probably the only thing that saved it from immediate destruction.

In the ensuing battles across the Ukraine, all the 240 Mechanised Division could realistically do was support the tank divisions in the 16 Mechanised Corps with its riflemen (who were mostly on foot). The division fought alongside the 15 Tank Division for the most part (in 12 Army, 18 Army and then 6 Army). By late July 1941 the 240 Mechanised Division had been reduced to the size of a rifle brigade, **whereby it was withdrawn to Kharkov for rebuilding**. Unlike the tank divisions (above), this meant the division avoided destruction in the Uman pocket along with the rest of the Soviet 6th and 18th Armies. On 6 August 1941 the 240 Mechanised Division was **redesignated the 240 Rifle Division**. This was accomplished by adding the 931 Rifle Regiment from reserves and building up the 'new' rifle division using replacements.[221] The division did not return to the front until January 1942. (p. 644)

j. 19 Mechanised Corps:[222]

[221] **Note:** As in several other cases, a destroyed *mechanized* rifle division is given a new rifle regiment, and some replacements, and re-designated as a simple rifle division.

The 19 Mechanised Corps was another late forming mechanised corps which started forming in February-March 1941. The 19 Mechanised Corps comprised the newly formed 40 and 43 Tank Divisions, the new 213 Mechanised Division, the 21 Motorcycle Regiment, the 86 Engineer Battalion, the 547 Armoured Signal Battalion and the 119 Aviation Squadron. The 19 Mechanised Corps was held in reserve in the Kiev Special Military District (it was deployed to the rear, just south of Zhitomir in June 1941). This fact, coupled with the fact that it was so late in forming, meant it never had the priority or time to form properly. The result was a mechanised corps made up of divisions with a varied assortment of weapons and equipment, **but with very limited mobility, combat power and resilience.** (p. 645)

The strength of the 19 Mechanised Corps, with all its component divisions and other support elements, on 22 June 1941 is shown in table Kiev MD 19MC. Different sources supply slightly different tank figures for the 19 Mechanised Corps on 22 June. On this date the 19 Mechanised Corps contained only 60% of its authorised personnel, an abysmal (very low) **18% of its authorised motor vehicles**, only **26% of its authorised towing tractors**, two thirds of its authorised mortars, 37% of its authorised artillery (including anti-tank and anti-aircraft guns), 10% of its authorised armoured cars and **44% its full complement of tanks.** Even this tank strength was an illusion because over a third of its **450 available tanks were very light tankettes** armed with MGs only. These vehicles were really only suitable for reconnaissance duties.

As with the 16 Mechanised Corps (above), on 22 June 1941 the 19 Mechanised Corps was initially deployed well away from the border, which was the principal reason it wasn't overrun immediately. However, the Southwestern Front's (ex-Kiev Special Military District) situation deteriorated so rapidly that it was **forced to commit its reserve mechanised units to battle before they were anywhere near ready**. Consequently the 19 Mechanised Corps never had an opportunity to consolidate or form up in the most basic organisational sense, and its divisions were **sent into action piecemeal.**

The **40 Tank Division** was formed in March-April 1941 from a number of separate tank battalions. Being only 2 months old, the 40 Tank Division was still very unprepared for war by 22 June 1941. **The division did possess 158 'tanks', but 139 of these were machine gun armed tankettes**; probably issued for training before more suitable tanks arrived. In addition the division's 40 Motorised Rifle Regiment was short over 80% of its MMGs and **had virtually no transport**, while the artillery regiment had only half its authorised 122mm and 152mm howitzers (3 batteries with 12 howitzers in all). Overall, the 40 Tank Division **contained around 53% of its authorised personnel (including only 53% of its authorised officers and NCOs)**, **negligible transport with only 6% of its authorised trucks and tractors**, 33-50% of authorised light anti-aircraft and anti-tank guns, 6% of its authorised armoured cars and **almost no combat support infrastructures**. Logically, this was what one would expect from a 2 month old tank division which was fairly low on the priority list of all the relevant commands. (p. 645)

This meant the 40 Tank Division was rapidly destroyed piecemeal fashion, and by 15 July 1941 its recorded strength (including rear area services) was only 2,010 men, 30 tanks (probably tankettes) and 99 vehicles of all types. Shortly after this the remnants of the 40 Tank Division were withdrawn and disbanded, with survivors going into the new 45 and 47 Tank Brigades. (p. 647)

The **43 Tank Division** was formed in March 1941 from the 35 Light Tank Brigade. The 43 Tank Division was the best prepared and strongest division in the 19 Mechanised Corps on 22 June 1941. This was principally because the original 35 Light Tank Brigade had a substantial number of light tanks and experienced personnel. On 22 June 1941 the division had **230 T-26s, 2 T-34s and 5 KV** heavy tanks available. Of these, 80 T-26s, and all the T-34s and KVs were operational. On the same date the personnel of the 43 Tank Division comprised 711 command personnel, 1,054 NCOs and 6,669 enlisted men, which constituted 77% of its full personnel complement. On the

[222] **Note:** Total personnel of **19 MC: 21,654.** Total tanks: T-26 (**291**), T-37/38/40 (tankettes) (**152**). It also had **2** T-34s and **5** KV-1s probably for training purposes.

equipment side the **division had only 571 motor vehicles (36% of its TOE, of which 421 vehicles were serviceable), only 15 tractors (18% of TOE)**, 4 37mm AA guns (33% of TOE) and 20 76-152mm artillery pieces (71 % of TOE). Equally as interesting as the equipment situation was the supply situation. On 22 June 1941 the 43 Tank division **had spare parts stock at 40-45%, was very short of 37mm ammunition, and had only one combat load of ammunition for its 122-152mm artillery**. This supply situation may have improved in late June and early July 1941, **but these figures illustrate the low readiness state of many Soviet tank divisions in June 1941.**

When the 43 Tank Division was committed to action it only had sufficient motorisation for the 2 tank regiments and 2 battalions of its rifle regiment. The rest of the division was organised as a rifle group **which remained separate and on foot.** In constant fighting west of Kiev, the division was soon decimated with most of its losses apparently occurring near **Korosten**. By 15 July 1941 its recorded strength (including rear area services) was only 2,625 men, 52 tanks, 17 artillery pieces of all types and 342 vehicles of all types. Another report states that by the end of July the 43 Tank Division's combat strength was down to 400 men. All but destroyed, the 43 Tank Division was **withdrawn and disbanded, with the survivors going into the new 10 and 12 Tank Brigades.**[223]

The **213 Mechanised Division** was formed in March-April 1941, and by 22nd June 1941 it was a 'division' in name only. Its armour consisted of a single battalion with 42 T-26s and a company of 13 tankettes in its reconnaissance battalion. But this wasn't the worst of it by a long shot. On the same date the division had around 53% of its authorised personnel, a dismal 140 motor vehicles (9% of TOE), 4 light anti-aircraft guns (50% of TOE) and only 1 battery of 4 122mm howitzers in its artillery regiment (i.e., only 11% of the authorised number of guns and howitzers in the artillery regiment's TOE). The 213th Mechanised Division had no anti-tank guns, no heavy anti-aircraft guns and no armoured cars. The division's 2 'motorised' rifle regiments were actually on foot and were missing around a third of their heavy weapons.

Only 48 hours after combat operations commenced the pretence of the 213 Mechanised Division being a mechanised unit was dropped. It was already being referred to as a rifle division, which was appropriate because this was also how it was immediately used. On 10 July the division's tank regiment (its single battalion) was detached to the Kiev Fortified Sector while the rest of the division fought on as a rifle unit. **The remnants of the rather valiant 213 Mechanised/Rifle Division were finally destroyed while under the 6 Army in the Uman pocket in August 1941**. (p. 647)

k. 22 Mechanised Corps:[224]

The 22 Mechanised Corps was a late forming corps which started forming in February-March 1941. The corps was comprised of the 19 and 41 Tank Divisions, the 215 Mechanised Division, the 23 Motorcycle Regiment, the 89 Engineer Battalion, the 549 Armoured Signal Battalion and the 122nd Aviation Squadron. The details of the strength of the 22 Mechanised Corps, with all its component divisions and other support elements, on 22 June 1941 is shown in table Kiev MD 22MC. Several sources supply different strength figures for the 22 Mechanised Corps on 22 June. (p. 648)

Considering how late this mechanised corps started forming, it was in a reasonable condition by 22 June 1941. The reasons for this may lie in the fact that it was assigned to the **5 Army which was directly in the expected path of any major Axis attack**. The 22 Mechanised Corps was deployed around Rovno; positioned to protect the northern flank of the 5 Army. In addition its 19 Tank Division had been recently reassigned (to the 22nd) from the

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[223] **Note:** D.M. Glantz, *Stumbling Colossus*, ibid, p. 143, states the 43rd Tank Division had only 20 light tanks left by 7th July 1941.

[224] **Note:** Total personnel of **22 MC: 24,087**. Tanks: T-26 (**512**), BT-2/5 (**50**), BT-7/7m (**113**). The corps also had **31** KV-2 tanks. The entire 22nd Mechanised Corps had only **47 motorcycles**, and, of these, only around 30% were medium to heavy motorcycles with engines larger than 351cc.

9 Mechanised Corps, and this corps had been forming since December 1940. On 22 June 1941 the 22 Mechanised Corps was able to muster **66% of its authorised personnel, only 25% of its authorised motor vehicles**, 35% of its authorised towing tractors, 85% of its authorised mortars, 69% of its authorised artillery (including anti-tank and anti-aircraft guns), almost a third of its authorised armoured cars and 69% of its **full complement of tanks (707 tanks and tankettes)**. Apart from the lack of trained and/or experienced personnel, the corps' greatest weakness was the **usual crippling shortage of all types transport.**

The **19 Tank Division was formed in December 1940** as part of the 9 Mechanised Corps. This corps was formed in November-December 1940; in-between the two great waves of Soviet mechanised formations formed in July 1940 and in February-March 1941. In February 1941, while still in the process of formation, the 19 Tank Division was reassigned to the new 22 Mechanised Corps. By 22 June 1941 the division contained around 85% of its authorised personnel, but it was still **missing almost 50% of its NCOs, and 33% of its required officers and technicians.** Despite having had over 6 months to form up, **the division's level of motorisation was still dismal. It had only 295 motor vehicles (including 18% of the truck TOE), 52 tractors (62% of TOE) and only 10 motorcycles in the entire division.** In addition the division had **163** mostly T-26 tanks (43% of TOE) and only 31% of its authorised armoured cars. The best features of the division were its 4 batteries of 122-152mm artillery, and the fact that the rifle regiment had almost all its riflemen as well as all its authorised heavy weapons. **The lack of motorisation meant the 19 Tank Division's artillery regiment struggled to move**, the 'motorised' rifle regiment was **actually an ordinary rifle regiment on foot**, and effective tank recovery and repair was nearly impossible. **As an example of how fast a division's combat power can decline due to a combination of enemy action, lack of preparation and lack of training, there are few better examples than the 19 Tank Division**. **The division went into action on 24 June 1941, and by 26 June it reportedly could field only 4 operational tanks and had lost half its divisional howitzers!** By 20 August the division had approximately 1,500 combat personnel, and around 6 tanks and armoured cars left. The remains of the decimated 19 Tank Division **disappeared into the Kiev pocket in September 1941.** (p. 648)

The **41 Tank Division** was formed in March 1941. It must have been given a high priority for tanks because by 22 June 1941 it was actually well over-strength in tank numbers: it had no less than **415 tanks available (111% of TOE) including 31 new KV-2 heavy tanks.** However, the number of available tanks was the strongest feature of the 41 Tank Division because in most other areas there were major problems. At this time the division could field around **66% of its authorised personnel, only 34% of its authorised trucks, only 18% of its authorised tractors** (with none in the division's artillery regiment), a quarter of its authorised armoured cars, and not even a single motorcycle. In the infantry heavy-weapons and artillery department the 41 Tank Division was well equipped. It had all its authorised MMGs, mortars, infantry-guns and anti-tank guns, and 16 122-152mm howitzers (two thirds of TOE). This meant that the well-equipped rifle regiment struggled to be a motorised unit, **and although the artillery regiment had most of its howitzers it was completely missing the tractors to move them.**[225] (p. 650)

On 22 June 1941 there were additional problems not apparent from table Kiev MD 22MC, which also served to reduce the combat effectiveness of the 41 Tank Division. These problems included: 57 T-26s (15%) being out of service on 15 June 1941, **the 31 KV-2 heavy tanks being so new that their crews (especially drivers) were almost completely untrained (they had only arrived in the division from 14-15th June 1941),** no 152mm ammunition immediately available for the KV-2s, and reconnaissance and pontoon bridging battalions with barely a third of their authorised equipment.

[225] **Note: It should be noted here that an artillery regiment without prime movers and other transport is not simply immobile.** There is also little to n**o facility for artillery observation and control**, or to keep the regiment supplied. The artillery units are effectively **reduced to fire at what they can see** until whatever local ammunition stock pile they have runs out.

From almost the first day of the war the 41 Tank Division was detached from the 22 Mechanised Corps and attached to the 15 Rifle Corps HQ. This was probably done because **the bulk of the division (apart from the tanks) was immobile: without even horses**, the 41st Tank Division was less mobile than many rifle divisions. However, it is arguable that this was a mistake because the 15 Rifle Corps immediately detached small tank units to support its various rifle divisions (which is the nature of rifle corps). **The result was the piecemeal destruction of the division's tanks without the division ever having had a chance to properly mobilise or consolidate.** By 6t July 1941 the 41 Tank Division had lost most of its T-26s and had only 9 KV-2s left. By 25 August 1941 the division was down to around 2,000 men and a few tanks and armoured cars. What was left of the 41 Tank Division was finally d**estroyed in the Kiev pocket in September 1941.**[226]

The **215 Mechanised Division** was formed in March-April 1941. On the plus side the division had **129 BT tanks**, 2 battalions of 12 [each] 122mm howitzers in its artillery regiment (with no 76mm guns or 152mm howitzers), and most of its authorised MMGs, mortars, infantry-guns and anti-tank guns. That's about it on the 'plus side' because in most other categories the division was in very poor shape. On 22 June 1941 the 215 Mechanised Division still had only around **half its authorised personnel**. These personnel included **only 30% of the required officers in its tank regiment and reconnaissance battalion, and 25% of its required mechanics and technicians overall.** In addition, the motorisation state of the division meant that it **could barely move its equipment**: it contained only 19% of its required trucks, 34% of its authorised tractors and 46% of its authorised armoured cars. The division **didn't' even have any motorcycles**. Consequently the relatively few riflemen available to the division were on foot, the artillery could hardly move, and **tank recovery and repair was just a theoretical concept.**

The 215 Mechanised Division went into action on 23 June 1941, and, as one would expect, within five days the 5 Army HQ was reporting it as "apparently (only) remnants left". **A steady stream of replacements** kept the division in existence and in action until 22 August 1941 when it was **officially designated the 215 Rifle Division**. At that time its reported strength was down to approximately 1,200 men, 8 T-37 tankettes, 12 artillery pieces and 12 mortars. Unfortunately the 'new' 215 Rifle Division barely had time to exist in the Soviet order of battle before **it was also destroyed in the Kiev pocket in September 1941**. (p. 650)

l. 24 Mechanised Corps:[227]

The 24 Mechanised Corps was formed in February-March 1941. It included the **barely formed 45 and 49 Tank Divisions**, the 216 Mechanised Division, the 17 Motorcycle Regiment, the 81 Engineer Battalion, the 551 Armoured Signal Battalion and the 124 Aviation Squadron. The 24 Mechanised Corps was held in reserve in the Kiev Special Military District and was stationed in the rear area near **Proskurov** on 22 June 1941. It is apparent that the **24 Mechanised Corps never had much priority for equipment because it was easily the weakest mechanised corps in the Kiev Special Military District when the Germans attacked**. The corps was so unformed and poorly equipped that in June 1941 it vied for the title of 'the weakest mechanised corps in the Red Army', along with the 17 and 20 Mechanised Corps in the Western Special Military District. The strength of the 24 Mechanised Corps on 22 June 1941, with all its component elements, is shown in table Kiev MD 24MC. (p. 651)

The most obvious and striking features of the 24 Mechanised Corps are that it **had only 229 motor vehicles (5% of the corps' TOE)**, 69 tractors (21% of TOE), 16 armoured cars (6% of TOE), no artillery and no mortars. In terms of motorisation, the entire corps was almost as weak as the average rifle division in the Kiev Special Military District. The only significant assets the 24 Mechanised Corps could show on 22 June 1941 were its **222 tanks and tankettes (22% of TOE**, but with over half being light tankettes), and its 21,556 personnel (**59% of TOE**). It is

[226] **Note:** Many of the original divisions of Southwestern Front, if not destroyed in the frontier battles, were later destroyed in the Uman and Kiev *Kesselschlachten*.

[227] **Note:** Total personnel: **21,556**. Tanks: T-26 (**102**), T-37/3840 (tankettes) (**120**).

apparent that the 24 Mechanised Corps was still in the very early stages of formation and training. Nonetheless, the **complete lack of all types of artillery weapons and transport really serves to demonstrate how overstretched the resources in the USSR were**, while attempting to fulfil the Red Army's massive (and **ridiculously ambitious**) pre-war expansion programme.[228]

The **45 Tank Division** started forming in February-March 1941, and by 22 June 1941 t**he division was still barely formed or organised.** At this time the division had approximately 63% of its authorised personnel, only 4% of its authorised motor vehicles, **123 tanks and tankettes** (33% of its TOE), a handful of armoured cars and no artillery of any type (including anti-tank and anti-aircraft guns). When Army Group South attacked, the entire 24 Mechanised Corps was deployed near **Proskurov** in the Kiev Special Military District's deep rear area. This saved the 45 Tank Division from immediate destruction, and enabled it to have some time to organise and receive more equipment and personnel. It is likely the division received additional resources before going into action, but the number and type is unknown. The 45 Tank Division fought in retreat through July and early August until it was **caught in the Uman pocket and finally destroyed**.

The **49 Tank Division** started forming in March 1941, and by 22 June 1941 the division was in an almost identical state to the 45 Tank Division described above. The division had very similar levels of personnel, motorisation and artillery, but **only 99 tanks and tankettes** (26% of its TOE). By all accounts the tanks had only arrived in April-May 1941; barely over a month before Operation Barbarossa so the **tank crews had had little time to train on the AFVs they had.** The 49 Tank Division probably received some additional personnel and equipment before going into action. However it was *never more than a brigade size tank unit with its infantry mostly on foot*. Along with the rest of 24 Mechanised Corps, the 49 Tank Division **disappeared into the Uman pocket in early August 1941**. (p. 651)

The **216th Mechanised Division** was formed in March-April 1941. Unlike the tank divisions in 24 Mechanised Corps, the 216 Mechanised Division didn't even have the benefit of any tanks. It did, however, still have all the other deficiencies listed for the other divisions in the corps. On 22 June 1941 the division had approximately 58% of its authorised personnel, a dismal **4% of its authorised motor vehicles, no tanks, no armoured cars and no artillery** (including anti-tank and anti-aircraft guns). From the beginning of the war the Soviet command identified the 216 Mechanised Division as a 'rifle division', and even then it had the **strength of a lightly armed rifle brigade**. The 216 Mechanised/Rifle Division stuck with the 24 Mechanised Corps, and accordingly the division **was also lost in the Uman pocket in early August 1941**. (p. 652)

m. NKVD Ground Forces in the Kiev Special Military District:

The personnel and equipment strength of the NKVD ground forces deployed in the Kiev Special Military District on 22 June 1941 is shown in tables Kiev MD NKVD 1 and Kiev MD NKVD 2. On this date there were more NKVD personnel deployed in the Kiev Special Military District than in any other Western Military District. This was due to: the Ukraine being a large area which contained an extensive rail network and strategic industrial infrastructure (all of which required guarding), the need to garrison the long borders to the west and southwest (with southern Poland, Hungary and northern Moldavia/Rumania), and **the need to exert strict control over the local civilian population**. The latter was particularly important as there were **still remnants of the Ukraine nationalist movement around** (at least in Stalin's mind). Previously, Stalin had ruthlessly crushed any hope of the Ukraine becoming a separate state by effectively starving the population into submission.[229] (p. 653)

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[228] **Note:** The reader should be clear here that the **ill-equipped nature of the Soviet mechanised corps in June 1941 was not due to lack of resources or production in the USSR**: it was almost entirely due to the incredible number of mechanised corps being simultaneously formed. As stated previously, the **29 mechanised corps in the Red Army (each with 3 tank/mechanised divisions)** dwarfed the combined mechanised forces in all the remaining armies in the world at this time (including those in the Wehrmacht).

The 10 NKVD border guard detachments[230] were the most combat capable NKVD troops in the Kiev Special Military District on 22 June 1941. These units were actually over-strength: they averaged around 109% of their authorised personnel strength, had all their heavy weapons, and had 53-132% of their authorised trucks and horse-drawn transport. **Apart from patrolling the borders, these units also manned many of the fortified positions just behind the borders.** Consequently *those border guard detachments in southern Poland were amongst the first Soviet units engaged in the initial attacks by Army Group South*. Ultimately only the 90, 91, 92, 95 and 98 Border Guard Detachments survived sufficiently intact to receive reinforcements, and then be reorganised and redesig-nated as border guard regiments (assigned to rear-area security duties). The Kiev Special Military District's **rail security was administered by the 10 Rail Security Division** HQ in Lvov (with the 64, 66, 75 and 77 Rail Security Regiments), and the **4 Rail Security Division** HQ in Kiev (with the 55, 56 and 57 Rail Security Regiments). It appears these units also provided the rail-security in the Odessa Military District and the 9 Separate Army in the southern Ukraine. The 10 Rail Security Division, along with its assigned regiments, was **destroyed in the Kiev pocket in September 1941.** (p. 653)

n. Kiev Special Military District (Front, Army and Corps Support Units):

Repeating the same checksum reconciliation process as for the Leningrad Military District, and combining this with available quantitative and qualitative information on the various support units, we can deduce the most probable actual strength of the various support units in the Kiev Special Military District in June 1941. The results of this process for the Kiev Special Military District are shown in tables Kiev MD Sup Units 1 to Kiev MD Sup Units 3. In addition, the strengths of the **PVO forces** and **fortified sectors** in the Kiev Special Military District on 22 June 1941 are shown in tables Kiev MD PVO and Kiev MD Fort Sec, respectively. These tables should also be viewed alongside the relevant military district in the table Soviet Deployment Matrix, in order to clarify reporting structures and ascertain any unit assignments to higher level HQs. The following are some general observations regarding the various support units in the Kiev Special Military District. (655)

● **Almost all the RVGK and corps artillery regiments were at full strength with regards to the number of artillery pieces, but were in an average to poor state with regards to motorised transport and support infrastructure.** This is to be expected given that the Soviets were *attempting to motorise all their RVGK and corps artillery regiments while at the same time trying to form 29 full mechanised corps* (with no less than 8 in the same Kiev Special Military District). The artillery regiments averaged 61-79% of their authorised personnel, 65% of their authorised towing tractors, b*ut only around 24% of their required trucks. This was especially critical as the signals, supply and artillery-observation infrastructure for the artillery regiments was carried in trucks*. Also serious was the **lack of towing tractors which made moving the artillery regiment's artillery pieces as one unified unit very difficult, if not impossible**. The *lack of trucks and towing tractors severely limited the tactical availability of the RVGK and corps artillery regiments for all types of fire missions*, as well as making them tactically and operationally vulnerable to being destroyed. This situation was further exacerbated by the quality and reliability of the available trucks and towing tractors, and the unavailability of alternative draft horse-teams in the artillery regiments.[231]

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[229] **Note:** This event is referred to as the **Holodomor** in modern Ukrainian history, which refers to 'extermination by hunger' or 'to kill by starvation'. It is also known as the 'Terror-Famine' and the 'Famine-Genocide in the Ukraine'. It was a Soviet induced famine in the Ukraine during 1932-33 that **killed around 7 million Ukrainian**s. Although there was a wider Soviet famine which affected the major grain-producing areas of the USSR (which was a man-made famine), most scholars agree that Stalin **used it as an opportunity to eliminate the Ukrainian independence movement.** Since 2006 the Holodomor has been recognized by the Ukraine, and many other countries, as a genocide of the Ukrainian people carried out by the USSR.

[230] **Note:** The average NKVD border guard detachment in KSMD had **1996** personnel and was lightly equipped with weapons including 50mm mortars and MMG.

[231] **Note:** Average **Type A** Corps Artillery Regiments (**21** total) equipped with: 122mm guns (**2**), 107mm guns (**10**), and 152mm gun/how (**24**). Average **RVGK** Cannon Regiments (**3** total) equipped with: 122mm guns (**48**). Average **RVGK** Howitzer Regiments (**5** total) equipped with: 152mm gun/how (**48**). Average **RVGK** Super Hvy Howitzer Regiment (BM) (**5** total)

● In addition to transport problems, the corps artillery regiments had **issues relating to weapon obsolescence.** In all, 82% of the '122mm type guns' authorised in the 21 **Type A** and 1 **Type C** corps artillery regiment's TOE, were actually **old 107mm M1910/30** guns as opposed to the new 122mm M1931 (A-19) and M1931/37 (A-19) guns. To achieve the authorised 36 gun/howitzers per Type A corps artillery regiment, the 107mm guns were used in place of the 122mm guns. This meant the average Type A corps artillery regiment had 24 155mm gun/howitzers, 2 122mm guns and 10 107mm guns. T**he RVGK artillery regiments were at full strength** with 122mm guns, 152mm gun/howitzers, 203mm howitzers and 280mm BR-5 Mortars.

● The **1 Anti-Tank Brigade**[232] was formed in April 1941. By 22 June 1941 the brigade had 79% of its authorised number of anti-tank and anti-aircraft guns (with no 85mm or 107mm guns), 48% of its authorised personnel, only **6% of its authorised trucks** (42 trucks) and only **3% of its authorised tractors** (only 6 towing tractors). Obviously the biggest handicap for the 1 Anti-Tank Brigade was its **inability to move or supply itself.** Despite this, the 1 Anti-Tank Brigade performed reasonably well in the initial stages of Operation Barbarossa (as part of the Soviet 5 Army). This was likely due to the fact that the brigade didn't need to initially move because the panzers of 1 Panzer Group came directly towards it. The 1 Anti-Tank Brigade must have found at least sufficient transport to move the remnants of the unit in July and August 1941, because it managed to reach Kiev where it was finally **wiped out in the Kiev pocket.**

● The **2 Anti-Tank Brigade**[233] was formed in April 1941. By 22 June 1941 the brigade had 72% of its authorised number of anti-tank and anti-aircraft guns (with no 85mm or 107mm guns), just over half of its authorised personnel, **only 23% of its authorised trucks and 26% of its authorised towing tractors**. The 2 Anti-Tank brigade had more towing tractors than any other anti-tank brigade in the Western Military Districts on 22 June 1941, so it could provide some mobility to its heavy guns and equipment. **Only 4 out of the 10 existing anti-tank brigades on 22 June 1941 had any tractors at all**. Initially assigned to 26 Army, the 2 Anti-Tank brigade retreated eastwards and was assigned to the 6 and then 12 Army by July 1941. Along with these armies, the 2 Anti-Tank brigade was **lost in the Uman pocket in early August 1941.** (p. 655)

● The **3 Anti-Tank Brigade**[234] was also formed in April 1941. By 22 June 1941 the brigade had 74% of its authorised number of anti-tank and anti-aircraft guns (including 12 85mm and no 107mm guns), 54% of its authorised personnel, 23% of its authorised trucks and only **13% of its authorised towing tractors**. The 3 Anti-Tank brigade was initially assigned to 6 Army but was spilt between the 6, 12 and 26 Armies by the end of June 1941. Retreating eastwards, the remnants of the brigade were assigned to 12 Army in July and were subsequently **lost in the Uman pocket in early August 1941**. (pp. 655-56)

● The **4 Anti-Tank Brigade**[235] was formed in April 1941 in the Odessa Military District. By 22 June 1941 the brigade had moved northwest and was assigned to the 12 Army. At this time it had around 60% of its authorised number of guns (including 9 85mm and no 107mm guns), **only 21% of its authorised trucks and no towing tractors.** Fortunately for the 4 Anti-Tank brigade the 12 Army was defending the border with Hungary and Rumania so it avoided the initial thrusts by 1 Panzer Group. This gave the 4 Anti-Tank brigade time to get more transport and make a fighting withdrawal eastwards. Eventually the remains of the brigade were assigned to the 18 Army HQ which had moved down from the Kharkov Military District. The 4 Anti-Tank brigade remained under 18 Army until November 1941 **when it was disbanded.** (p. 656)

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equipped with: 203mm howitzers (**24**). Average **RVGK** High Power Artillery Battalions (**4** total) equipped with: 280mm mortars (**6**). One (**1**) **Type C** Artillery Regiment equipped with: 122mm gun (**1**), 107mm guns (**17**), and 152mm gun/how (**24**).

[232] **Note: 1 AT Bde** equipped with **96** 76mm field guns; only **6** tractors.

[233] **Note: 2 AT Bde** equipped with **94** 76mm field guns; only **46** tractors.

[234] **Note: 3 AT Bde** equipped with **84** 76mm field guns and **12** 85mm AA/AT guns; only **24** tractors.

[235] **Note: 4 AT Bde** equipped with **72** 76mm field guns and **9** 85mm AA/AT guns; had **0** tractors.

● The **5 Anti-Tank Brigade**[236] was also formed in April 1941. By 22 June 1941 the brigade had barely formed and was assigned to the Kiev Special Military District reserves. It had approximately 67% of its authorised number of guns (including **12 85mm and no 107mm guns**), **only 20% of its authorised trucks and no towing tractors**. After receiving additional transport, the 5 Anti-Tank Brigade was sent west and was assigned to the 5 Army. It remained defending with the 5 Army until August 1941 when it was assigned to the newly mobilised 40 Army. Subsequently, the 5 Anti-Tank Brigade was **destroyed in the Kiev pocket battles.**

● In terms of total numbers of heavy anti-aircraft guns, **the PVO air defence forces in the Kiev Special Military District were the strongest in the USSR**. They contained approximately **1,586 76-85mm anti-aircraft guns and 68 37mm anti-aircraft guns**. In addition the Kiev Special Military District had far more new 85mm M1939 guns than any other district in the USSR; with **1,368 85mm M1939** anti-aircraft guns available on 22 June 1941. This represented 40% of the total of **3,402 85mm M1939 anti-aircraft guns** available in the entire USSR. There were over 2.2 times as many 85mm anti-aircraft guns in the Kiev Special Military District as there were in the Leningrad Military District, and over 4.1 times as many as in the Moscow Military District. The PVO forces in the Kiev Special Military District can be viewed in two distinct categories. These are the **7 PVO brigades** (6 regional) which defended the Kiev PVO zone but excluded Kiev itself, and the **3rd and 4th PVO Divisions which defended Kiev and L'vov**. . . Thus the PVO regiments in the 7 PVO brigades in the Kiev Special Military District were stronger than those in the Northwestern PVO zone (Baltic Special Military District) and comparable in strength to the PVO regiments in the Western PVO zone (Western Special Military District).

● The PVO regiments in the **3 and 4 PVO Divisions** (**defending Kiev and L'vov**) were much stronger than those in the 7 PVO brigades (above), because Kiev was a strategically important target. Kiev was the capital of the Ukraine, one of the largest cities in the USSR, and was **a major road and rail crossing of the Dnieper River across which supplies for the Southwestern Front moved.** The result was that the PVO batteries and regiments defending Kiev were at 90-100% of their authorised personnel and heavy anti-aircraft gun strength. The level of motorisation in the PVO regiments was obviously much lower than this, but as these units were mostly occupying fixed defences this mattered less than for regular Red Army units. This was true unless, of course, they had to evacuate or became involved in a mobile battle. Unfortunately for all the PVO forces in the Kiev Special Military District (or Southwestern Front) this need for mobility arose. It is not known how many of the PVO's heavy anti-aircraft guns and personnel defending cities in the Southwestern Front were evacuated by road or rail in 1941. However, given the large majority of the mobile Red Army units failed to escape the Uman or Kiev pockets, **it is unlikely that many of the PVO forces near these cities survived**. (p. 656)

● **The average strength of the machine-gun artillery battalions in the <u>16 fortified sectors</u> in the Kiev Special Military District was the highest on any border in the USSR**. This was because the fortified sectors along the border with East Prussia and German occupied Poland had been reinforced immediately prior to Barbarossa (i.e., the new Molotov Defence Line), and were still in the process of being reinforced on 22 June 1941. The reason why the Kiev Special Military District fortified sectors were so strong is because the main effort of any major enemy attack was thought to be most likely along the south-western axis and into the Ukraine. (p. 657)

<u>16</u> total fortified sectors (numbered): 2, 4, 6, 10, 11, 12, 8, 1, 3, 5, 7, 9, 13, 14, 15 & 17. Together they included **45** MG/Art Btls. Average manpower per sector: **2860** (total for all sectors: **45,761**). LMG & MMG: **68** and **73**, respectively (average per fortified sector). 82mm mortars: average **3** per sector; 45mm AT gun: average **6** per sector; 76mm IG/cannon: average **11** per sector (**180** in all). (p. 661)

o. Total Manpower and Equipment in the Kiev Special Military District (22 June 1941)

[236] **Note: 5 AT Bde** equipped with **79** 76mm field guns and **12** 85mm AA/AT guns; had **0** tractors.

Table Kiev MD Total shows the total personnel and equipment present in the Kiev Special Military District (designated the Southwestern Front from 22 June 1941) on 22 June 1941, as well as the proportion allocated to Deployed (D) combat units. Summarising the reconciled results for the entire district, we can see that there were **35,267 crew served MGs** (excluding 12.7mm AAMGs), 6,972 mortars, 7,784 artillery pieces (including anti-tank guns but excluding anti-aircraft, coastal and rail guns), 2,221 anti-aircraft artillery guns, **5,465 tanks and tankettes**, and **907,046** personnel present in the Kiev Special Military District on 22 June 1941. These total figures are very consistent with other up to date published sources. (Note, care must be taken when comparing total equipment figures because some sources list equipment as 'on hand' or 'serviceable' equipment. In general, 'on hand' equipment, including 'on hand unserviceable equipment', is more akin to the 'Allocated to Combat Units' column in table Kiev MD Total.)[237] (p. 662)

Kiev Special Military District, Total Manpower and Equipment (22 June 1941)

- Manpower: **907,046** (total); **760,338** (allocated to combat units); **146,708** (Rear Area / Other).
- Rifle Squad / Light Rifle Squad: **9647** & **1311**, respectively.
- MGs (LMGs, MMGs, Quad MMGs): **35,267**
- Mortars: **6972** (50mm, 82mm, 120mm, 107mm Mt Mor)
- Horses: **74,917**; estimated total motorcycles: **5700**.
- Trucks / Tractors: **34,779** & **8144**, respectively.[238]
- Artillery pieces: **7784** (45mm AT gun [**2276**], 76mm guns (ca. **2000**), 107mm gun, 122mm gun, 122mm how (**1402**), 152mm how (**612**), 152mm gun/how (**650**), 203mm how, 280mm how (**35**).
- Tanks/Tankettes: Total of **5465** (T-26: **1955**, T-28: **215**; BT-2/5: **468**; BT-7/7M: **1351**; T-34: **496**; KV-1: **189**; KV-2: **89**. Total T-37/38/40 tankettes: **651**.[239]

(pp. 663-64)

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[237] **Note:** E.g., D. M. Glantz, *Barbarossa*, Tempus Publishing Ltd, Stroud, UK, 2001, p. 217, notes 2, note 31. Glantz gives the Kiev Special Military District strength on 22 June 1941 as **907,046** men (including **142,105** in training), 16,997 guns and mortars, **5,465 tanks (4,788 operational)**. Also, I. Drogovoz, *Zhelezniy Kulak RKKA. Tankovyje i mechanizirovannyje korpusa Krasnoy Armii 1932-41 gg,* (Iron Fist of the Red Army. The tank and mechanized corps of the Red Army in the years 1932-41), Technika - Molodezhi, Moscow, 1999, states **5,464 tanks (4,788 operational)** on 1st June 1941. Table Kiev MD Total gives the same total number of personnel and tanks (with 4,910 in a **category 1or 2 state of readiness** i.e. operational, although this was probably based on more optimistic Soviet reports/estimates), and 16,977 guns and mortars (a difference of only 20 guns and mortars).

[238] **Note:** Significant number of trucks and tractors (but largely trucks) were **Category 4** and **5**. In other words, they were in bad shape.

[239] **Note:** Most tanks of KSMD were in Category 1 & 2; however, almost **400** (across all models, excluding tankettes) were Category 3 or 4. Category 3 tanks required '**medium repairs**' to be done at the district level in peacetime, or army or higher level in wartime. Category 4 tanks required a major rebuild or '**capital repairs**' to be done in central depots or in the factory, to re-enter service.

10. The Odessa Military District, Including the 9th Separate Army (Part of Southern Front from late June-July 1941)[240]

In this section we will focus on the actual manpower and equipment strength of the land combat units deployed in the Odessa Military District, including the 9 Separate Army, on 22 June 1941. We will examine the strength of the individual combat units within the district, and then reconcile this with the actual strength in the entire military district. Some sources list the 9 Separate Army as part of the Soviet forces in the Western Military Districts and the Odessa Military District as one of the USSR's Internal Military Districts in June 1941. **This is because the Odessa Military District was not directly on the border with Rumania and was effectively 'buffered' by the presence of the 9 Separate Army.** In this analysis, and in this work generally, the forces in the Odessa Military District which were west of the Dniester River (i.e., in Bessarabia, Northern Bukovina and Hertza), and those east of the Dniester River, are considered as part of the Western Military Districts. **Therefore the 9 Army (an occupation force deployed west of the Dniester River) is treated as part of the overall forces in the Odessa Military District.** (p. 665)

a. Rifle Divisions:

On 1 June 1941 the average personnel strength of the **6 rifle divisions in the 9 Army was around 8,400 men**, or 58% of the wartime authorised TOE. **The 6 rifle divisions directly under the Odessa Military District (east of the Dniester River) were held in reserve**, and 3 of these divisions had only been formed in 1940-41. The divisions east of the Dniester River were weaker than those in the 9 Army; averaging only around 40% of their full complement of personnel. The amount of available equipment in the rifle divisions in the Odessa Military District on 22 June 1941 varied. **The divisions in the 9 Army were generally more established and had more MGs, mortars, artillery, anti-tank guns and all types of transport** compared to those in the rear (or reserve) of the Odessa Military District. However, all the Odessa Military District reserve rifle divisions *would have at least two weeks to organise and improve their personnel levels before going into combat.*

Of the **12 rifle divisions in the Odessa Military District, 8 were established before 1940.** We are mainly interested in the rifle divisions in the 9 Army as these are the divisions that saw combat in late June and early July 1941 (more or less in the same state that they were in on 22 June). An examination of the available equipment shows that on average the 9 Army's rifle divisions possessed over 90% of their authorised MGs, and were at full strength in mortars, anti-tank guns and infantry guns. In addition they had close to all their authorised artillery with 94% of 76mm field guns, 97% of 122mm howitzers, 100% of 152mm howitzers and 83% of heavy anti-aircraft guns. **As in the Western and Kiev Special Military Districts, all this equipment was maintained at a high level even in the '12' strength peacetime rifle divisions**: the Red Army did not plan to commandeer this type of equipment from any other source in the event of war (to fully mobilise these divisions).

It is again worth noting that **all the rifle divisions in 9 Army were at full strength in anti-tank guns and even those in reserve were near to full strength.** Similarly to the Kiev Special Military District (Southwestern Front) and the Western Special Military District (Western Front), shortages of suitable anti-tank guns was not the major problem facing the Soviet rifle divisions (which is a common perception). This is especially significant because **only 244 tanks and assault guns were fielded by the entire Rumanian 3 and 4 Army, and the German 11 Army, in June 1941**. There was going to be no rapid armoured breakthroughs on this front.

The areas where the rifle divisions in the Odessa Military District remained weak were: **all forms of transport and especially motorised transport, all types of light anti-aircraft weapons, and, initially at least, lack of rifle-infantry.** The 9 Army's rifle divisions averaged only around **19% of their authorised trucks, 36% of the required towing tractors**, 21% of their authorised 37mm anti-aircraft guns, 16-24% of their heavy authorised

[240] **Note:** I am making "swift work" of this final military district.

quad AAMGs and 12.7mm AAMGs, and 40% of their full complement of rifle-infantry. Those (reserve) divisions east of the Dniester River were even weaker than this: they averaged only around **8% of their authorised trucks, 27% of the required towing tractors**, 0% of their authorised 37mm anti-aircraft guns, 4-9% of their authorised quad AAMGs and 12.7mm AAMGs, and only 22% of their full complement of rifle-infantry. Clearly the reserve rifle divisions needed to be brought up to a higher strength, especially all types of transport and rifle-infantry, before being committed to combat operations. (665)

Of the **12 rifle divisions deployed in the Odessa Military District (Southern Front)** on 22 June 1941, **4 were completely destroyed and officially removed from the Soviet order of battle during 1941**. **None of the divisions initially deployed under the 9 Army were lost. They all managed to conduct a slow and relatively orderly fighting withdrawal into Odessa or the western Ukraine,** under pressure from the Rumanians or the German 11 Army. Some of these divisions did come close to being destroyed (e.g., they were evacuated from Odessa or across the Kerch Straits in the Crimea in 1941) and they all suffered high attrition rates. **The divisions completely destroyed were the 116, 196, 206 and 147 Rifle Divisions.** These divisions all spent around two weeks organising and mobilising before being sent north in mid-July to assist the Southwestern Front as part of the 7 Rifle Corps. The 7 Rifle Corps and all its divisions were completely destroyed in the Kiev pocket in September 1941. It is significant that the only rifle divisions which were deployed in the Odessa Military District on 22 June 1941 and which were completely destroyed in 1941, were lost fighting the German forces further north. This is not a reflection on the Rumanian forces but an illustration of the difference between an infantry force with very limited mobility (the Rumanian 3 and 4 Armies), and a fast moving and much more lethal mechanised/armoured force backed up by heavily armed infantry (the 1 Panzer Group and German 6 Army). (p. 667)

b. 3rd Airborne Corps:

The 3 Airborne Corps was a new formation formed in April 1941. It comprised the very new 5 and 6 Airborne Brigades and the older 212 Airborne Brigade (which was formed in 1938). Because the 5 and 6 Airborne Brigades had only started forming in April 1941, it meant that, at most, a third of the airborne brigade was 'jump' or parachute trained. **In addition the corps had never trained together as a unit prior to the Axis invasion.** On 22 June 1941 the 3 Airborne Corps was deployed in the rear of the Odessa Military District and well away from any potential front. **It was given around two weeks to organise and was then shipped north to reinforce the Southwestern Front,** having never gone into action against the Rumanians or the German 11 Army in the south. In early July 1941 the **3 Airborne Corps was committed to battle as lightly armed infantry**. The 5 Airborne Brigade was used in the Kiev Fortified Sector from mid-July 1941, while the 6 and 212 Airborne Brigades were assigned to various locations west of Kiev. Luckily for the 3 Airborne Corps it was ordered out of the Kiev sector before the Kiev pocket formed, thus avoiding complete destruction which was the fate of the Southwestern Front's 1 Airborne Corps. **In mid-November 1941 the remnants of the 3 Airborne Corps became the 'new' 87 Rifle Division by making the 5, 6 and 212 Airborne Brigades into the division's 16, 96 and 283 Rifle Regiments, respectively.** (p. 668)

c. Cavalry Divisions:

On 22 June 1941 the cavalry forces in the Odessa Military District included the **veteran 2 Cavalry Corps**[241] under the 9 Separate Army and the separate 32 Cavalry Division.[242] The 2 Cavalry Corps comprised the 5 and 9 Cavalry

[241] **Note:** Total personnel: **13,340.** Possessed **42** BT-2 and BT-5 tanks, **32** 45mm AT guns.

[242] **Note:** The **32 CD** was formed in 1938 and in June 1941 it was deployed in the Crimea. After several weeks of mobilising and organising, the 32 Cavalry Division was sent a very long way north to reinforce the collapsing Western Front. In Western Front it became a major component of the **Batskelevich Cavalry Group**, along with the newly mobilised 43 and 47 Cavalry Divisions. The group carried out several raids into the flanks and rear of the German 2nd Panzer Group and 2nd Army south of Smolensk in July and August 1941. It was named after the commander of the 32 CD, Colonel A.I.

Divisions, and was probably the most combat ready mobile formation in the 9 Army in June 1941. **Both these divisions were premier divisions in the Red Army at this time**. The 5 Cavalry Division's lineage dated back to 1919 and the 1 Cavalry Army of the Russian Civil War. The 9 Cavalry Division's history also dated back to the Civil War where it was known as the Crimean Division. (669)

Provided the 2 Cavalry Corps didn't come up against enemy tanks or heavily armed infantry, and kept away from enemy low-level attack aircraft, it remained a very effective mobile raiding force. In Southern Front's 9 Army these preconditions were largely met during late June and July 1941. Consequently **the 2 Cavalry Corps successfully conducted delaying actions, raids and counterattacks in the southern Ukraine during the summer of 1941**. After Southwestern Front was annihilated in the Kiev pocket, the 2 Cavalry Corps was quickly shifted north. By October 1941 it was raiding the flanks of the **German assault on Tula and Orel**, but this time the casualties proved to be far heavier than in the summer fighting further south. **In late October the much depleted 2 Cavalry Corps was withdrawn into Stavka reserves**. Considering the dire situation across the whole front at this time, the 2 Cavalry Corps must have required major rebuilding for the corps to be withdrawn to reserves. The 2 Cavalry Corps was r**ebuilt (to the much smaller July 1941 *Shtat*)** and on 26 November 1941 the 2 Cavalry Corps was redesignated the **1 Guards Cavalry Corps** in honour of its performance during 1941. As part of this process, the 5 and 9 Cavalry Divisions were also redesignated the 1 and 2 Guards Cavalry Divisions, respectively. (p. 669)

d. 2 Mechanised Corps:[243]

The 2 Mechanised Corps was one of the early forming mechanised corps, and it started forming in June 1940 using cadres from the 173 Motorised Rifle Division, the 4 Light Tank Brigade and various tank battalions removed from the rifle divisions in the district. By June 1941 the corps included the 11 and 16 Tank Divisions, the 15 Mechanised Division, the 6 Motorcycle Regiment, the 49 Engineer Battalion, the 182 Armoured Signal Battalion and the 102 Aviation Squadron. In terms of equipment on hand, the 2 Mechanised Corps was the most powerful armoured and mechanised unit in Bessarabia (and in the entire Odessa Military District), *and it was far more powerful than anything opposing it in Rumania in June and early July 1941*. (p. 671)

The general historical view seems to be that the 2 Mechanised Corps was relatively weak in June 1941. It is unclear why this perception exists, but presumably it is because it had "only half" of its authorised tanks. However this was still a great many tanks, and, far more important than numbers of tank, in every other regard the 2 Mechanised Corps was in good condition. It was almost fully manned, had more motorised vehicles than any other mechanised corps in the entire Kiev Special or Odessa Military Districts (Southwestern or Southern Fronts), had most of its reconnaissance armoured vehicles, and was close to full strength in artillery and heavy weapons. In addition to all this, the **2nd Mechanised Corps had 50 T-34s, 10 KVs, and 300 relatively modern and fast BT-7/7M tanks out of 517 tanks on strength.** This means that the 2 Mechanised Corps, alone, had over twice as many tanks as the total number of tanks and assault guns in the entire Axis force that initially invaded the Odessa Military District. **Only 244 tanks and assault guns were fielded by Army Group Antonescu** (3 and 4 Rumanian Armies and reserves) and the German 11 Army in June and early July 1941.[244] To push the tank balance even further in the Soviets' favour was the fact that 354 tanks (68%) of the tanks in the 2 Mechanised Corps were **BT**

Batskelevich. **This group was the first such 'cavalry group' organised during the war.** C.C. Sharp, *'Red Sabers', Soviet Cavalry Corps, Divisions, and Brigades 1941 to 1945*: Soviet Order of Battle World War II Volume V, George. F. Nafziger, West Chester, OH, 1995, p. 24.

[243] **Note:** Total personnel: **32,396.**

[244] **Note:** This includes the **126 R-2s and 75 R-35s** in the **1st Rumanian Armoured Division**, 22 R-1s in the various Rumanian cavalry brigades and **21 StuG III** assault guns in the German **190th Assault Gun** (StuG) Battalion. Note, the R-1s and R-2s were relatively old, lightly armed and very lightly-armoured AFVs. The Soviet 9 Separate Army's 2 and 18 Mechanised Corps had **797 tanks on 22 June 1941**, while there were **1,011 tanks in the Odessa Military District in total**. This gave the Odessa Military District **a tank superiority of over 4 to 1 against the invading Axis forces in June and early July 1941**.

fast tanks, which were superior AFVs to the majority of Rumanian tanks. This is before we even consider the additional presence of **60 T-34 and KV tanks.** In terms of personnel, weapons, vehicles and overall readiness, the 2nd Mechanised Corps was actually amongst the most powerful corps in the Red Army in June 1941. Furthermore, it was opposed by weak enemy tank forces or other infantry-based forces with far less mobility (at least for the first month of the campaign). (pp. 671-72)

f. 18th Mechanised Corps:[245]

The 18 Mechanised Corps started forming in February-March 1941. It comprised the late forming 44 and 47 Tank Divisions, the 218 Mechanised Division, the 26 Motorcycle Regiment, the 68 Engineer Battalion, the 552 Armoured Signal Battalion and the 118 Aviation Squadron. In all respects, **the readiness state of 18 Mechanised Corps was well below that of the 2 Mechanised Corps** (above). . . On 22 June 1941 the 18 Mechanised Corps contained 74% of its authorised personnel, only 27% of its authorised motor vehicles, **18% of its authorised towing tractors**, 14% of its authorised mortars, 47% of its authorised artillery (including anti-tank and anti-aircraft guns), 2% of its authorised armoured cars and **27% its full complement of tanks**. This meant the 18 Mechanised Corps was very fragile organisationally (in terms of C&C and unit cohesion), had poor mobility and had limited overall combat power. Fortunately it was initially deployed southwest of Odessa; well away from the path of any dangerous and fast moving panzer troops. (675)

The **44th Tank Division** was formed in February-March 1941 from the 23 Light Tank Brigade, and was still in the early process of formation on 22 June 1941. At this time the division had around 78% of its authorised personnel **but only 10-17% of its authorised towing tractors and trucks**. The 44 Tank Division also had only 1 light battalion in its artillery regiment (with 2 batteries of 122mm howitzers), a third of its authorised mortars, half its authorised anti-tank guns, and no 76mm artillery or anti-aircraft guns. The division's **209 tanks** were a hangover from being formed from a light tank brigade, and consisted of a mixture of **old T-26 tanks and tankettes**. The 44 Tank Division was initially deployed facing the infantry based Rumanian 4 Army, and it was almost certainly this fact which prevented its destruction in the first weeks of war. . . It was while in the 6th Army that the large bulk of the division, including its rear elements, **were lost in the Uman pocket.**

The **47 Tank Division** was formed in February 1941 from the 49 Light Tank Brigade, and, if anything, it was in even worse shape than the 44 tank Division (above). On 22 June 1941 the division had approximately 68% of its authorised personnel, **only 5-9% of its authorised towing tractors and trucks**, a third of its authorised 122-152mm artillery, and was very short of mortars and anti-aircraft guns. Furthermore the division had no armoured cars, and only **22 BT and T-26 tanks** (a single tank company). Like the other divisions in 18 Mechanised Corps, the 47 Tank Division had a relatively easy initial war period compared to the Red Army divisions further north. By July-August 1941 the 47 Tank Division was reporting directly to the 18 Army in Southern Front, and in September 1941 it was transferred northwards to 38 Army in Southwestern Front. In October 1941 the severely depleted division was withdrawn and sent to the North Caucasus Military District to help form the 47 Tank Brigade. There can't have been much left of the 47 Tank Division by October 1941 because the small 47 Tank Brigade didn't complete its formation until April 1942 in Stalingrad. (676)

The **218 Mechanised Division** was formed in February 1941 from the 12 Motorised Rifle Brigade. This meant that, like the tank divisions in the same corps, the 218 Mechanised Division was only 3-4 months old when it was forced to go to war. Nevertheless the 218 Mechanised division was **probably the most 'combat ready' division in the 18 mechanised Corps on 22 June 1941**. On the plus side it had around 79% of its authorised personnel, **35-46% of its authorised towing tractors and trucks,** and 75-100% of its authorised anti-tank guns and 76mm artillery. On the downside the division had very few mortars and all types of anti-aircraft weapons, no armoured cars, and **only 45 BT tanks in its tank regiment**. **The division was also very short of medium to heavy artillery.** The 218 Mechanised Division fought mainly as a rifle unit with the 9 Army across the southern Ukraine and the

[245] **Note:** Total personnel: **26,879.**

Donbass until September 1941. On 8 September all pretence at being a 'mechanised' division was dropped and the **218 Mechanised Division was redesignated the 'new' 218 Rifle Division** by adding the 182 Rifle Regiment from reserves. After a period of rebuilding in the Southern Front reserves, the 218 Rifle Division was assigned to the 12 Army (Southern Front) in November 1941. (p. 676)

g. Total Manpower and Equipment in the Odessa Military District (22 June 1941):

Summarising the reconciled results for the entire district, including the 9 Separate Army, we can see that there were **11,381 crew served MGs** (excluding 12.7mm AAMGs), 3,360 mortars, 2,809 artillery pieces (including anti-tank guns but excluding anti-aircraft, coastal and rail guns), 429 anti-aircraft artillery guns, **1,011 tanks and tankettes**, and **339,291** personnel present in the Odessa Military District on 22 June 1941. (p. 685)

It is interesting to note that of the total equipment shown in table Ode MD Total, the 9 Separate Army contained **174,620 personnel**, 6,381 crew served MGs, 118 AAMGs, 7,821 trucks, 2,220 other motorised vehicles, 1,471 tractors and 31,701 horses. This means the 9 Separate Army contained over half the personnel, most of the MGs and most of the motorised transport in the Odessa Military District. The 9 Separate Army figures acquire importance if reviewing different sources regarding Soviet armed forces strength in the Western Military Districts on 22 June 1941. **This is because some sources only include the 9 Separate Army as 'in the Western Military Districts' while others include the Odessa Military District as well**. *In the former case the Odessa Military District is treated as one of the USSR's internal military districts.* This represents a difference of over 164,000 men with a large number of heavy weapons and artillery in the final analysis. For the purposes of this work and the Soviet FILARM model, both the 9 Separate Army and the Odessa Military District are classified as being 'in the Western Military Districts' on 22 June 1941.

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Appendix A
The T-34 in WWII: the Legend vs. the Performance

The technical superiority of the T-34 in 1941 (and during WWII in general) has become the stuff of legend. *Its apparent superiority has become so entrenched in the psyche of post WWII authors that it is now assumed without question*. Some go as far as to claim the T-34 as "the finest tank of the twentieth century" and the T-34 "rendered the entire fleet of German tanks as effectively obsolete". However, if battle performance was (and indeed still is) the ultimate determinant of the effectiveness of any weapon system, **then unlike some legends in WWII, the tactical combat record of the T-34 does not match up to its legendary status**. An objective look at the T-34's record, without preconceptions, reveals questions which are hard to answer given the T-34's apparent superiority. (p. 689)

Were T-34 and KV Tanks Only Available in Small Numbers During 1941?

There is little doubt that as an all-round tank the T-34 was the most powerful medium tank in the world in 1941, with far reaching influences on future tank design. Historically, the poor showing of the T-34 in 1941 has been entirely attributed to the general state of the Red Army's mechanised forces in 1941, and the 'small' number of T-34s available. This is accomplished with statements along the lines that 'T-34 and KV tanks were only available in small numbers' and 'the small number of available tanks was distributed amongst the Army in small packets'. **These statements are only true if the number of T-34s involved is measured relative to other Soviet tank types available during the second half of 1941, and not if measured against the number of German tanks available during the same period.** Logically, it is only the latter comparison that is important if assessing relative combat performance.

From June to December 1941 the Soviets either already had in service, or placed in service, a total of at least **3,017 T-34s out of a manufactured total of 3,111.**[246] This is not a small number even by later WWII standards. With this number in service, T-34 tanks must have been much more established during 1941 than common perception. **For comparison the total number of German Pz IIIs, Pz IVs and StuG III assault guns committed to the East Front, during the entire period under consideration, was 2,688.** This figure includes Pz IIIs with only 37mm guns, all the tanks and assault guns in all the units that arrived as reinforcements in transferred (to the East Front) units, and all Replacements (R) up to December 1941. *These were the only general issue German AFVs which had any reasonable chance of success in one to one combat with a T-34 or KV tank, and, based on a cursory analysis of armour and firepower, this chance was theoretically low.*

In other words, even in 1941 the Red Army fielded over 1.12 times as many T-34s as any German AFV 'theoretically' capable of taking them on. If we add the **1,560 even more powerful KV-1 and KV-2 tanks fielded by the Soviets from 22 June 1941 to 31 December 1941** (i.e., assigned to Red Army combat units out of the 1,602 manufactured), this figure increases to a very large 1.7 to 1 in the Soviets' favour. This is before we even consider the many thousands of other tank types that the same German Pz IIIs, Pz IVs and StuGs had to fight against during 1941.

Were T-34 and KV Tanks Distributed Amongst the Red Army in Small Packets During 1941?

[246] **Note:** This includes: **1,225 T-34s manufactured before 22nd June 1941,** of which **956** were in service with the Red Army. In addition **1,886 were manufactured from 22nd June to December 1941**, of which at least 95%, or 1,792 entered service. Refer Volume IIIA 2. 6) k. - 'T-34 Medium Tank'. Also refer to Volume IIIB 1. 15) - 'The Soviet Tank Deployment Matrix' for details on the numbers (and distribution) of T-34s and KV tanks Deployed (D) on 22nd June 1941.

We now come to the 'small packet' statements regarding T-34 deployments. In fact, on 22 June 1941 the majority of T-34 and KV tanks were actually concentrated in several powerful mechanised corps, and were definitely not dispersed in small packets. For example:

● The 4 and 7 Tank Divisions, 6 Mechanised Corps, Western Special Military District had **238 T-34s and 114 KVs** on strength on 22 June 1941.

● The 8 and 32 Tank Divisions, 4 Mechanised Corps, Kiev Special Military District had **313 T-34s and 99 KVs** on strength on 22 June 1941.
(p. 689)

● The 12 and 34 Tank Divisions, 8 Mechanised Corps, Kiev Special Military District had **100 T-34s and 71 KVs** on strength on 22 June 1941.

Considering that T-34 and KV tanks apparently 'rendered all other tanks in the world as obsolete', then the 4 tank divisions in the 4 and 6 mechanised Corps easily represented (on paper) the most powerful concentrated armoured formations in the world during the whole of 1941, and even well into 1942. **From late August 1941 the Red Army started creating tank brigades**, each with 29 authorised T-34 and KV tanks (and 38-64 lighter tanks depending on TOE). By October 1941 many of these tank brigades were in action, but by then many of the panzer division's panzer regiments were dispersed over wide areas and had far fewer numbers of operational tanks. In short, by late 1941 the Germans had almost as many problems concentrating their armour as the Soviets did. (p. 690)

The T-34's Overall Combat Results During 1941

The combat results for 22 June to 31 December 1941 show the Soviets lost an average of over 7.4 tanks for every German tank lost.[247] If all German fully tracked AFVs (assault guns, tank destroyers, SP artillery, etc.) and losses from Germany's allies are included in the German figures, then the ratio drops to 6.6 to 1 in the German favour. Of the total of 20,500 Soviet tanks irrecoverably lost in 1941, ca. **2,300 were T-34s and over 900 were mostly KV heavy tanks.** Even if the T-34's loss ratio was better than 7 for every German tank, it was still **most likely in the region of 4-5 to 1**. Frankly, if 2,300 of any new *Wehrmacht* tank type had been lost within six months of its first deployment, even with a loss ratio of 1 to 1 (let alone 0.2-0.3 to one), then most WWII historians would have described the tank's combat record as an unmitigated disaster.

More informed commentaries relating to the T-34's combat performance in 1941 consider factors such as: **the T-34 tank crews had little time to train on their machines, they had major ammunition supply problems, and the support infrastructures were not in place to recover damaged machines**. These arguments have a lot more merit than the 'only small numbers available' or the 'committed in small packets' arguments. There is no doubt that a large proportion of T-34s in 1941 fell victim to operational type losses, especially in the situations the Red Army found itself in during the summer of 1941. **Many T-34s had little or no armour piercing ammunition in June 1941, although they did in the months that followed**. Many T-34s were abandoned and lost due to breakdown, being bogged down or simply running out of fuel. The *Red Army's tank divisions, already very short of tractors, had little to no recovery vehicles or time to recover these tanks*. However, even if we assume a

[247] **Note:** T. Bean, W. Fowler, *Russian Tanks of WWII-Stalin's Armoured Might*, Ian Allan Publishing, London, 2002, appendix, p. 170. Also, S. J. Zaloga, L.S. Ness, *Red Army Handbook 1939-1945*, Sutton Publishing, Stroud, UK, 1998, p. 181, table 6.3. Figures quoted are **20,500 Soviet tanks irrecoverably lost vs. 2,758 German tanks irrecoverably lost**. The Soviet figure is also verified by *Soviet Casualties and Combat Losses in the Twentieth Century*, Col. Gen. G.F. Krivosheev (ed.), et al, English Translation of the Russian General Staff 1993 Study, Greenhill Books, London, 1997, p. 252, Table 95. Apparently the *German loss figures include losses fighting against the Western Allies as well*.

staggering 40-50% of T-34s were operational losses (which is probably too high an estimate), then the T-34's loss ratio in tactical combat is still around 3 to 1 in the German favour.

The Effect of Anti-Guns on the German-Soviet AFV Kill-Loss Ratio During 1941

At this point it is worth digressing to review the critical role (and effect) of towed anti-tank guns in this analysis. It has been put to me that focusing solely on the AFV vs. AFV kill-loss ratio fails to consider tanks lost due to other causes. This, in turn, could significantly distort the kill-loss ratio in favour of one side or the other. This view does have a lot of merit. **Firstly, the primary role of tanks at the tactical-operational level in WWII was actually not the destruction of enemy tanks.** The ability of tanks to kill tanks stemmed from the fact that they generally had the firepower to engage enemy tanks, and that they inevitably came into contact with enemy tanks on the battlefield (both in offense and especially if forced to defend a position). **The primary role of tanks was to concentrate enough firepower, protection and mobility at a single location (a point of main effort)[248] in order to enable a rapid breakthrough of the enemy's position**. Tanks and other mechanised forces would then exploit this breakthrough. Secondly, the primary role of anti-tank guns was specifically to stop and destroy enemy tanks. Anti-tank guns were generally deployed to prevent the 'tank breakthrough' scenario above. Ideally, both tanks and anti-tank guns were supported in their respective roles by infantry, artillery, anti-aircraft guns and aircraft (any and all if possible). (pp. 690-91)

Later in the war (especially from early 1943) the advent of specialised and powerful tank-destroyer AFVs meant the role of the towed anti-tank gun was supplemented by these vehicles. In addition the tank-destroyer AFVs could operate in a more pro-active fashion and 'seek out and destroy' enemy armour. Note: The large majority of specialised tank destroyers fielded in WWII were poor at engaging enemy anti-tank guns and infantry. Assault guns (especially German assault guns) introduced another layer of complexity again. They were generally turretless vehicles with tank type armour and primarily designed to support infantry. The fact that the German assault guns became prolific tank-destroyers during WWII was more due to necessity than purposeful design. The Germans had no choice but to use their assault guns as tank-destroyers and even as tanks (although their excellent design, optics and firepower enabled them to be very effective in these roles).[249]

The upshot of all this is that during WWII, especially from 1939 to 1943, tanks actually spent far more time engaging enemy anti-tank guns, infantry, artillery, pillboxes, bunkers and other fortified positions, than they did in direct combat with enemy tanks. This was particularly true if tanks were involved in offensive operations, and at the operational level tank units were usually kept in reserve ready for major offensive operations or as a mobile counter-attack force. **The result was that overall tank losses during WWII were, in general, considerably higher against enemy anti-tank guns, infantry and artillery than they were against enemy tanks**. This was especially the case from 1939 to 1943. In fact, throughout 1941 to 1944 German tank crews were more afraid of hidden Soviet anti-tank guns than they ever were of Soviet tanks. The famous German tank-ace, **Michael Wittmann, is quoted as stating "to destroy an enemy tank is important, but to destroy an enemy anti-tank guns is doubly so".**

So the question is; how does this background affect our overall **6.6 to 1** German-Soviet AFV kill-loss ratio in 1941? The table below summarises the numbers and losses of the most important anti-tank gun calibres fielded by the Soviets and Germans on the East Front during 1941. The numbers 'fielded' includes the guns Deployed (D) on 22 June 1941, all guns received as part of reinforcing units (arriving at the front assigned to a combat unit), and all guns received as Replacements (R).[250]

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[248] **Note:** To create a *Schwerpunkt*.

[249] **Note:** German fully tracked AFVs, such as the StuG III assault guns and tank-destroyers like the 4.7cm Pak(t) auf Pz. Kpfw I, are included in the 6.6 to 1 German-Soviet AFV kill-loss ratio.

[250] **Note:** Small numbers of **Soviet 57mm anti-tank guns and German 47mm (mainly French and Czech supplied)** anti-tank guns are excluded. The numbers fielded were relatively small and do not significantly affect the overall balance of

Principal Soviet and German Anti-Tank Gun Calibres Fielded on the East Front from 22 June to 31 December 1941.

Soviet:

Calibre	No. Fielded	Lost (ca.)	% lost
45mm	17,214	12,000	70%
76mm	11,696	7,000	60%
Totals	28,910	19,000	66%

German:

Calibre	No. Fielded	Lost (ca.)	% lost
37mm	12,681	3,276	26%
50mm	2,235	426	19%
Totals	14,916	3,702	25%

The first thing that is apparent from this data is that the **average Soviet anti-tank gun fielded was significantly larger and more potent (against tanks as well as soft targets) than the average German anti-tank gun**. All the 45mm gun types were more powerful than the German 3.7cm Pak 36, and all the Soviet 76mm field-gun types were more powerful than the German 5cm Pak 38. The latter was also in short supply, with **only 812 5cm Pak 38s available to the German forces on 22 June 1941.** The mitigating circumstance here is that the 76mm weapons were also largely used as light artillery as well as anti-tank guns (*they had AP ammunition and the optical gun-sights required*). In the Soviet anti-tank brigades and anti-tank battalions, the 76mm guns were designated solely as anti-tank guns. (p. 691)

All the German tanks were vulnerable at normal combat ranges to the Soviet 45-76mm weapons, whereas all the Soviet tanks, with the exception of T-34 and KV tanks, were vulnerable at normal combat ranges to the German 37-50mm weapons. Both the T-34 and KV tanks were more or less immune to the 3.7cm Pak 36, while the 5cm Pak 38 was hard pressed to deal with a T-34 (it realistically had to be at close range). **The KV tanks were very tough opponents for all German 1941 anti-tank weapons, and required a huge volume of fire at close range, a lucky shot or some other weapon to destroy them.** Given the Soviet technological advantages in the armour vs. anti-armour race, we would normally expect the Soviet 1941 tanks to have had a higher kill-loss ratio against anti-tank guns than the 1941 German tanks. (p. 692)

The second thing that is apparent is that the Soviets fielded 1.4 times as many light anti-tank guns (37-45mm) as the Germans did, and 5.2 times as many medium anti-tank guns (50-76mm) as the Germans did. In total the Soviets fielded 1.9 times as many light-medium anti-tank guns. The proportionate losses were, however, much higher. The Soviets lost around two thirds of all the guns fielded while the Germans only lost around a quarter of those fielded. **Overall, the Soviets lost over 5.1 45-76mm guns for each German 37-50mm gun lost. This ratio, significantly, is not too different to the corresponding overall German-Soviet AFV kill-loss ratio (of 6.6 to 1).**

If we correlate the AFV and anti-tank gun losses in 1941, we find:

● The Soviets lost 5.5 tanks for each German 37-50mm gun lost, which is similar to the overall German-Soviet AFV kill-loss ratio of 6.6.

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forces shown.

● The German forces lost 0.16 AFVs for each Soviet 45-76mm gun lost, which is very similar to the overall Soviet-German AFV kill-loss ratio of 0.15.

● In addition we find the Soviets lost 1.1 tanks for each of their own 45-76mm guns lost, while the Germans lost 0.8 AFVs for each of their own 37-50mm guns lost. In other words, both the Soviets and German forces lost close to 1 tank for each of their own anti-tank guns lost.

These raw numbers infer that the German and Soviet tanks, on average, spent similar amounts of time engaged with anti-tank guns and enemy tanks. They also show that the average German tank's tactical-operational level kill ratio against towed Soviet anti-tank guns was similar to their kill ratio against Soviet tanks. Equally as important, the figures show that the average Soviet tank's tactical-operational level kill ratio against towed German anti-tank guns was very similar to their very poor kill ratio against German tanks.

Clearly, factoring anti-tank guns 'into the equation' does not change the fact that **in 1941 around 3 T-34s were lost for each German tank** (**as well as ca. 3 T-34s for each German anti-tank gun**) during tactical-level combat. The bottom line is that Soviet 1941 tanks, including T-34s, were neither optimised for tank vs. tank combat, or tank vs. anti-tank gun combat. If we include T-34 operational losses in 1941 (i.e., tanks broken down, abandoned, etc.), this figure still goes up to **4-5 to 1 in the German favour.**

As a general comment, we should not really be surprised by these figures. What they essentially show us is what common sense tells us; which is that if we take account of the tanks lost to other causes (than enemy tanks) on one side, then we have to make precisely the same allowances for the tank losses on the other side. These effects then largely cancel out. There is no doubt that non-AFV based anti-tank weapons altered the pure AFV vs. AFV kill-loss ratios during WWII, especially as most WWII tanks were not destroyed by enemy tanks. However, in general this effect during 1939 to 1943 was in the region of plus-minus 5-20% (depending on the particular campaign). **During 1944-45, with the proliferation of lethal hand held anti-tank weapons and ever larger numbers of ground-attack aircraft, the pure AFV vs. AFV kill-loss ratio was probably altered in the region of plus-minus 10-40%.**

The T-34's Design Weaknesses

When one considers the **apparent armour-gun superiority of the T-34**, the question has to be asked; why did the T-34 consistently *suffer at least a 3 to 1 loss ratio* against 'inferior and obsolescent' enemy tanks in tactical combat, i.e., when they were actually shooting at each other? Either the Germans' combat proficiency was supernatural, the Soviets' combat proficiency was unbelievably incompetent, *or there were design flaws inherent in the T-34 as a complete weapon system* which are not apparent in a cursory analysis of combat power based on armour and gun penetration. I believe the latter to be the case. (p. 692)

The T-34/76's single greatest weakness was its fire control efficiency. It suffered from the same two-man turret syndrome as other Soviet tanks in this period, namely that the tank's commander, gun aimer, gun-firer and platoon commander (if a platoon leader) were all the same person. Exacerbating this was the fact that the T-34/76 had relatively **poor main gun optics** quality, no turret basket, a very cramped and low turret (the **gun could not depress more than 3 degrees**, severely restricting use on a reverse slope or at close range), poor turret drive reliability, **no radios**, and generally poor target observation and indicator devices (including no turret cupola and **only 1 vision periscope for the tank's commander**). All these factors are considered in detail in calculating a tank's Fire Control Effect (FCE) factor detailed in Volume I. **In summary, the T-34/76's inherent fire control efficiency was so bad that even well trained and experienced tank crews were put at a severe disadvantage.** For inexperienced tank crews, with no radios and probably no organised combined arms support, it was a disaster. (pp. 692-93)

So what was the result of the T-34/76's very poor overall FCE factor? **In one report German tankers noted that "T-34s operated in a disorganised fashion with little coordination**, or else tended to clump together like a hen with its chicks. *Individual tank commanders lacked situational awareness due to the poor provision of vision devices and preoccupation with gunnery duties*. A tank platoon would seldom be capable of engaging three separate targets, but would tend to focus on a single target selected by the platoon leader. As a result T-34 platoons lost the greater firepower of three independently operating tanks". **The Germans noted the T-34 was very slow to find and engage targets while their panzers could typically get off at least 3 rounds for every 1 fired by the T-34**. (p. 693)

A German Army combat report from 1941 highlights the problem with the T-34/76's fire control systems and also **why its overall combat power is so (historically) overrated**. "Remarkably enough, one determined 37mm gun crew reported firing 23 times against a single T-34 tank, only managing to *jam the tank's turret ring*". In this engagement T-34 proponents will highlight the impunity of the T-34 to the 3.7cm Pak 36 anti-tank gun. However this is hardly surprising against a gun that can only penetrate 29mm of 30 degree sloped armour at 500 metres with ordinary AP ammunition. What is really important in this story is that the anti-tank gun managed to get 23 shots off, and it turns out that the T-34 in this report didn't even manage to hit the anti-tank gun! Once better anti-tank guns appeared, which they rapidly did, T-34s would be lucky to survive 2-3 rounds. Contemporary German tank crews would have been appalled if they let enemy anti-tank guns get more than a couple of rounds off before they took defensive action. This example highlights the difference between tanks designed to optimise all their fire control related systems and hence maximise their firepower, and those that weren't.

The T-34's Performance in 1942

The only problem with using 1941 figures is that **T-34 proponents will always argue** that the operational state of the Soviet mechanised forces, and the general situation in 1941, were the primary factors in the T-34's combat performance during 1941. So what of the T-34's combat record in later years, when these operational factors were removed or when they had swung in the Soviets' favour? **The combat results for 1942, 1943, 1944 and 1945 show the Soviets lost (at least) an average of 6, 4, 4 and 1.2 tanks, respectively, for every German tank lost.**[251] If all German and Soviet assault guns, and all other types of fully tracked AFV losses are included, then the ratio changes to 5, 3, 3 and 1.3 for 1942, 1943, 1944 and 1945, respectively, in the German favour.[252] *The figures for 1945 are not much use as the majority of German losses were operational or strategic*, i.e., they are classified as lost when Germany surrendered in 1945. The figures for 1942 to 1944 are more useful in assessing the T-34's tactical combat performance. (p. 693)

The year 1942 deserves particular attention, because at the operational level the sides were more evenly matched. In this year the most common Soviet main battle tank was the T-34/76. The most common German main battle tanks were Pz IIIs with long and short 50mm guns, and Pz IVs, most still with short 75mm L/24 guns. **The Pz IV and StuG assault guns with long 75mm L/43 or L/48 guns had only began appearing on the East**

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[251] **Note:** T. Bean, W. Fowler, *Russian Tanks of WWII-Stalin's Armoured Might*, Ian Allan Publishing, London, 2002, appendix, p. 170. Also, S. J. Zaloga, L.S. Ness, R*ed Army Handbook 1939-1945*, Sutton Publishing, Stroud, UK, 1998, p. 181, table 6.3. The above state the Soviets lost **20,500, 15,000, 22,400, 16,900 and 8,700 tanks** (excluding fully tracked and turretless assault guns and tank destroyers) from 1941 to 1945, respectively (total, **83,500 tanks**).

[252] **Note:** As stated, the Soviet figures (above) exclude fully tracked and turretless assault guns and tank destroyers (such as the **Su-76, Su-85, Su-100, ISU-152, IS-122, IS-152**, etc.). These are included in *Soviet Casualties and Combat Losses in the Twentieth Century*, Col. Gen. G.F. Krivosheev (ed.), et al, English Translation of the Russian General Staff 1993 Study, Greenhill Books, London, 1997, p. 252, Table 95. These show Soviet fully-tracked AFV losses as 20,500, 15,100, 23,500, 23,700 and 13,700 from 1941 to 1945, respectively (**total 96,500 AFVs irrecoverably lost) [which comes to almost 70 tanks/day over 1418 days**]. These figures include the 13,000 fully tracked and turretless assault guns and tank destroyers (referred to as self-propelled guns in Russian terminology), which the USSR also lost in WWII. Also, refer to Volume V - 'Relative Overall Combat Proficiency (ROCP) of Soviet and Axis Forces during WWII' which includes all German and Soviet fully tracked AFV losses.

Front in limited numbers. These guns were capable of destroying a T-34 frontally at around 1,000 metres. However only 870 Pz IVs and 699 StuG IIIs with the long 75mm gun were manufactured in the whole of 1942, and many of these didn't reach the East Front until 1943. Hence for most of 1942 the majority of German tanks in the field were still the older and apparently obsolete types. **In addition many publications rate the Pz IV with the long 75mm gun as only equivalent to the T-34/76 in terms of firepower, but still much weaker in terms of armour and mobility.** (pp. 693-94)

So what happened? The Soviets still managed to irrecoverably lose 15,100 fully tracked AFVs in 1942, including 6,600 T-34s and 1,200 of the even more powerful KV heavy tanks. **This meant their overall kill-loss ratio was almost as bad as 1941!** To a large extent it was worse than 1941 because in this case over half the tanks destroyed were T-34 and KV tanks, and the large majority of losses were due to direct enemy fire and cannot be attributed to operational losses. *There is no doubt that, on average, German tank crews in 1942 were probably still the best trained and most experienced in the world*. However this does not explain how apparently obsolete and inferior German AFVs **continued to achieve a kill-loss ratio better than 3 to 1 against T-34s in direct combat**, unless the overall combat power of the T-34 is historically overrated. The T-34 must be the only tank in history rated as the best in the world in the same year it lost 3 or 4 for every enemy AFV destroyed. (p. 694)

It is well known that the only German weapon fielded in 1941 which was routinely deployed to destroy a T-34 or KV tank at long range, was the **8.8cm Flak 18/36**. Accordingly the Flak 18/36 achieved a fearsome reputation as a tank destroyer on both the East and West Fronts. In many battles during 1941, and to a lesser extent in 1942, the '88' is often credited with stopping T-34s and KVs when all else had failed. **However, we find from above that relatively few T-34s were destroyed by 88s**[253] and almost as many T-34s were destroyed by artillery. Either way, relatively few T-34s (6.3%) were destroyed by flak guns or artillery at long range.

It also appears (as we would expect) that relatively few were destroyed by direct attack from aircraft (probably some of the unknown and possibly some of the 20mm). **Most significantly, approximately three quarters of T-34s were destroyed by standard issue 1941-42 German tanks and anti-tank guns (excluding 75mm guns).** These 20-50mm calibre weapons would have needed to get perilously close to a T-34 frontally, or hit it in its more vulnerable side or rear armour. The conclusion has to be that the majority of T-34s were destroyed because their crews could not pre-empt these weapons from getting into a 'killing position' (usually because no crew member was in a position to see the enemy early), and were slow to acquire the enemy target once it became known. T**his is consistent with a very poor Fire Control Efficiency (FCE) factor in the T-34/76.**

The T-34's Performance in 1943

By 1943 the strategic initiative had swung in the Soviets' favour. Operationally the sides were similar, but as better German tanks reached the battlefield the combat power of individual AFVs had started to swing against the Soviets. **Nevertheless, many current publications still rate the T-34/76 as the best all-round medium tank in the world**, **until the advent of the Panther tank** which appeared in significant numbers after mid-1943. Despite the Germans losing progressively larger numbers of tanks as operational losses (due to recoverable tanks being abandoned on the battlefield as they retreated), and erosion of tank crew quality, t**hey still achieved a fully tracked AFV kill-loss ratio of around 3 to 1 during 1943.**

In this year the Soviets lost a staggering 23,500 fully tracked AFVs, including: **14,700 T-34s**, 1,300 heavy tanks (almost all KVs), 6,400 light tanks (mostly **T-60s and T-70s**), 500 heavy assault guns (mostly **SU-152s**), 100 medium assault guns (mostly **SU-85s and SU-122s**) and 500 light assault guns (mostly **SU-76s**). Close to two thirds (63%) of all AFVs lost were T-34s. As in 1941 and 1942, *at least 3 T-34s were lost for every enemy fully*

[253] **Note:** According to this table (results of a Soviet wartime study), only **3.4%** of T-34s were knocked out by German **88mm** guns; **61.8%** were destroyed by **50mm** guns (both "short" and "long").

tracked AFV destroyed. The vast majority of these losses were due to direct enemy fire and cannot be attributed to operational losses, because by 1943 the Soviets were most often gaining control of the battlefield and were recovering almost all disabled and partially destroyed tanks. Indeed, it was the Germans who were suffering increasing numbers of operational losses, so, if anything, the T-34's tactical loss-kill ratio (i.e., when they were actually shooting at each other) in 1943 **was probably closer to 4-5 to 1.** (p. 695)

The T-34's Performance in 1944

Even the Soviets realised that their 1943 tank loss-kill ratio was unsustainable. In order to restore the technological balance they attenuated T-34/76 production and moved quickly to up gun the T-34 with a **new turret and the 85mm M-1944 ZIS-S53 L/51.5 gun.** The new design was designated the T-34/85.

By 1944 the Soviets had the absolute strategic initiative, with massive numerical superiority across the front, and operational superiority in terms of supply distribution and support. They had the luxury (and enormous operational-strategic level advantage) of being able to concentrate large armoured forces at any points on the front they desired, while still being able to strongly defend everywhere. In terms of tactical level combat proficiency, the Soviets could now claim to have tank crews as well trained and experienced as the Germans. I**n addition the RAF and USAF had given the Soviet VVS critical air superiority for the first time.**

For most of 1944 the Soviets had technical parity in terms of AFVs, with the large majority of T-34s now being the T-34/85s. The Soviets, and many modern publications, still claim the T-34/85 was superior to any model Pz IV or StuG assault gun and similar in combat power to the Panther. On top of this the Soviets were now also fielding large numbers of the new **IS-2 heavy tanks**, one of the most powerful tanks in WWII, as well as the almost equally powerful ISU-122 and ISU-152 assault guns.

And yet, even with all the above in play, **in 1944 the Soviets still managed to irrecoverably lose 23,700 fully tracked AFVs: the highest number of AFV losses in a single year by any country in history!** These staggering losses were made up of **13,800 T-34s** (58% of the total, and the large majority being T-34/85s), 900 heavy tanks (mostly IS-2s), 2,200 light tanks (mostly T-70s), 900 heavy assault guns (mostly ISU-122s and ISU-152s), 1,000 medium assault guns (mostly SU-85s and SU-100s) and 4,900 light assault guns (mostly SU-76s). Despite all possible factors being in their favour, and despite massive German operational losses during 1944 (mainly due to recoverable tanks being abandoned on the battlefield as they retreated), t**he Soviets still managed to lose around 3 fully tracked AFVs for every German AFV destroyed, or around 4 tanks (mostly T-34/85s) for every German tank destroyed.** (p. 695)

Conclusions Regarding the T-34's Overall Performance as a 'War Winner'

The T-34 is possibly the only weapon system in history to be rated by most commentators as the finest all-round weapon in a century of warfare, and yet never consistently achieved anything better than a 1 to 3 kill-loss ratio against its enemies.1724 The fact that the USSR produced 54,550 T-34s (to become the most widely produced tank of WWII) and hence produced a 'war winning' tank is a separate strategic level discourse and should not be confused with giving the T-34 credit for being effective at the tactical level. (p. 696)

Undoubtedly the T-34 went a long way to enabling the USSR to be ultimately victorious, but the price was appalling with approximately 44,900 T-34s (82% of total production) being irrecoverably lost. Soviet output during WWII was 99,150 fully tracked AFVs (including 76,827 tanks and 22,323 assault and self-propelled guns) produced from June 1941 to May 1945, and an additional 11,900 tanks and self-propelled guns received via Lend Lease.

The Germans are often criticised for their low tank production during WWII: being accused of producing too few high quality tanks with too many refinements and excessive quality control during production. In support

of this statement the figure of only 26,900 German tanks is quoted as being produced during WWII. However tanks formed only part of German fully tracked AFV production: t**hey actually produced 26,925 tanks, 612 command tanks, 232 flame tanks, 10,550 assault guns, 7,831 tank destroyers (including 2,711 SP AT guns) and 3,738 assault and self-propelled artillery AFVs, from 1938 to May 1945**. A total of **49,888** fully tracked AFVs out of a total production of **89,254** AFVs of all types. This represents around 50% of Soviet fully tracked AFV production during WWII.

Another important fact which is almost always ignored (in the discourse on Soviet-German AFV production) is that the Germans also produced **21,880 semi-tracked Armoured Personnel Carriers (APCs)**, including 15,252 of the excellent **Sd Kfz 251s**. These vehicles weighed 7.8-10 tons (depending on which of the many variants is considered) and were as difficult to manufacture as light tanks. For comparison, the T-60 averaged around 6.4 tons and the T-70 around 10 tons, and many versions of the Sd Kfz 251 were more heavily armed than either of these tanks. **The German APCs were certainly as useful as light tanks, and were in fact more useful in the overall scheme of modern mechanised warfare.** The Soviets produced nothing comparable during WWII (although they knew the value of this type of vehicle and mass produced them post-war). And yet the lightest Soviet tanks and tankettes are always included in Soviet tank production figures, while all German APC production is completely ignored and excluded from German production figures. **In short, if the total AFVs produced by Germany and the Soviets are included, and the effects of USA and British AFV production are excluded, then Germany certainly wasn't 'swamped' by Soviet AFV production and there was nothing 'inevitable' about the outcome of the war in the East.** Furthermore it should be remembered that Western Allied strategic bombing reduced German AFV production by at least 10% in 1943, 40% in 1944 and even more during 1945; exactly when German AFV production had peaked. Unfortunately, this is yet another fact that seems to be conveniently ignored by the '**low German tank production' school of followers.**

There is no doubt that German tanks possessed many refinements, subtleties of design and high quality components which contributed to a slower production rate. In comparison Soviet tanks had a generally rough and ready finish, and lacked many features which were assumed essential by German tankers and to a large extent by their Western Allied counterparts. There were of course considerably more Soviet tanks, which ultimately helped them to win the war. Nonetheless it was these same refinements and subtleties of design which gave German tank crews the edge in combat at the tactical level . . . (p. 696)

As always, the Soviets had a choice regarding weapon system production during WWII: they could have mass produced more lower-quality and less refined AFVs, or they could have produced fewer higher-quality and more refined AFVs. **They chose the former and achieved strategic success, but payed an exceptionally high price in terms of human life**. Fortunately for the USSR (and unfortunately for many Soviet citizens) it had the 'expendable manpower' available to choose this option. In terms of AFVs, **this 'price' was the loss of 96,500 fully tracked AFVs compared to 36,100 German fully tracked AFVs** (on the East Front) during WWII (**2.67 to 1)**. (pp. 696-97)

One very significant point about these figures is that if we remove the 11,900 tanks received by the Soviets via Lend Lease, and allocate all German WWII fully tracked AFV production to the *Wehrmacht's* East Front forces (i.e., add those lost fighting the Western Allies), then the Germans would have only needed a kill-loss ratio of 2.45 to 1 in order to have destroyed every Soviet fully tracked AFVs that existed on 22 June 1941 (23,300 AFVs) and all 99,150 fully tracked AFVs produced during the war (a total of 122,450 AFVs). This figure is well below the **2.67 to 1 kill-loss ratio historically achieved by the *Wehrmacht*** (which even includes the AFVs surrendered in May 1945). **These figures, alone, demolish another more recently fashionable myth relating to the East Front; specifically that the Soviets (largely due to the huge number of T-34s produced) could have won WWII without any input from the US or Commonwealth forces.** This is before we even consider the effects of increased German production (of all weapon types, ammunition and oil) due to the absence of Allied strategic bombing, the direct effects of German air superiority on the East Front from 1943 onwards, the effects of the Red

Army losing well over half its motorised transport, and the effects of literally thousands of additional heavy 88mm flak guns on the East Front from 1941 onwards.

The ongoing discourse on the strategic decisions regarding weapon manufacture is not particularly relevant here: we are more focused on the inherent tactical combat power present in specific AFV designs. In the T-34's case however, there appears to be *confusion among T-34 enthusiasts between the strategic features of the T-34's design (ease of manufacture, simplicity of design, etc.) and the tactical features of its design (the overall combat power inherent in the individual vehicle, or OCPC*). To put it another way, **the T-34 was a 'war winning' tank but this should not detract from the fact that at a tactical level its performance during four years of continuous war was relatively poor**. If there was ever a case for not basing a tank's overall combat power on over simplified parameters such as thickness and slope of frontal armour, and penetration of a single round from its main gun, then the T-34's case is it.

Applying a more detailed and thorough methodology (as detailed in Volume I Part II) reveals an Overall Combat Power Coefficient (OCPC) for the T-34 much more in line with the actual combat record of this tank from June 1941 to May 1945.

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Appendix B
A Reassessment of the Ilyushin Il-2's Effectiveness against Tanks

It is always enlightening when one examines any weapon system's performance figures impartially and with cold mathematical style analysis, alongside the 'historical record'. The Ilyushin Il-2 is one of WWII's particularly interesting cases *because its performance figures were not at all exceptional for the time, and yet this aircraft is given very favourable historical treatment in the large majority of literature which mentions this aircraft.* However, in historical descriptions of this aircraft I see a lot of identical phrases repeated over and over again (and, it seems, *mutually copied from one book to another*). As usual, this type of historical treatment immediately raises alarm in my mind. The core of these flattering accounts of the Il-2's exploits remains its apparent ability to kill German tanks during WWII. Of all the accounts, these are the ones most filled with the generally accepted '**received wisdom**' about the history of this aircraft. However, there is almost invariably no real objectivity, no questioning, no original thought, and, perhaps worst of all, **no attempt at verification with any historical record.** (p. 698)

It is as though someone in the 1940-50s wrote the anti-tank history of this aircraft, and then this has somehow become the widely accepted 'truth'. In this essay **I have put together more objective thoughts on the Il-2's true anti-tank capability as measured by the contemporary standards of WWII**. The following is not a reflection on the Il-2's achievements *in attacking soft-targets behind the German lines, which was almost certainly the Il-2's greatest achievement*. These targets included critical supply lines, supply depots, trains, train marshalling yards, truck columns, bridges, airfields, etc. In this regard the Il-2's achievements were similar to those of the better known Western Allied ground-attack aircraft during WWII.[254] However, tanks (and AFVs in general) remained one of the most difficult and hazardous targets for any aircraft to attack during WWII. They were small hard-targets which were often mobile, concealed and well protected by light and medium flak.

This essay is focused very specifically on the true anti-tank capability of the Il-2, and its achievements in this regard during WWII. Its aim is to help the reader become more aware of the physical and historical reality behind many of the Il-2's anti-tank 'stories', and at least **question the many clichés that abound in most descriptions of this aircraft.**

The Anti-Tank Armament on 1941-42 Production Il-2s

On first glance the 1941-42 production Il-2 appears to be formidably armed. **In fact it was relatively lightly armed for a ground-attack aircraft of the day**, and especially for one which was supposed to be a specialised anti-tank weapon system. The 1941 production Il-2s were single-seaters armed with **2 20mm ShVAK cannons, 2 7.62mm ShKAS MGs, 4 100kg bombs (FAB-100 HE) and up to 8 82mm rockets (RS-82)**. The effectiveness of the small RS-82 rockets against tanks is covered later (below). The bombs were carried in 4 small internal bomb-bays positioned just inboard of the landing gear, while the rockets were mounted on the underside of the outer wing area.

For comparison, the contemporary M**esserschmitt Bf 110E-1** fighter-bomber routinely went into action with 2 20mm MG FF/M Cannon, 4 7.92mm MG17s, 1 (rearward facing) 7.92mm MG 15, 2 500kg bombs and another 4 50kg bombs: **a 1,200kg bombload and altogether a far more lethal ordnance load and better defensive gun load than the Il-2.** At the same time, the contemporary Junkers **Ju 87D-1** was capable of delivering a massive **1,800kg bomb load with far greater accuracy** (easily the most accurate air-borne delivery system in the world

[254] **Note:** The problems and difficulties the Il-2 faced in attempting to destroy German tanks were replicated by all the Western Allied ground-attack aircraft fielded during WWII, as well as by the *Luftwaffe's* **Hs 129** and late war fighter-bombers. [What about the Stuka?]

at that time).[255] This bomb load included **a single 1,400kg PC 1400 armour-piercing bomb.** With this weapon (or even the more common 1,000kg bomb) the Ju 78D-1 effectively became an 'anti-everything' weapon: it was capable of destroying everything from the heaviest tanks to **bridges, to bunkers, to battleships**.[256]

The Il-2's 100kg bombs had very little effect on heavily fortified or armoured targets, mainly because little short of a direct hit was going to seriously damage tanks. Also, note, all these aircraft dropped their bombs from lower altitudes, so invariably the bombs were not moving at particularly high speeds upon impact.[257] Even the diminutive **Henschel Hs 123A-1** (dedicated to extreme close-support dive bombing) normally carried 450kg of bombs into action, and one of these was normally a 250kg bomb. This was easily on a par with the Il-2's load. **But, along with the Ju 87, the Hs 123 was able to deliver bombs with almost ridiculous accuracy compared to the Il-2 (or, for that matter, any of the fighter-bombers and bombers in WWII** which normally attacked at angles less than 40 degrees from the horizontal, including the Bf 110). (p. 698)

Both the Bf 110E-1 and Ju 87D-1 were contemporary aircraft being delivered to *Luftwaffe* units in the spring of 1941, and both were optimised for ground attack. **These aircraft** (along with several other similar variants) were **considerably more lethal to tanks than the Il-2 during the whole Operation Barbarossa period and well into 1942.** And yet, neither aircraft type (with the arguable exception of the Ju 87) is commonly mentioned as a particularly effective 'anti-tank aircraft' in WWII aviation literature. When a breakdown of Soviet and German tanks losses is carried out, we find that, in actuality, during 1941 and 1942 **both these aircraft types (and especially the Ju 87) destroyed considerably more tanks per aircraft lost than the Il-2 ever did.** (p. 699)

Note: Below is footnote **#1733** (pp. 699-700) which is much too long to place in a footnote at bottom of this page:

The Soviets (and some suitably impressed Western commentators today) have claimed "the Il-2 was the most successful ground-attack aircraft of WWII". If the sheer quantity produced is the measure of success, along with the strategic outcome of this, then this might be true. **From a purely qualitative point of view, the British Hawker Typhoon, the US P-47 and the German Hs 129 were at least as good.** However, if military success is measured by the amount of enemy material and personnel destroyed (including tanks, ships, guns, trucks, bunkers, aircraft on airfields, pillboxes, other fortified positions, etc.) divided by the number of aircraft lost, then the most successful ground-attack-aircraft of WWII was by far the German Ju 87 series.

The first Ju 87 flew in 1935, almost four years before the first Il-2. The later model Ju 87D-1 (in service in the spring of 1941) had a top speed of **410kph (255mph)**, an operational ceiling of 7,290 metres (23,915ft), and an operational range of **998km (600mls**). This made it only 5kph slower than the 1941-42 production IL-2, but with a superior ceiling and range. **A total of only 5,709 Ju 87s of all types were ever produced**. This is an incredibly small number by Soviet and Western Allied standards, especially considering the Ju 87's reputation and the impact it had on the course of the war. Ju 87s ranged across Europe, North Africa and the USSR from the first day of the war in 1939 to the last day of the war in Europe in 1945. There were never enough Ju 87s to operate more than a few hundred in any theatre: **even at the start of Operation Barbarossa the Luftwaffe forces in the East had only 315 Ju 87s in total.**

The Ju 87's greatest strength was its ability to deliver its ordnance very accurately, as well as the mass of the weapon delivered. **In fact, no other aircraft in WWII could deliver an unguided 500-1400kg bomb with such deadly accuracy** (refer to Volume IIA 2. 19) a. for more on what features of the Ju 87's design enabled this). This made it *lethal to almost any target*, including small hard- targets like tanks. Large numbers of French,

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[255] **Note:** The range with **1,800kg bomb load was an impressive 998km (620mls).** For greater range, a more typical bombload for the Ju 87D-1 was a **1,000kg SC 1000 bomb** on the crutch and 4 50kg or 4 100kg bombs under each wing. [**Note:** I think the primary iteration of the Stuka in 1941 was the Ju 87**B.**]

[256] **Note:** "Bridges, to bunkers, to battleships!" Nice way of putting it.

[257] **Note:** It was (and is) common for the heaviest bombs, dropped from high altitude, **to reach supersonic terminal-velocity speeds.**

Commonwealth and Soviet tanks fell victim to the Ju 87, particularly from 1939 to 1942 when it operated in conditions of at least air-parity. To be fair, one of the main reasons the Ju 87 destroyed so many tanks in this period is that it operated in a very 'target-rich' environment from 1939-1942; i.e., there were a great many tanks for the Ju 87 to attack compared to the number of German tanks fielded from 1943-45 (for the Il-2, Hawker Typhoon, Hurricane II and P-47 to shoot at). **The reason the Ju 87 was relatively effective at killing tanks was because even a near miss from a 500-1000kg bomb would likely destroy a light or medium tank (it could, literally, lift a tank off the ground and turn it over).** Even the heaviest rockets carried by the IL-2, Typhoon and P-47 were nowhere near as destructive, and *their delivery was far far less accurate*. Many Ju 87 pilots became so proficient in 1940-42 that they were able to hit individual pillboxes, as well as relatively small tank and vehicle columns. Even the Ju 87G, with its 2 37mm cannon, was somewhat more effective at killing tanks than other similarly armed aircraft. This was because it attacked at a much steeper angle than any fighter-bomber or the Il-2. This increased greatly the penetrative ability of such weapons against a tank's top armour (see below in Appendix B), as well as reducing 'strafing dispersion' effects (see below in Appendix B).

Just so the reader fully appreciates the kind of damage inflicted by Ju 87s, consider the following. The 10 German Ju 87 aces: Rudel, Nordmann, Heinz-Ruffer, Plenzat, Wosnitza, **Stahl**, Hubsch, Noller, Polz and Studemann, **flew an incredible 11,950 combat-missions during WWII**. They are credited with the destruction of **1,354** tanks, as well as innumerable trucks, bridges, ships of all sizes and types, armoured trains, trains, fortifications, aircraft, and other targets! (And this is only 10 of a very long list of Ju 87 aces). It is very likely that the Ju 87's tank-kill claims are also highly exaggerated (as with all WWII ground-attack aircraft), but even if they destroyed a quarter of this number, **it is an astonishing total**. The figure above does equate to only 1 tank destroyed for every 8.8 combat missions, and given the expertise of these pilots and the bombing accuracy of the Ju 87, the number of tanks destroyed seems a lot more plausible. **Note: some of these pilots also flew Fw 190Fs later in the war, but the very large majority of these kills were in Ju 87s**. Furthermore, the Ju 87 lays claim to another **astonishing statistic**; **namely that it sank more ships than any other aircraft type in WWII**. This seems doubtful at first glance, especially considering the war in the Pacific. But, incredibly, when tallying up the ships sunk it turns out to be very possible (perhaps the subject of another essay!). Nevertheless, the mere fact that the Ju 87 is a serious contender to this WWII 'anti-shipping title', as well as all the other damage inflicted, is truly remarkable.

Despite the Ju 87s remarkable combat record doing what it was designed for, **most aviation books seem obsessed with the Ju 87's vulnerability to fighters, as demonstrated in the Battle of Britain**. Yet, even in this battle, **only 62 Ju 87s were shot down from 10 July to 1 October 1940**, and when **Ju 87s in France sunk 6 warships, 14 merchant ships,** destroyed around 50 aircraft on airfields and wrecked 3 radar stations. It is ironic that no one (today) objects to the modern **Fairchild-Republic A-10's** vulnerability to enemy air-superiority fighters because they understand the A-10 was designed and optimised for destroying all types of ground target. If 62 A-10s were shot down without fighter escort and in conditions of local enemy air-superiority, then I wonder if these same aviation commentators would forget **how good the A-10 is at killing everything in its path**, and duly become obsessed with its vulnerability to enemy fighters? It is noteworthy that the *IL-2 was also vulnerable to enemy fighters (although significantly less so than the Ju 87*). IL-2/IL-10 losses during WWII were huge, exceeding **23,600 aircraft**; and yet this seems conveniently forgotten, ignored or remains unknown (see below in Appendix B for more on IL-2 losses in WWII). The Douglas SBD Dauntless (5,937 produced) and Curtiss SB2C Helldiver (7,200 produced) were also relatively vulnerable to enemy fighters. However neither of these aircraft (both of which were produced in greater numbers than the Ju 87, and this was just for the US Navy and Marine Corps) had to operate under conditions of enemy air-superiority for more than minutes at time. Their attacks were almost invariably covered by at least equal numbers of navy fighters so their vulnerability was, apparently, never an issue.

(pp. 699-700 / end of footnote)

The RS-82 and RS-132 Armed Il-2

Apart from the **20-37mm cannon**, the next most common anti-tank weapons carried by Il-2s during WWII were the **RS-82 (*Roketniy Snaryad*-82 or Rocket Projectile-82**) and the RS-132 rocket systems. (p. 703)

Design work on aircraft launched rockets had commenced in the USSR as early as the mid-1930s. This work was done by a design team led by G. Langemak, and included V. Artemiev, B. Petropavlovsky and Y. Pobedonostsev. At the time there were three sizes of rocket developed **with the designations RS-75, RS- 82 and RS-132; the numerical suffix referring to their diameters,** 75mm (2.95in), 82mm (3.23in) and 132mm (5.2in), respectively. The first test firing from an aircraft took place in 1937, with the 82mm version proceeding to production. The **82mm rocket system consisted of racks of 4x82mm rockets** (the RS-82) mounted on a fighter's wings using a rail type launcher which was designated the RO-82. It was originally intended for air to air combat, and the **first known use in this role was at Khalkhin Gol in 1939**. Between 8th August and 15th September 1939, I-16s from 22 IAP were equipped with RS-82s, and they flew 59 sorties and used them in 16 air to air combats.

By June 1941 the **RS-82 was also seen as a ground attack weapon**, and by this time it had been slightly enlarged but still used the same RO-82 launcher. The rocket weighed 6.8kg, was around 325mm long, had a flight velocity of around 340m/s and **carried a relatively small 0.36kg explosive charge**. The RS-82 was intended to target soft targets, but a later version was developed with a **shaped charge warhead**. It is unclear if this was available in 1941. The anti-armour RS-82 is sometimes called the BRS-82 (*Bronirovaniy* or armour), but this was possibly only ever an unofficial designation. In ideal circumstances the BRS-82 could penetrate a maximum of 65mm of non-face hardened and homogenous armour if it struck at 90 degrees to the armour plate. Unfortunately, **German armour was face hardened, and in practice air launched and unguided rockets rarely hit their target at 90 degrees.** (p. 703)

The real problem with the RS-82 turned out to be much the same as that which plagued every air-launched and unguided anti-tank rocket used in WWII: **namely very poor inherent accuracy made far worse by being fired from a rapidly moving aircraft**. Rocket effectiveness tests carried out by the VVS in late 1942 showed that out of 186 BRS-82 rockets fired at a stationery tank at a range of 500m, only 2 (around 1%) could be regarded as hitting the tank. Just as bad was that none of the hits were considered to have inflicted significant damage (the type of tank is unspecified). The test was reduced to a firing range of 300m against a small column of tanks and other light AFVs (again, exact number and type is unspecified). This time around 3.7% of the BRS-82 rockets hit a target, but the damage results were still very poor. It was found that a direct hit was required to disable a light tank (presumably something like a Pz Kpfw IIF) or an armoured halftrack. Near misses as close as one metre did no damage to any of the armoured vehicles. (pp. 703-04)

It was abundantly clear to the Red Army and VVS authorities that the **BRS-82 was ineffective against armour**. Accordingly the large majority of RS-82 rockets manufactured and used during the rest of the war were of the HE fragmentation type (and they continued to be used in large numbers on most types of Soviet combat aircraft). They **remained effective against soft targets** such as trucks, supply columns, etc., as long as they could hit them or at least land within a few metres. (p. 704)

The PTAB Armed Il-2

We now come to the last significant anti-tank weapon system deployed on Il-2s to destroy armour, namely the **PTAB bombs** (*Protivotankovaya Aviabomba* - Anti-tank Aviation bombs). **These were a relatively effective and unique anti-tank weapon developed by the Soviets,** when they realised that aircraft cannon and rocket were not doing the job'. The VVS started thinking about the accuracy problem in a different way, and instead of trying to blast the target with a single large cannon shell or rocket, t*hey realised that by dropping many smaller bombs in clusters they would increase the chances of a direct hit.* **Thus the PTAB was, in effect, an early version of the modern cluster bombs.** With the advent of **shaped charge**s (High Explosive Anti-Tank - **HEAT)** it became possible to build very small bombs which could still penetrate quite thick armour. (pp. 704-05)

Development commenced in 1942-43 and proceeded very rapidly. The PTAB bomb (or more accurately, bomblet) was designed by I.A. Larionov, weighed 2.5kg and contained around 0.5kg of explosives. It was **capable of penetrating around 60mm of non-face hardened homogenous armour if it struck at 90 degrees to the armour plate**. This was sufficient to penetrate the top armour of even heavy tanks of the period. *The Il-2 was chosen as the main delivery platform and special delivery canisters were designed*, each of which could carry **48 PTAB bomblets**. The bomblets were arranged in the canister in 6 rows of 8. When released (fired), the bottom of the canister would spring off and the bombs would be released rapidly. It took around two seconds to release all 48 bomblets. **The Il-2 was able to carry 4 canisters, or 192 bomblets, in total**. Soviet post-war claims for the success of the PTAB in destroying German tanks are abundant, and a large number were dropped during the war (mostly during 1944-45). Specifically, Soviet records show that **1,171,340** were dropped in 1943 (or 6,100 Il-2 sorties equivalent), **5,024,822** were dropped in 1944 (or 26,170 Il-2 sorties equivalent), and **3,242,701** (or 16,889 Il-2 sorties equivalent) were dropped in 1945. (p. 705)

However, there are **at least two major inconsistencies in the historical record** which do not support the view that the Germans suffered extraordinary tank losses to this weapon. *The first is that German tactical reports from 1943 to 1945 do not regularly attribute exceptional tank losses to PTAB attacks,* over and above the relatively small number lost to other weapons like the NS-37 or BRS-132. I**n fact it is difficult to find any first-hand accounts by German panzer crews on the Eastern Front describing anything more than the occasional AFV loss to direct air attack.** From mid-1944 to 1945, one would have expected such reports to be commonplace as this was when the Soviet air-superiority and PTAB usage peaked. **German Panzer crews did, however, spend plenty of time 'complaining' about hidden Soviet anti-tank guns, artillery and riflemen with anti-tank rifles.**

The **second major historical inconsistency** is the total number of German tanks, assault guns and other types of fully tracked AFVs lost to air attack on the East Front during WWII (and particularly in 1944). Total German fully tracked AFV (irrecoverable) losses on the East Front from 1941 to 1945 [particularly 1944] amounted to approximately **36,100 fully tracked AFVs**. This includes German tanks, command tanks, flame-thrower tanks, assault guns (StuGs), assault artillery, tank destroyers (including self-propelled anti-tank guns) and self-propelled artillery (such as the *Wespe* and *Hummel*). It also includes around 3,500 AFVs 'captured' by the Soviet forces when Germany surrendered in May 1945. **The vast majority of German tank, assault gun, assault artillery and tank destroyer losses were due to enemy anti-tank guns, artillery, tanks, tank destroyers, mines, infantry assault, or simply abandoned as operational losses.** (p. 705)

At most, **7%** of these AFVs were destroyed by direct air attack,[258] which amounts to approximately 2,500 German fully tracked AFVs lost to direct air attack. A *significant portion of these were due to other Soviet aircraft types such as the Petlyakov **Pe-2*** (which, as far as is known, did not use PTABs). If we give the PTAB the benefit of any doubt, and make the assumption that as many as 40% of all German fully tracked AFV losses to aircraft were attributable to **PTAB weapons** from 1943 to 1945 (which is on the high side), then this equates to some 1,000 AFVs. From the above data on the total number of PTABs used, we can see that approximately 9,440 PTABs were expended for each fully tracked AFV destroyed by PTABs. An alternative way to think of it is that, on average, the equivalent of 49 Il-2 sorties were flown, each with a full load of PTABs, for each fully tracked AFV destroyed by PTABs. (pp. 705-06)

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[258] **Note: Less than 7% of German tanks, assaults guns and tank destroyers were lost to direct air-attack in the entire Normandy campaign** in 1944. The Western Allies had complete 'air-supremacy' which is above just 'air-superiority. They conducted what amounted to the most intense, concentrated and destructive ground-support and air-interdiction campaign of WWII. Even USAF and RAF strategic bomber forces were involved in carpet bombing whole areas (and **this was a relatively small battlefield**). **To estimate that as many as 7% of all German fully tracked AFVs were lost to direct air attack on the East Front is being extremely generous to the Soviet VVS.** The figure was probably more in the region of 4-5%. Another example is that **only 2-5% of Soviet tanks lost in the Battle of Kursk were due to direct air attack**, despite the Luftwaffe's intense air-campaign and very exaggerated claims of destroying hundreds of Soviet tanks.

It is clear from these figures, and the general lack of alarm in German tactical and operational reports, that the *PTAB weapon system was not as effective against German armour as hoped or believed by the Soviets* (and by many commentators today). So the question remains; why was this the case? Given the above, there are two probable explanations. **Firstly, the PTABs were not as effective against AFVs as first thought (or as hyped in much post-war literature). Secondly, a large proportion of the total PTAB stock was expended on other softer-target types**; such as enemy truck supply columns, airfields, marshalling yards and supply trains. I believe both of the above factors were the reason why German armour losses to IL-2s with PTABs were not much higher. (p. 706)

Continuing on with why the PTAB system was less effective than expected. Because of the nature of the PTAB HEAT warhead, and the **relatively low speed of impact** (i.e. a light bomblet dropped from low altitude), the PTAB was one of the easiest anti-tank weapons to protect against. The PTAB **used a shaped charge warhead** and for this to work properly it needed to make contact with the armoured surface it was trying to penetrate. **The shaped charge literally blasts its explosive gases at hypersonic speeds against the armour until it melts and gives way.** The explosion then continues into the interior of the tank and causes damage, fire, etc. However, if there is a small air gap between the shaped charge and the armoured surface, then the exploding gases take the easiest route and dissipate outwards into the air: the larger the gap the greater the dissipating effect. For a relatively small warhead such as a PTAB bomblet, even a 6-8cm gap would cause most of the explosive energy to dissipate away from the armour. In addition, because the PTAB was a light bomblet and traveling at a relatively low speed (for a bomb) on impact, it needed a **contact fuse** which quickly and easily triggered. Otherwise it was possible for a bomblet to hit the tank and bounce off without detonating, or (most likely) detonate a fraction of a second too long after it struck. In the latter case the 'bouncing bomblet' would explode with an air gap between it and the armour, nullifying the effect of the shaped charge. (pp. 706-07)

After the Battle of Kursk, where the PTAB was first used in significant numbers, the Germans had become aware of the potential PTAB threat so the average German tank crew started to take appropriate precautions (apart from the obvious dispersing of armoured vehicles along roads, etc, when on the march). As **with all shaped charge (HEAT) warheads**, this involved placing items on the armoured surface (preferably with an air space) to prematurely detonate the warhead before it came into contact with the actual armour. For a weapon like the PTAB which was light and easy to trigger, there were many items that would do and which were not too heavy. They were easily emplaced on the tank's horizontal surfaces with special attention to more important areas such as engine grill covers, fuel tanks and turret tops. Suitable items included: spare tank tracks (perfect for the job as they were easily strong enough, had air gaps and the tank usually already carried them), metal tool boxes preferably with the tools inside, Jerry Cans full or half full of water, **sandbags**, the large coiled metal cables used to tow broken down tanks, **planks of wood** (preferably a few layers) and even **thick wire mesh placed on frames.**[259] The latter were more often used to protect open top vehicles like Sd Kfz 251 halftracks or some armoured cars. As long as the PTAB was triggered some distance away from the armoured surface, the 12-25mm of top armour would do the rest. A medium or heavy tank festooned with such items over its vital surfaces was pretty close to being invulnerable to critical hits from PTABs. (p. 707)

In addition to all this, **Soviet PTAB cluster bombs were one of the most hazardous (to the carrying aircraft) types of air-ordnance carried during WWII**. This was because all 192 bomblets (in an Il-2's full load) were armed with contact fuses in their canisters when loaded. The closer the bomblets were dropped together, then the higher the chances of two or more colliding and exploding just after release when they hit the airstream (with the possible adverse consequences to the launch aircraft). Even more dangerous was if one or more bomblets released, or became dislodged, while inside the canister when in transit to the target. Note: The bomblets were especially designed to release very easily and rapidly. If this occurred there was a significant chance that a bomb would detonate on the canister walls, especially if the aircraft was subject to violent movement as a result of flak or air to air combat. **All in all, one starts to wonder if the PTAB weapon system (as developed in WWII) was more dangerous to the Il-2 aircrew than the enemy tank crew. From the Russian Il-2 loss figures quoted later in**

[259] **Note:** Kind of a percursor to modern reactive armor.

this appendix, it is apparent that the Il-2 suffered a very high rate of 'operational losses' or 'non-combat losses'. One is left to wonder if losses due to PTAB 'accidents' were considered operational losses? (pp. 707-08)

Lastly it is worth looking at the total number of PTABs used. The previous figure of **9,438,863 PTAB bomblets** used during WWII seems like a lot. However this actually equates to some 49,160 Il-2 sorties with a full PTAB weapon load, or an average of 73 sorties per day from 5 July 1943 to 8 May 1945. When one considers the size of the whole Eastern Front (over 3,000km long), the thousands of aircraft sorties flown by the VVS every day, and the thousands of Il-2s that were operational in 1944-45, then 73 sorties per day is a relatively small number. It does mean that **the PTAB was not a commonly used weapon in Soviet terms**, and the very large majority of Il-2s only ever went into action with cannon, rockets and bombs. (p. 708)

Examples of the Il-2's Completely Exaggerated Anti-Tank Performance

For examples of the Il-2's hugely exaggerated anti-tank performance during WWII, I have selected some repeated descriptions relating to the Battle of Kursk. During this battle in July 1943, **the VVS and post-war Soviet accounts claimed many hundreds of German tanks totally destroyed by Il-2s.** The following examples appear in numerous aviation books on aircraft (**with almost identical phrasing**) and are presented as 'fact'. I have included some of these publications in the footnotes for illustration purposes. *In none of these has the author even attempted to verify the validity of the Soviet claims.*

1. **On 7 July 1943**, in one 20 minute period it has been claimed Il-2s destroyed **70 tanks of the 9 Panzer Division**.

It actually turns out that close to the start of the battle on 1 July 1943, 9 Panzer Division had only one tank battalion (the II./Pz Regt 33) with only **83 tanks** of all types in the Division. These comprised 1 Pz Kpfw II, 38 Kpfw Pz III, 38 Kpfw IV and 6 command tanks (Pz Bef). The division had no assault guns. **The 9 Panzer Division didn't record any such loss in July and only registers an air-attack referred to as heavy strafing.** According to the Soviet VVS accounts the 9 Panzer Division should have lost 84% of all its tanks in one day. The 9 Panzer Division remained in almost continuous action for over three months after this so called 'devastating attack'. It covered the 9 and 2 Panzer Army's withdrawal north of Orel and Kirov, and in August 1943 it fought a whole series of mobile defensive actions (against Red Army tank units) east of Bryansk. During this time 9 Panzer division received almost no replacement tanks, and most of its initial 83 tanks remained operational.

2. **During the battle of Kursk**, the Soviet VVS Il-2s claimed the destruction of no less than **270 tanks** (and 2,000 men) in a period of just two hours against 3 Panzer Division. (p. 708)

Just prior to the battle, on 1 July, the 3 Panzer Division's 6 Panzer Regiment actually had **only 90 tanks on strength.** These comprised 7 Pz Kpfw II, 59 Kpfw Pz III, 23 Kpfw IV and 1 command tank (Pz Bef). The division had no assault guns. This means the division had 180 fewer tanks than claimed as destroyed by the VVS in two hours! To put it another way, the VVS claimed the destruction of three times more tanks then existed in the entire division. On 13 July (well after the Kursk battle) the 3 Panzer Division still had 41 operational tanks.[260] The 3rd Panzer Division continued fighting throughout July, mostly with 48th Panzer Corps. It did not record any extraordinary losses to air attack throughout this period. As with the other panzer divisions at Kursk, the large majority of 3 Panzer Division's tank losses (at most, 49 tanks) were due to dug in Soviet anti-tank guns and tanks. (pp. 708-09)

3. Perhaps the most extraordinary claim by the VVS at Kursk, is that over a period of four hours (during the Battle of Kursk) **Il-2s destroyed 240 tanks**, and in the process virtually wiped out the 17 Panzer Division.

[260] **Note:** D. M. Glantz, J.M. House, *The Battle of Kursk*, Ian Allan Publishing Ltd, Surrey, UK, 1999, p. 353. Also, A. Frankson, N. Zetterling, ***Kursk 1943: A Statistical Analysis***, Frank Cass, London-New York, 2000, p.195.

On 1 July 1943 the 17 Panzer Division had only one tank battalion (the II./**Pz Rgt 39**) with a grand total of only **67 tanks**. These comprised 4 Pz Kpfw II, 29 Kpfw Pz III, 32 Kpfw IV and 2 command tanks (Pz Bef). The division had no assault guns. This time the VVS claimed only 173 more tanks destroyed than existed in the division, or 3.6 times more tanks then existed in the entire division! When Operation Citadel was launched on 5 July 1943, the 17 Panzer Division was not even in the main attack sector: it was deployed further south with 1 Panzer Army's 24 Panzer Corps. The 17 Panzer Division's records do not register any abnormal losses due to aircraft in the summer of 1943, and definitely not tanks during the Battle of Kursk. During late July and into August the division then fought a series of mobile rear-guard actions to cover 1 Panzer Army's withdrawal from the Donets River. **During this whole period the 17 Panzer Division averaged 25-30 operational tanks in its II./Pz Rgt 39. The division was never withdrawn for a rest and refit, and remained in continuous action.** In 1944 it participated in the relief of the Korsun-Cherkassy Pocket, and later the breakout from the **Kamenets-Podolsky (Hube) Pocket;** both extremely hard fought tank battles. Altogether miraculous for a division that had been 'annihilated' less than a year earlier. (p. 709)

One might imagine these claims to be some of the worst over-claims from WWII, **but unfortunately this type of claim (and rhetoric) is actually not that unusual in descriptions of the Il-2's apparent anti-tank accomplishments.** Regrettably, it is now clear that almost all VVS claims regarding tanks destroyed, and enemy losses in general, need to be treated with a great deal of scepticism.[261] The only reasonable excuse I can think of for such over-claims (above) by the VVS is that the Battle of Kursk included the first large scale use of the PTAB weapon system. It is possible that when the cluster bombs were dropped the whole area became a mass of fire and smoke, leading to over enthusiastic reports by Il-2 pilots of enemy tanks 'destroyed'. However this does not excuse the Soviet post-war accounts which perpetuated the myth. **Even more, it does not excuse the procession of post-war Western aviation authors who have taken these statements at face value without any attempt whatsoever at corroboration.**

Far more modern and objective analyses of the Battle of Kursk reveals that, in actuality, **total German tank losses in Operation Citadel amounted to 1,612 tanks and assault guns damaged and 323 totally destroyed; the vast majority to Soviet anti-tank guns and AFVs.** Admitted Soviet tank losses in this battle were **1,614 tanks totally destroyed: around 5 times higher than German tanks 'totally destroyed**'. It is clear that the many hundreds of German tanks 'destroyed' by Il-2s during July 1943 is *nothing more than wishful thinking*. (p. 709)

The Bottom Line

Total German tank production from 1938 to war's end was **27,769 tanks**, command tanks and flame-thrower tanks. They also produced **12,175** assault guns and assault artillery AFVs, and **9,944** tank-destroyers, self-propelled anti-tank guns and self-propelled artillery AFVs. These **49,888 fully tracked AFVs** are the only vehicles that could be considered 'tanks' in any real sense. Even though the assault guns, assault artillery and tank destroyers did not have a rotating turret, they were fully (and often heavily) armoured like a tank. The fully-tracked self-propelled AFVs were not really 'tanks' as their armour was very light, they had open tops and usually did not have a rotating turret. These vehicles were specialised machines and were only suited for specialised roles. However they are included here because they were still fully tracked AFVs and were obviously subject to direct air attack. (p. 710)

Of these AFVs, around **36,100 (ca. 72% of the total) were lost on the East Front during WWII.**[262] The figures break down as: 20,570 tank, flame tank and command tank losses (74% of production), 8,595 assault gun and assault artillery losses (71% of production), and 6,917 tank-destroyers, self-propelled anti-tank guns and self-propelled artillery losses (70% of production). These loss figures include around **3,500 AFVs which were**

[261] **Note:** This author would go as far as to say that, in fact, the large majority of RAF, USAF and *Luftwaffe* claims regarding enemy ground forces destroyed (especially AFVs) should to be **treated with a large dose of scepticism**.

[262] **Note:** And, also, ca. **70%** of the *Wehrmacht* personnel lost on the eastern front.

'strategic losses', i.e. they were 'lost' when Germany surrendered in 1945. Strictly, these should not be included as 'combat losses' or 'operational losses', which is what we are considering here.

As we have seen, all the 'weapon systems' deployed on Soviet aircraft during WWII were not particularly effective against tanks. This then largely explains **why, at most, only 7% of all German fully tracked AFV lost on the East Front were directly attributable to direct air-attack**. This amounts to approximately 2,500 German fully tracked AFVs lost to direct air attack, a portion of which were lost to other aircraft types (apart from the Il-2) such as the Petlyakov Pe-2. The large majority of German fully tracked AFV losses were due to enemy anti-tank guns, artillery, tanks, tank destroyers, mines, infantry assault, or simply abandoned as operational losses.

During WWII a total of **36,136 Il-2s were produced**, and in terms of aircraft numbers it remains the most mass produced military aircraft in history. This figure does not include the **similar but much improved Il-10, which entered production in October 1944** and first went into action in February 1945. However, the Il-2 was also probably the most 'shot down' aircraft fielded during WWII, and losses were very heavy throughout the war. Official Russian figures indicate that from 22 June 1941 to war's end, approximately **23,600 Il-2 and Il-10 ground attack aircraft were irrecoverably lost**. These losses can be broken down as follows (rounded to the nearest 100); 1,100 in 1941, 2,600 in 1942, 7,200 in 1943, 8,900 in 1944, and 3,800 in 1945. **These losses include 'combat losses' and so called 'operational losses'. Combat losses are given as 12,400 aircraft, or 53% of the total**. However it is very likely that a large proportion of the so called 'operational losses' were in fact aircraft which were damaged in battle to the point of being written off, as well as aircraft destroyed by enemy action while in transit and on airfields. (p. 710)

True to form on the Il-2, it seems, **some have chosen to minimise the admitted Il-2 losses during WWII, largely by neglecting the so called 'operational losses'**. For example, one source indicates only 10,762 Il-2 aircraft were lost during WWII.[263] These losses are broken down as follows: 533 in 1941, 1,676 in 1942, 3,515 in 1943, 3,347 in 1944, and 1,691 in 1945. This figure is approximately 1,640 below the Russian 12,400 figure (above) for combat losses, and at least a portion of this figure would be additional Il-10 losses from late 1944 and 1945. **Obviously the 10,762 figure does not include any operational losses. It is simply disingenuous and misleading to exclude operational losses from any discussion on wartime losses and casualties: operational losses are very closely related to combat losses, particularly in air-forces.** For example, excessive combat losses can quickly lead to rushed and improper training programmes for pilots, which in turn lead to increased operational-type losses. Furthermore aircraft which return so shot up that they are written-off and /or cannibalised for parts, should also be classified as combat losses and not operational losses. In this case the aircraft were removed from service due to enemy action. (p. 711)

Another well-known (Russian) author states, "The *Luftwaffe* command claimed that the Russians lost 6,900 Il-2s in 1943 and 7,300 in the following year. Although these figures were exaggerated by a factor of 2 to 2.2..." Even taken in context, the author implies that the VVS lost only around 6,760 Il-2s during the whole period from 1 January 1942 to 31 December 1944! **In fact it is apparent that the German claims were remarkably accurate when compared to the actual Il-2 losses.** In 1943 the official Russian figures indicate 7,200 Il-2s lost in 1943 and 8,900 lost in 1944: *the German claim is therefore 96% of the actual losses* (from all causes) in 1943, and only 82% of the actual losses (from all causes) in 1944. The same source indicates that 3,300 (46% of 7,200) in 1943, and 4,800 (54% of 8,900) in 1944, were Il-2 'operational losses'.

Perhaps incredibly, there is also s**trong evidence that the 23,600 official Russian figure (for Il-2 and Il-10 irrecoverable losses in WWII) is actually too low**. Total Il-2 production, including the small number produced pre-war, amounted to 36,136 aircraft. Total Il-10 production amounted to 4,966 produced in the USSR during the war and post-war. Il-10 production started in October 1944, and approximately 390 Il-10s had been delivered to

[263] **Note:** C. Bergstrom, *Bagration to Berlin: The Final Air Battles in the East 1944-1945*, Classic Publications, Hersham, UK, 2008, p. 132. These losses exclude IL-10 losses.

VVS combat units by the end of WWII in Europe. This equates to at least 36,526 Il-2s and Il-10s entering service before 8th May 1945. (p. 711)

According to Russian figures, on 1 May 1945 there were 9,316 Il-2s and Il-10s in service in the entire Red Army Air force and the Air Defence Force (encompassing the entire VVS). These comprised: 4,293 in the active front level units (including any flying schools), 499 in the Air Force of the Far Eastern Front (including their lying schools), 185 in the Transbaikal Military District (in the 12 Air force), 3,621 in rear areas and 718 in rear-area flying schools. So the question is; if approximately 23,600 Il-2s and Il-10s were irrecoverably lost during the war, what happened to the missing 3,610 aircraft? (pp. 711-12)

So what conclusions can be drawn from all these figures if the number of tanks destroyed is the measure of success? Well, to put it bluntly, considering the Il-2 was supposedly the most 'successful' ground attack aircraft in WWII, and considering it was one of the premier anti-tank aircraft of the war, **then its average performance against German fully tracked AFVs was nothing short of dismal.**

On average, over 9.4 Il-2s were irrecoverably lost for every German fully tracked AFV irrecoverably lost on the East Front due to direct air attack (23,600 vs. 2,500). *The real reason for this figure is, of course, that Il-2s spent far more time and effort attacking targets which were not tanks*, and this is where this aircraft excelled both in quality and sheer quantity. Critical targets included supply lines, supply depots, trains, marshalling yards, truck columns, bridges, airfields, artillery emplacements, bombardment support for infantry and tank attacks, etc. It was in this regard that Il-2s did by far the most damage to the Axis war machine. Unfortunately the images of destroyed trucks, trains, horse-carts and supply depots will never fire the imagination like the image of a burning Panther or Tiger tank.

Having said all this, the Il-2 was at least as good at killing tanks as any aircraft fielded by the Westen Allies during WWII. To be fair, the RAF and USAF claims of German tanks destroyed in Normandy, and the Western Front in general, were no more realistic than the VVS's claims.[264] It is hard to distinguish the winner between the RAF, USAF and VVS for the title "having achieved the most tank kill over-claims during WWII".

The reality is that right up to the end of the war, tanks remained one of the hardest targets to hit with effective anti-armour weapons, and tank battlegroups remained one of the most hazardous targets for any ground-attack aircraft to engage. In addition it was very difficult for a pilot flying away from a tank, probably under enemy fire and obscured by smoke and debris, to accurately assess the real damage inflicted. The problems and difficulties the Il-2 faced in attempting to destroy German tanks were replicated by all the Western Allied ground-attack aircraft fielded during WWII, as well as by the *Luftwaffe's* Hs 129 and late war fighter-bombers. (p. 712)

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[264] **Note:** However, during the war the **British Army at least initiated a series of detailed reports which analysed the causes of German tank losses (based on surveys of wrecked vehicles)**. These reports were released post-war, and revealed that **only around 7% of the German tank wrecks** littering the Normandy battlefield could be attributed to direct air attack. This still did not stop many Western authors perpetuating the myth that aircraft like the Hawker Typhoon and P-47 Thunderbolt were prolific and efficient tank killers in 1944-45.

13. Selected Bibliography

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