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Northwest Airlines' MODIFICATION CENTER in World War II

With the end of World War II came the revelation that the city of St. Paul had played a crucial part in achieving victory. During wartime, residents had grown accustomed to the constant din emanating from Northwest Airlines' Modification Center at Holman Field, across the Mississippi River from downtown; however, the level of secrecy involved in the work there prohibited employees from discussing any details. Not until September 1945 did the news emerge that the "Mod Center" was responsible for altering aircraft for a variety of duties, including photo-reconnaissance, fuel transport, anti-shipping and, most important, high-altitude bombing utilizing new radar technology.¹

In his fireside chat of December 29, 1940—one year before the Japanese attack on Pearl Harbor—President Franklin D. Roosevelt addressed the urgent need to support Britain against Axis aggression. American industry—specifically, Detroit's efficient assembly-line auto manufacturers—should become the "arsenal of democracy," converting from making luxury goods to producing defense material. In early 1941 new factories, such as Ford's Willow Run plant near Ypsilanti, were quickly built to produce aircraft. While the feats of industry in support of the war effort are well known, less is said of the role played by commercial airlines. Civil aviation's commit-

FACING: Celebrating victory, Northwest Airlines' station manager E. B. Curry and Army Air Force representative Maj. A. B. Horner pose, pretending to pull the last B-24 bomber out of the Modification Center hangar, August 1945.



ment to a collaborative modification program enabled manufacturers to maintain high production levels without stopping to tailor aircraft for specific missions or theaters of combat. Nationwide, modification centers were credited with customizing 50 percent of the aircraft produced in America. During its three-year existence (1942–45), Northwest's plant at Holman Field hired more than 5,000 workers from across the Upper Midwest and modified one-third of the aircraft produced at Willow Run. At this critical moment in American history, the federal government, military, industry, and commerce successfully collaborated to defeat totalitarianism.²

The modification concept was championed by Edgar Staley Gorrell, a military veteran and president of the Air Transport Association (a trade organization), and supported by Army Air Force Gen. Harold Arnold. When discussions favoring a government takeover of the airline industry arose, the two met privately with President Roosevelt and strenuously urged him to preserve the rela-

Modified B-24 bomber departing Holman field; St. Paul skyline in background.

tionship whereby military authorities enlisted, rather than commandeered, the support of commercial aviation. Roosevelt reconsidered and, as events unfolded, this proved a successful decision.³

Although the concept was simple, execution was problematic as it required military and civilian professionals, albeit sharing a common vision, to coordinate and run operations. For the duration of the war, Holman Field was designated a U.S. Army Air Corps installation; however, Northwest's station manager maintained control of daily operations and was responsible for the site's maintenance and security.

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His military counterpart, the Army Air Force representative, played a dual role, simultaneously ensuring that production levels were met and serving as an advocate for the center. Due to constant wartime demands and rapidly evolving aircraft development, modifications were occasionally performed outside of existing written regulations. These deviations required the AAF representative's consent and explanations to higher authorities.⁴ In addition, the command hierarchy relied upon the ingenuity of labor to identify shop-floor problems and propose solutions; incentive prizes—awarded by Northwest with government's consent—encouraged creativity. Ultimately, the war effort benefited from this three-way collaboration.

In January 1942, shortly after the Japanese attack on Pearl Harbor, Gorrell circulated a memo throughout the airline industry. Emphasizing the need for cooperation, his memo discussed wartime control, industry coordination, and requests from the military. Besides ferrying men and equipment to the front, these requests included a call for bids to modify aircraft. Before the month was over, Northwest Airlines was awarded a contract utilizing its existing maintenance facility at Holman Field, which was then designated Modification Center 12. In the bleak winter of 1942, the collaborative concept bore early fruit when crews at Holman successfully modified twenty B-25 Mitchell bombers for use by Britain's Royal Air Force against Hitler's Afrika Korps. In return, Northwest was awarded further contracts for various modifications of the U.S. Army Air Force's utilitarian heavy bomber, the B-24 Liberator.

This new challenge required significant expansion and additional employees.⁵

Before the U.S. entered the war, Northwest Airlines employed 881 workers nationwide; by September 1942, that figure had increased to 3,600 with numbers projected to reach 10,000. Northwest's president, Croil Hunter, saw future benefit in the new tie between civil and military aviation: "The tremendous extent to which the airlines are operating military contracts will be a factor of prime importance in the development of post-war aviation." But commercial airlines were also taking a risk: they were liable for any damage to planes at their facilities.⁶

Labor shortages resulting from the draft compounded industry's challenge in supporting the war effort. Necessity required tapping resources previously overlooked,

no guarantees that workers would remain—especially, employers thought, women whose significant others returned from the war. Lucrative offers of war work elsewhere, routinely advertised in local newspapers, lured away both men and women. When workers left, companies were forced to repeat the hiring, orientation, and training process. Fortunately, they received support from a variety of federal agencies that assisted with recruiting, screening, and training applicants—particularly female ones.⁸

As a result, women such as Hazel Larson from Hillsboro, North Dakota, and Millie Bowers of Bell Creek (Goodhue County) left rural life to take employment with Northwest in the big city. The company also readily hired men like Anton (Tony) Kortenkamp from Des Moines, a newly trained sheet-metal worker whose medical condition exempted him from the draft, and Harry Chin,

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yet companies were slow to hire unskilled labor, especially women, partly due to the multitude of reconfigurations required and labor regulations involved: separate restrooms, special representation, smaller-sized coveralls, lower workbenches, and gender-specific sick-leave rules were among the considerations. Unions exacerbated the problem by initially refusing to enroll women.⁷

And then, once hired, there were

a recent immigrant with rudimentary English-language skills who was working in a restaurant. Northwest sent him to its mechanics school in Minneapolis, then put him to work. To prevent being mistaken as Japanese, Chin wore a lapel pin with large letters stating, "I am Chinese." Northwest also reached out to individuals like Ezra Oberg, a former teacher left blind at the height of his career. Along with five other legally blind



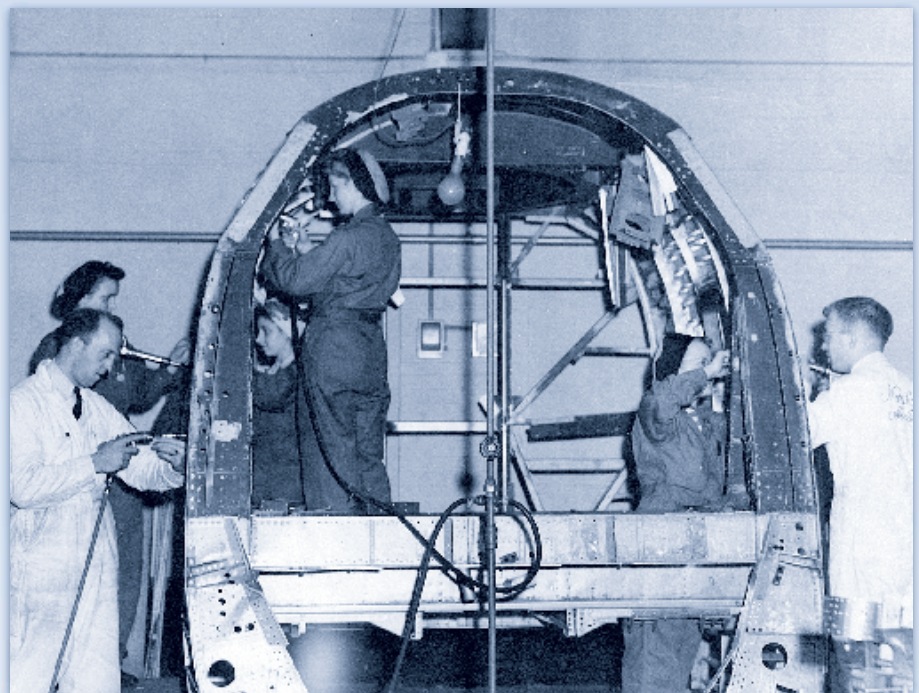
Women eventually held 40 percent of the Mod Center's jobs. These workers are most likely at an off-site training program.

The Modification Center experienced growing pains in 1943, a year of transition and expansion. To handle an increased workload, the facility needed two new hangars; until they were completed, crews were forced to work outside regardless of weather conditions. During construction, Northwest requisitioned the Air National Guard's hangar on the west side of the field, vacant since the squadron deployed overseas in 1941. The large new hangars, each able to hold thirteen B-24s, stood near the Mississippi River and were collectively called Riverside. Between them was a narrow, two-story building where workers maintained machine guns on the lower level while professional chefs provided food in the employees' cafeteria upstairs.¹¹

men, he worked the night shift at the center's reclamation department, sorting discarded parts for reuse the following day.⁹

Applicants were evaluated and, based on aptitude, placed in a job such as riveting, sewing, or metal or electrical work. Orientation and training lasted approximately eight weeks, after which each employee was scheduled to work a rotation of two-week shifts: 8:00 A.M. to 4:00 P.M., 4:00 P.M. to 12:00 A.M., and 12:00 A.M. to 8:00 A.M. For security reasons, all employees were issued an identification badge. Those working in the shop areas received a pair of coveralls—white for men and blue-gray for women—with Northwest Airlines emblazoned on the back. A pocket-sized manual spelled out rules pertaining to safety (particularly fire safety), security, appropriate behavior, and attendance. Also included were several helpful tables listing all bolts, rivets, nuts, washers, screws, cotter pins, zippers, fasteners, grommets, tubing, and clamps of various sizes and shapes used on B-24 Liberators. A detailed

profile drawing of the bomber came in handy when working outside and away from the shops and hangars. Rules and regulations, however, did not prevent some from engaging in sophomoric behavior at the expense of others. As Millie Bowers Johnson recalled, "Occasionally a newly hired woman was sent to the Parts Department to fetch a 'relief tube' only to discover what a relief tube was actually for."¹⁰



Practicing on a mock-up of a rear fuselage



Working outside, 1943, before the new Riverside hangars were completed

Rapid expansion, compounded by the complexities of aviation technology and pressures to meet shifting demands and deadlines, occasionally resulted in miscommunication that caused surprises and mishaps. Sometimes, for example, aircrews landing

followed by the smell of cordite. The plane had been towed to the gun pit to test its .50 caliber machine guns. He was not harmed, but haste could cause injury. Hazel Larson slipped and fell from the catwalk of a B-24 while hurrying to inspect its wiring.

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at Holman for a scheduled stopover returned the following morning dismayed to find their ship disassembled, in the process of modification. Sheet-metal worker Kortenkamp remembered that crews once moved an aircraft when he was working inside. Suddenly, the sound of roaring guns echoed throughout the fuselage,

Landing hard on the asphalt below, she reported to the first-aid station where she was given an ice pack for her injured knee and some aspirin for the pain before being sent back to work.¹²

In addition, the nature of warfare challenged the company's scheduling. Preparations for air offensives

temporarily overwhelmed the center with projects marked "urgent," while lulls in campaigns intermittently left some departments at the facility dormant. Contrary to company policy against loafing, Harry Chin and co-workers occasionally retreated to the interior of a bomber parked on the field to play cards while waiting for work to pick up.¹³

The military hierarchy interpreted these problems as leadership deficiencies. This perception led to a series of replacements of AAF representatives who failed to meet expectations, earning the center the inglorious reputation of "Coffin Corner." Matters improved with the arrival of the center's seventh (and last) Army Air Force representative in March 1943: Capt. A. B. Horner, whose experience at other modification centers honed his skills and his reputation as a man of demanding high standards. His efforts were strengthened with the arrival of his civilian counterpart, E. B. Curry, a St. Paul native recalled from Northwest's Ohio facility in 1944 to serve as station manager at Holman Field. He was assisted by George H. Pietsch, the airline's safety specialist; together, they focused on reducing accidents and streamlining processes.¹⁴

Employee input, too, helped the Mod Center run more smoothly and meet its production and safety goals. The center offered workers various incentives to devise cost-saving measures. Employee innovations ranged from a process improvement suggested by Carl Larson, a blind worker who developed a better way to sort parts, to a movable platform with a

Joseph De Beer and Benny Ystenes (left to right) demonstrating Carl Larson's sorting method, Production for Victory show, Minneapolis

detachable ladder, designed by Al Stendke and sketched on a piece of wallpaper. The platform allowed mechanics to work around engines with greater ease and efficiency. For their efforts, Larson received a suggestion pin (he chose that over a \$5 war bond) and Stendke, a \$300 war bond.¹⁵

Labor contributed to the war effort in numerous other ways, as well. Workers played a vital part in reducing accidents; for example, blind employees educated others about preventative measures to ensure eye safety. And staff participated in programs such as blood-donation and war-bond drives. When the center achieved goals, it celebrated with public recognition, sometimes featuring pomp and pageantry. On one occasion, Hollywood actress Ingrid Bergman presented William Alwin, a stock clerk, with a wristwatch for



purchasing \$2,125 worth of war bonds.¹⁶

To encourage employee bonding and teamwork, the Mod Center sponsored a variety of social activities including horseback riding, dramatics, bowling, basketball, men's and women's softball (no co-ed teams), and even a choir complete with robes in airline colors bearing the company logo. With management's consent, *In-Formation*, an employee newsletter independent of the weekly corporate one, was

launched in June 1943 to inform workers of the latest center news, clubs, and social events as well as to reiterate the dual emphasis on production and safety. A \$25 war bond was awarded to the worker who won the naming contest. All work was done by volunteers, and the early issues, with typewritten stories and hand-drawn illustrations and headlines, looked amateurish. In the first issue, an enthusiastic employee celebrated the arrival of women in the workplace with a poem, "Slacks."



There are lines that have a meaning
That an artist's eye can see
But the lines at Northwest Airlines
Have a special charm for me.

There are slacks that show the
waistline
There are slacks that show the thigh
But the slacks at Northwest Airlines
They're the ones that catch the eye.

There's the portly dame with broad
hips
With the Mae West smile that wins
But the gal who graces our ships
Is the Northwest Airlines bim.

Al Stendke's mobile platform

They are buxom, thin, or slender
Having everything complete
As they pose in their slack splendor
With a grace that can't be beat.

So all praises to our slack girls
To the Northwest Airlines dame
We'll carry them within our hearts
And in our Hall of Fame.¹⁷

In 1944, however, the newsletter improved substantially when management hired Mrs. Ida Hunt, a musician turned writer, to replace the previous editor who had deployed overseas. In addition to a new name, *Field and Hangar*, the publication received a complete overhaul, resulting in typeset copy, an organized layout, high-quality photographs, and a breakdown of news and events by department.¹⁸

As the war progressed, processes were streamlined, dividing modifications into three categories. The first involved engineering changes addressing a specific technical order, such as adding a special part. The second category pertained to theater modifications enabling aircraft to perform better in certain climates. Last were modifications that required significant alterations to the airframe for a specific role, including weather recording, fuel supply, photo reconnaissance, and Northwest's greatest contribution to the war effort: the installation of the H2X radar system. This new technology was developed by the British and refined and mass produced in the United States. Its ground-mapping capability enabled bomber

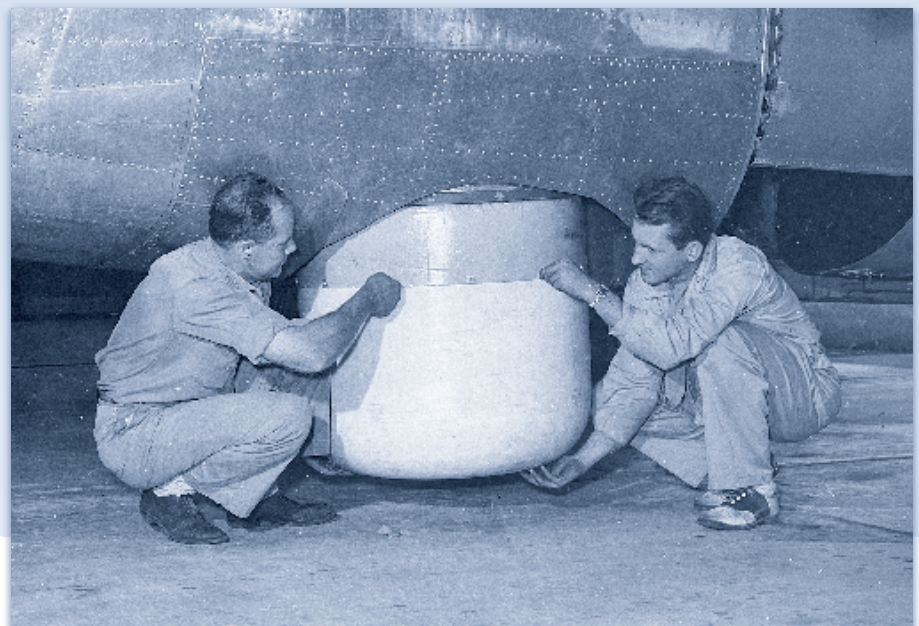
crews to locate and accurately strike targets during inclement weather. A December 31, 1943, memo from Capt. Horner, circulated to all in the center, stressed both the importance of the project and the secrecy surrounding it.¹⁹

By mid-1944 the center had established an efficient system for handling the Liberator bombers arriving from Willow Run. First, they were checked in and any equipment classified as top secret was immediately removed and securely stored. While awaiting modification, aircraft were temporarily sealed, or "pickled," to prevent corrosion. Each ship was towed to the Riverside hangars and weighed to determine its center of gravity. While alterations progressed, instruments were checked to certify functionality. Afterwards, aircraft were moved to an outside platform where a process known as "swinging the compass" ensured that all three compasses on board worked correctly. Next, planes were sent to the gun pit where the .50 caliber guns were bore sighted. Then the aircraft were towed across the field to Building 109 (the Air National Guard hangar) for preflight inspections of all movable components. Aircraft were swept clean of any loose parts



St. Paul Pioneer Press, September 16, 1945, revealing the center's "theoretical" bomber test runs

or debris to prevent damage to cables and equipment. Discarded parts were collected, inspected, and sorted in the reclamation department. Final steps involved a test hop by civilian pilots to evaluate the instruments, particularly the autopilot, manufactured locally by Honeywell. The test flight also enabled the bombardier and navigator to secretly test the



Installing an early version of H2X radar

B-24 bomber crew returning from a test run

H2X—using St. Paul's iconic First National Bank Building as an aiming point. Any problems encountered during flight were addressed upon return and, once they were resolved, the plane was reloaded and signed over to the Army Air Force for action.²⁰

Departing aircraft often contained notes from employees or carried names staff had invented. For example, one B-24 Liberator was nicknamed *School Daze* to honor the 1,378 students from a technical school in Detroit who had raised \$250,000 to purchase it in the national "Buy a Bomber" campaign. Mod Center staff not only designed its nose art but also took turns autographing the fuselage. An airman serving in England told his sister working at the center that *School Daze* was assigned to his squadron and that the crews appreciated the way it handled. Occasionally, employees who had left for the war found themselves crewing or pulling maintenance on aircraft they had modified in St. Paul.²¹

By 1944 the pendulum of victory was clearly swinging in the Allies' favor, and so the curtain of secrecy at the Mod Center was partially raised. With the government's consent, Northwest sponsored an open house in the summer of 1944 and again in 1945, limiting the event to workers and their families. Here, civilians could see firsthand the vital work in which their family members were engaged. Each event drew substantial crowds—30,000 and 20,000, respectively—and reinforced citizens' ties to the war effort.²²



With the collapse of Germany in the spring of 1945 and victory close at hand, officials urged employees to remain focused in their efforts to defeat Japan. Projections dated June 1, 1945, revealed an ambitious program for Northwest to complete 988 modifications by year's end for the final Allied assault on the Japanese empire. In early August, however, world events changed dramatically when President Harry S. Truman ordered that atomic bombs be dropped on Hiroshima and Nagasaki, effectively nullifying modification plans. On

August 16 Horner (now a major) sent a memo to Northwest's management, ordering an immediate halt to all projects. Aircraft were placed in temporary storage to await "fly away instructions."²³

Employees arriving for work the next morning were met at the front gate. Most were immediately released, but some were retained to assist with closing down the center. Among them was Harry Chin, who had the distinction of modifying the center's last bomber. No sooner was that work completed than the aircraft was flown to a collection facility

and, eventually, scrapped. By September 1945 the Modification Center that once employed 5,000 workers had closed, leaving civic officials to debate the future of the Riverside hangars, labeled a “Million Dollar White Elephant” by the press.²⁴ The hangars stand today as vague reminders of the war effort. Currently owned by 3M Corporation, they are as securely guarded in peacetime as they once were in war.

During the center’s three-year existence, employees were credited with modifying 3,286 aircraft deployed to every theater of the war and performing missions involving weather and photo reconnaissance, supply, anti-shipping and, most notably, bombing, utilizing the H2X radar.²⁵ In the process, Northwest’s employees provided cost-saving ideas that reduced technological and labor expenses by \$292,400. Moreover, workers received repeated praise from the Army Air Force for their vital work installing the H2X radar that enabled aircrews to pinpoint a target area, thereby reducing missions and saving lives.²⁶

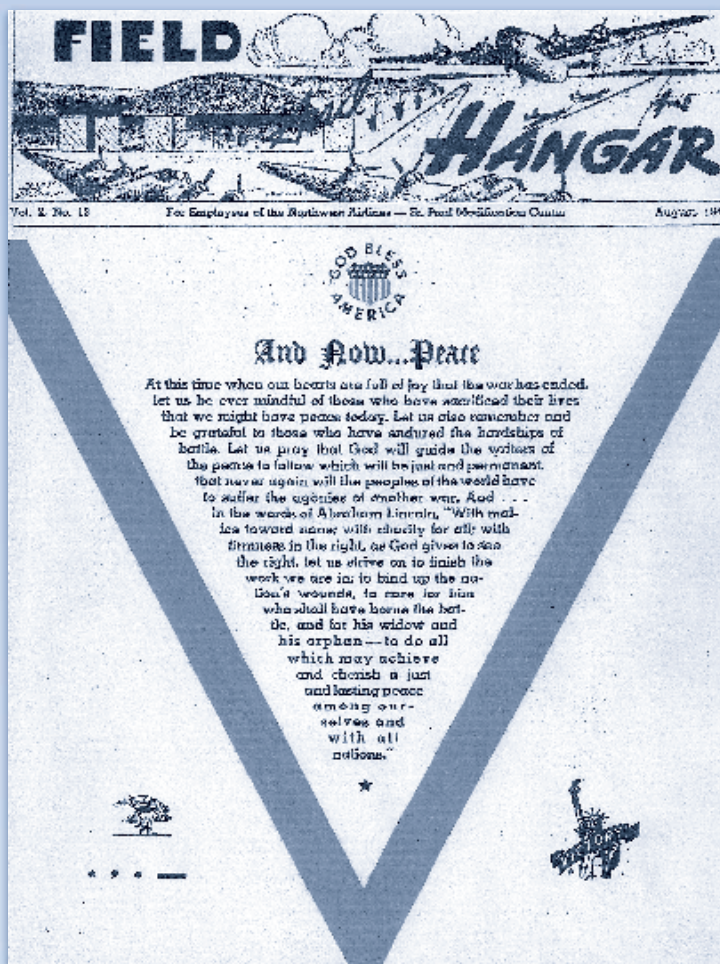
Gorrell’s plan of putting airline resources to use in wartime provided the vital measure that allowed the Allies to offset and, eventually, surpass Axis airpower. His vision was validated by Gen. James Doolittle at a 1946 gathering at the Institute of Aeronautical Science: “We found that the tempo of production could be kept at a much higher rate if the necessary service changes were made in modification centers away from production plants than if they were attempted in the factory itself.”²⁷ The synergy between government, indus-

try, and labor culminated in a robust and successful Allied air campaign.

Putting the war behind them, Mod Center employees transitioned to a peacetime economy and faded into history. With few exceptions, they are now difficult to track. There was an attempt to form a postwar Mod Club, limited to men who had held the position of foreman and above, but no evidence has been found to document it.²⁸

Nevertheless, some stories survived. In the twilight years of his life, Tony Kortenkamp, the sheet-metal worker from Des Moines, became friends with two others at his assisted living center who had witnessed the war from very different perspectives. One served as a B-24 pilot,

flying missions over Europe; the other was a Holocaust survivor. The three men often reflected upon their experiences, and Tony’s son, Daniel, appreciated the historic thread that connected them. He was pleased that his father and coworkers at Northwest’s Modification Center played a small yet significant part in liberating countries from totalitarianism and hastening peace.²⁹ □



Notes

The author gives special thanks to the staff at the Minnesota Historical Society, NWA History Centre, and Norwich University Archives for their kind and generous assistance.

1. A. B. Horner, “Center Closes with Brilliant Record,” *Field and Hangar*, Sept.

1945, 4. All center newsletters are archived at the NWA History Centre, Bloomington, MN. One example of secrecy: radar tests involved targeting (but not firing at) a downtown building; *St. Paul Pioneer Press*, Sept. 16, 1945, S2.

2. For a transcript and audio file of Roosevelt's speech, see www.americanrhetoric.com/speeches/fdrarsenalofdemocracy.html. Virginia Toole, *The Modification of Army Aircraft in the United States, 1939–45*, Army Air Forces Historical Studies no. 62 (Maxwell Air Force Base, AL: Air Historical Office, 1947), 1–2; Horner, "Center Closes," 1.

3. Reginald M. Cleveland, *Air Transport at War* (New York: Harper & Bros., 1946), 1–2. The Air Transport Association is now Airlines for America.

4. *Field and Hangar*, Sept. 1945: "War Saboteurs Are Thwarted By Internal Security Guards," 12, and A. B. Horner, "Horner Reviews Problems, Achievements," 5–7.

5. Cleveland, *Air Transport*, 80–82; "History of Northwest Airlines Modification Center," *Program Presentation of the Army–Navy "E" Production Award*, Nov. 24, 1944, Northwest Airlines Corporate Records, Minnesota Historical Society (hereinafter NW records and MHS). Northwest had a second modification center in Vandalia, Ohio.

6. "Northwest Airlines' War Growth Tremendous," *Seattle Post-Intelligencer*, Sept. 20, 1942, clippings scrapbook, NW records; "B24s Tailored to Fight," *Field and Hangar*, June 1945, 5.

7. Byron Fairchild and Jonathan Grossman, *The Army and Industrial Manpower* (Washington, D.C.: Office of Military History, 1959), 169–74.

8. Fairchild and Grossman, *Army and Industrial Manpower*, 169–74. Daily ads by the War Manpower Commission promised free transportation and training for individuals willing to relocate to the West Coast; see, for example, *St. Paul Pioneer Press*, May 1, 1944, 18.

Substantial documentation in the War History Committee Collected Research Materials, State Archives, MHS, reveals a prodigious effort to recruit and train women. The Office of War Information and the War Manpower Commission launched a vigorous radio campaign urging applications. A 1942 OWI pamphlet, *War Jobs for Women*, 23, promised training and pay equal to men's through the Vocational Training for War Production Workers program. It listed wiring, riveting, inspection, and sewing fabric as suitable jobs (p. 27). By 1943 OWI reported that the aircraft industry's labor force was 70 to 80 percent female.

9. Hazel Mary Jane Larson Allert, interview by author, July 1995, notes in author's possession; Millie Bowers Johnson, interview by Ben Petry and Andy Wilhide, Min-

nesota's Greatest Generation Oral History Project, MHS, <http://stories.mnhs.org/stories/mgg/story.do?id=142>; Daniel Kortenkamp, "Preparing B-24 Liberators for Combat," <http://people.mnhs.org/mgg/story.cfm> and search for Kortenkamp; "Harry Chin Visits the NWAHC," *Reflections* (NWA History Centre newsletter), Fall 2011, 5, www.nwahistory.org/newsletter/11_fall_newsletter.pdf. The lapel pins were produced by community organizations, not the government or employers. "Son of NWA Blind Worker Writes Thanks," *Field and Hangar*, Aug.–Sept. 1944, 8. At least 15 blind men eventually worked at the Mod Center; *St. Paul Dispatch*, Aug. 29, 1945, 10.

10. Bowers Johnson interview; *Northwest St. Paul Modification Center Employee Handbook*, Harley R. Schneider Papers, MHS.

11. "History of Northwest Airlines Modification Center," NW records; "Café Served 3 Million Meals," *Field and Hangar*, Sept. 1945, 3.

12. Horner, "Horner Reviews Problems, Achievements," *Field and Hangar*, Sept. 1945, 2; Kortenkamp, "Preparing B-24 Liberators for Combat." Decades later, Larson Allert's physician noticed the damage and asked how it occurred. "Oh, that happened when I fell out of an airplane," she replied, leaving the doctor speechless. Larson Allert interview.

13. Horner, "Center Closes with Brilliant Record," 7; "Harry Chin Visits the NWAHC," 5.

14. Horner, "Horner Reviews Problems, Achievements," 2; George H. Pietsch, "The Trail to Safety," Dec. 1943, E. B. Curry clippings scrapbook, NW records; "Safety Program Plays Big Role," *Field and Hangar*, Sept. 1945, 7.

15. "Suggestions Bring Savings of \$292,400," *Field and Hangar*, Sept. 1945, 12. In 2013 dollars, the bonds would be approximately \$63 and \$3,863.

16. Vernon Olson and Joe De Beer, "Protect Your Vision! Blind Workers Make Safety Plea," *Field and Hangar*, Aug.–Sept. 1944, 8; "Bergman Thrills MP Fans," *News Letter* (produced weekly for employees by Northwest's publicity department), Nov. 1944, 1, copy in Schneider papers.

17. "Employee Sign Up Sheet for Sports and Activities," *In-Formation*, Aug. 1943, 10; Les Code, "Slacks," *In-Formation*, June 1943, 5.

18. Dwight K. Loring, "Portrait of an Editor," *Field and Hangar*, June–July 1944, 4.

19. A. B. Horner, "The AAF Representative Says," *Field and Hangar*, June 1945, 2; A. B. Horner to NWA Employees at Modification Center, memo, Dec. 31, 1943, box 11, War History Committee Collected Research Materials.

20. Dave Kenney, *Minnesota Goes to War: The Home Front during World War II* (St. Paul: Minnesota Historical Society Press, 2005), 144; *St. Paul Pioneer Press*, Sept. 16, 1945, S2; "B-24s Tailored to Fight," *Field and Hangar*, June 1945, 4–10.

21. *Field and Hangar*: "Modites Sign Liberator 'School Daze,'" Feb. 1945, 8; "Remember 'School Daze?'" and "Lt. Otten, Former Modite, Flies B-24 Modified at Center," both Aug. 1945, 11.

22. *Field and Hangar*: "Family Day at Mod Center Thrills 30,000," Aug.–Sept. 1944, 1; "20,000 At Family Day Celebration," July 1945, 1.

23. Tentative Modification Planning Schedule, June 1, 1945, and Horner to General Manager, memo ("Modification Assignment"), both in Schneider papers.

24. "Harry Chin Visits the NWAHC," 5; *St. Paul Pioneer Press*, Sept. 9, 1945, 1A.

25. "Center Closes With Brilliant Record," 1, 4–7, provides a breakdown of total modifications: 165 B-25 Mitchell Medium bombers; 1,633 B-24 Liberator Heavy bombers; 120 Camera Ships (F-7A and F7B Liberator); 34 aerial tankers (C-87); 46 weather reconnaissance planes (B-24 Liberator); 1,119 radar ships (B-24 Liberator with H2X radar); 155 low-altitude bombers (unspecified); 13 anti-submarine aircraft (PB1 Mitchell); and 1 B-24 Liberator modified for the Australian Air Force.

26. Total savings in 2013 dollars: \$3,681,075. Average Cost of Airplanes Authorized, By Principal Model: Fiscal Years 1939–1945, *Army Air Forces Statistical Digest, World War II*, www.usaaf.net/digest/t82.htm. Quoting Brig. Leon Johnson on his August 1945 visit to the Mod Center, Maj. Horner wrote, "If it hadn't been for H2X, the war in Europe would probably still be going on"; "AAF Representative Says," 2.

27. Cleveland, *Air Transport*, 282–83.

28. Harold Rosendahl, "Mod Club," memo, Sept. 17, 1945, Schneider papers. In 1995 Bruce Kitt, NWA History Centre, conducted approximately 50 recorded interviews with former Mod Center employees. For the MHS exhibit *Minnesota's Greatest Generation* (opened in 2009), staff interviewed others, including Martha Kufner Schmaltz, Millie Bowers Johnson, and Daniel Kortenkamp (worker Tony's son).

29. Kortenkamp, "Preparing B-24 Liberators for Combat."

The photos on p. 325, 327, and 332 are courtesy the NWA History Centre, Bloomington, MN. All others are in the Northwest Airlines Corporate Records, MHS.



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