EXCERPTS OF REMARKS BY

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Our Nation's greatness has been due in large measure to our ability to adapt to the needs of changing times. Are we still as adaptable and imaginative?

The direct relationship between science and technology on the one hand and our military capability and effort in space exploration is spectacularly obvious. Not nearly so obvious is the dependence of our general economic and social well-being on science and technology.

A technological revolution has literally transformed our society from one based largely on natural resources and raw manpower to one based essentially on brainpower.

Technology has made agriculture so productive that today one American farm worker supplies food and fiber for 27 people, and agricultural workers constitute less than 7 per cent of our labor force.

The shift of workers from farm to factory provided manpower for our rapid industrial growth. But technology also made manufacturing workers more productive. It has shifted employment opportunities from the assembly line to the services and trade -- wholesale and retail trade, finance, insurance, real estate, public utilities, transportation, services, and government. This shift from farm to factory, and now to services and trade has demanded high skills, better training and more education. It has also sloughed off onto the unemployment rolls those with little skill, inadequate training and incomplete education.

The composition and characteristics of our labor force have been altered. Whole regional economies have been drastically affected. Many areas of our country find themselves bypassed by technical change, relying still on natural resources for which there is diminishing demand or on the conversion of materials---an activity that now requires fewer workers.

The prosperity of any region of the United States is no longer tied to abundant resources of mine or field or forest. Our most important resource, we now see, is brains. This human resource is highly mobile and flexible. It is not unusual to see bursting prosperity in localities and States in our country that have substantially only one product to sell - brains.

Our educational requirements have been sharply increased by the technological revolution. If a high school education today is a must, it is not enough. Specialized training and education to the college and post-graduate levels are increasingly required.

Unlike other one-crop economies, brains will never be obsolete.

In view of the great and increasing dependence of our economy and our society generally on trained human resources, how are we as a nation utilizing these scarce resources, developing them, and conserving them? In particular, how do we compare with other countries?

Currently, of course, we enjoy the largest gross national product of any nation in the world, the highest

standard of living, and the highest over-all productivity. But our annual rate of economic growth is trailing behind most industrialized nations.

Like the hare, we cannot take our lead over the tortoise for granted.

In the 1950's, the average growth rate of U. S. productivity (GNP per worker) was 2.2 per cent. This compares with 6.1 for Japan, 4.5 for West Germany, 4.0 for Russia, 3.4 for the Netherlands, and 2.8 for Sweden.

In the same period, the average growth rate of the U. S. standard of living (GNP per capita) was 1.1 per cent---compared with 7.2 for Japan, 6.1 for West Germany, 4.0 for Russia, 3.4 for the Netherlands, 2.8 for Sweden, and 2.1 for the United Kingdom.

If we accept the thesis that economic strength depends on technical capability, it is disturbing to compare the rate and direction of the technical effort of other nations with our own. For example, Western Europe and the United Kingdom, with a much smaller GNP sustain a technical effort to enhance private industry that is at least as great and probably greater than that of the United States.

Moreover, this effort is being stepped up. In France, Germany, and England, for example, non-space, non-military technical efforts have been doubling approximately every 3 to 4 years. The French research and development effort is expected to double again over the next four years, and to exceed the U. S. research and development effort as a percentage of gross national

product. In contrast, our own increase has been only a few per cent per year. In fact, we have a diminishing rate of increase in non military & Space Research.

We in the United States have long counted on our technological superiority, as well as on the economy of scale made possible by our large continental domestic market, to give us the needed edge in inter-national competition. These advantages tended to offset lower labor costs abroad. But improved technology abroad and the merged economic strength of the Common Market are shaking some of the suppositions of the past.

If we are going to reduce the adverse balance of international payments, we must expand our exports. And to expand exports we must broaden the technical base of our economy. We have to improve the quality of our goods and reduce our costs---including both the direct

and the indirect costs. Only through research and development can we do it.

We already have an enormous research and development effort, it is true. In the past 20 years, our research and development expenditures jumped 30-fold.

But three-quarters of that enormous national technical effort is federally - sponsored for such purposes as defense, space, atomic energy, and public health---all vital national objectives, but none particularly directed toward promoting economic growth.

Only about $4 billion annually is spent by industry for industry, and of that amount, only about $1.5 billion is aimed at increasing productivity. Although industry-sponsored research increased in the last several years, it was at a significantly slower rate than government-sponsored work. Last year it

barely increased at all.

Moreover, 80 per cent of this industry-sponsored research was done in 300 companies, and 73 per cent was concentrated in 5 industries.

Such industries as building and construction, textiles, and apparel, and food processing, which constitute about 30 per cent of the manufacturing and construction components of GNP, perform less than 4 per cent of privately-supported research and development.

The concentration of research and development in certain industries and in large firms has special significance, because there is a high and direct correlation between growth and profitability on the one hand and the relative amount of research and development performed.

The growth of military and space research and development has further concentrated technical effort in firms and areas already technically competent. The Pacific States now perform almost half the total military research and development (46 per cent); the Middle Atlantic States almost a fifth. The rest of the country splits less than a third of the military research and development---the South with about 9½ per cent, the Mountain States with almost 9 per cent, and the Midwest with 8 per cent.

A similar pattern is clear in the geographic distribution of trained human resources---scientists and engineers as a percentage of population.

In 1960, the number of engineers per million population was 3,330 in the South---roughly half the number in the Far West, at 6,570. The Midwest, with

4,580 engineers per million population, was also sharply below the Far West and the East Coast.

In 1961, the number of scientists per million population was 750 in the Midwest, compared with 1,240 on the Pacific Coast and about 1,035 per million in the New England-Middle Atlantic region. It is so serious a problem that the Midwest has become a net exporter of scientists and engineers to both coasts. Our midwestern universities are training men and women with advanced degrees who are increasingly migrating out of the Midwest. State money is being used, in a very real sense, to provide advanced-degree training for out-of-state industry. If there were a two-way flow of advanced-degree graduates back into the midwest from the Far West and the East Coast, this would be a

tolerable situation. But so long as the federal procurement dollar is providing the overwhelming majority of job opportunities in limited areas of our country, there will the flow of trained people go.

There are those of us who feel that a conscious effort on the part of the Federal Government should be made to break this pattern by a wider distribution of government procurement.

Another example of research and development imbalance is the fact that, out of 2,000 universities in the United States, 100 of them, or 5 per cent, perform 90 per cent of federally-supported academic research.

A serious by-product of the present research and development pattern is that university faculty and students tend to commit themselves to technical

activity suited to space, defense, and similar missions---instead of to the more mundane, less glamorous, but vital mission of increasing economic productivity and developing new products. Such a bias in the career-orientation of our brightest minds is perhaps the most disturbing problem arising out of the necessary but large concentration on special national programs.

Of the 400,000 scientists and engineers doing U. S. research and development, about 275,000 are doing research and development for government programs, and 125,000 for industry-oriented programs. But of this industry group, about 100,000 work for the 300 largest research and development companies; only about 25,000 work for all the other industrial and commercial enterprises in America.

This year's increase in the supply of scientists and engineers for research and development is expected to be about 30,000. But the increase in space research and development alone next year will absorb just about the entire new supply.

By 1970, we expect to be short by more than 250,000 engineers. Enrollments in engineering in American schools have actually declined; we are graduating about 30,000 engineers each year now while the Russians are graduating 120,000 yearly.

It is my view that trained, educated people constitute the major national resource. And this natural resource deserves national support. By that I mean federal support---federal funds in the form of scholarships and the construction of adequate scientific and educational facilities.

Neither can we afford to permit the continued and accelerating concentration of our most talented young people in almost purely defense-oriented industry, without risking intellectual starvation of the civilian-oriented sector of our society.

The Federal Government has traditionally contributed significantly to the advancement of science and technology for economic development. In this fiscal year, for example, the Federal Government in supporting research and technology for non-military, non-space activities in several specialized areas. The major areas include: atomic energy ($230 million); agriculture ($176 million); basic science ($153 million); transportation---mostly air ($121 million); and natural resources ($107 million).

The Administration has taken several major steps to assist industry and commerce---including tax credits, accelerated depreciation schedules, area redevelopment, accelerated public works, manpower retraining, and the Trade Expansion Act. Now, specifically to the point of our discussion, the President has called for a new civilian industrial technology program.

This proposed new program consists of two efforts. First is the industrial science and technology program.

Here the idea is to provide federal support for technical work and to disseminate technical information that is basic to industrial development. Contracts or grants will be awarded to institutions organized for research, education or the dissemination of technical information.

Support will be designed to develop information applicable to a broad segment of industry, such as textile or apparel. It will encourage the interaction of people interested in science and technology, economics, and related fields.

Initially, the major support will go to activities basic to three broad industrial groupings---textiles and apparel; building and construction; and metal working, including machine tools, foundries, and castings.

A second major element of the new civilian industrial technology program will be the university-industry technical (extension) service. Here is a pilot program designed to improve local and regional technical practices through a closer cooperation association between local industry and the universities. A closer association

and contact would be encouraged between the scientists and engineers in the universities and their counterparts in industrial laboratories and between technical people and management.

This is frankly going to be an experiment. Hopefully, an effective technical extension service may later be established---with matching funds from state and local governments and from industry---based on the experience gained from the pilot projects.

Now to summarize: we are throwing heavy financial and intellectual resources into the arms race and the space race. But while we are maintaining a strong position in those areas, we have a domestic economy that is erratic, spotty, and unsatisfactory in many respects.

Yes, we have more than 70 million people working at good jobs, at good pay, and under good working conditions. But we have an unemployment rate that is almost the highest of the world's industrial nations, and more than double that of most European countries.

Our four million jobless not only fail to contribute to the gross national product---but they drain off every year $3 to $4 billion in unemployment and relief payments and other costs.

We have stubborn, persistent areas of chronic unemployment which sometimes run as high as 30 per cent unemployed.

We have almost sixteen per cent of our out-of-school teenagers also out of jobs. Some estimates have indicated that by 1970, unless something is done about it, half of our unemployed will be teenagers.

Yes, a tax cut will be a great stimulation to the general economy. I support it.

But I am convinced that we are not going to solve the many specific economic problems caused by increasing automation, changes in raw materials use-ages, competitive international trade, and other econo-mic trends without a massive upgrading of our human re-sources.

We must put more of our intellectual capital into solving these problems.

And we must create more intellectual capital by moving much harder and faster and with more determination to the task of training, retraining, and higher education.

I have spoken primarily of national developments and challenges. Let me conclude now with a note of local interest.

Minnesota and its communities have a magnificent potential to grow and to contribute a big share of the brainpower its people and the nation will need in coming years.

Our State has a tradition of excellence in human skills, a tradition of pioneering into new areas of human endeavor.

Today, with our universities, colleges, and research centers, Minnesota is in a position to handle the most complex projects which require human skills and technology.

Our State's capacity has been tested---with great success---in recent years with the development of a new and thriving electronics industry.

But we must not allow our capacity for growth in new areas of economic development and technical

progress to go unfulfilled.

I, for one, will not stand by passively if a few, select areas on the West and East Coasts continue to receive a lion's share of the vast Federal budget for research and development efforts.

The funds our government spends for space and defense-related research in particular will continue to affect the areas of the country in which they are spent----or <u>not</u> spent.

We need an established government policy to use the funds for research and technical development to increase the resources and potential of the <u>whole</u> country.

America is the sum of its parts. Our national strength can not be based on only a few of the geographical parts of the country. If the important

Federal research budget is spent primarily in the coastal areas of the country, we could face the prospect of a nation with the structure of a strong, expensive picture frame---enclosing nothing.

Minnesota and other parts of the Midwest are capable of producing the skilled people and technical advances the nation needs. All of us must work together to see that our State and area share in the opportunities and demands of the space age.

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