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SCIENCE AND ENGINEERING IN THE USSR

The "secret weapon" of the Soviet Union is science. The purpose of the Soviet leaders is to dominate and communize the entire world -- by techniques of the cold war if possible, but by resort to force as and when they think the West is too weak or too irresolute to resist effectively. These leaders know that they must first overtake and surpass the United States as the world's strongest industrial and military power. They expect to achieve this by a much greater concentration of effort on scientific education and research than the world has ever before witnessed, and by a completely regimented society which subordinates the welfare and living standards of the people to the priorities of industrialization and scientific development.

The Soviets promote scientific achievement with enormous resources of money and manpower. Some of the most clearly defined means of promotion are as follows:

* The substance of this talk was given before a number of other groups during Fall and Winter of 1958.

1. Soviet Education. Much has been said and written on this subject, especially since Sputnik, but our trip to Russia last summer convinced me that there has been no exaggeration of the emphasis which the Soviets place on education at all levels. Nor is there the slightest doubt that the primary concern is to provide superior education in science, mathematics and engineering. About 50% of the total curriculum of the 10 year public schools is devoted to science and mathematics. The institutes, tekhnikums and universities continue these priorities. For example, we were told that about 65% of the total enrollment of Moscow University -- the largest in the Soviet Union -- are training to be scientists and engineers. The percentage is considerably greater in the institutes and tekhnikums which are concerned primarily with highly specialized education.

2. Scientific Research. Probably the most important body in the Soviet Union, after the Presidium of the Communist Party and the Council of Ministers, is the Academy of Sciences. Founded in 1726, this Academy enjoyed a respectable reputation in the pure sciences even during the reign of the Czars. Since the Revolution, the Communist leadership has greatly enhanced the prestige and authority of the Academy of Sciences and provided it with almost unlimited financial resources.

It is an elite body, comprised of about 200 full members and another 300 "candidate members" -- all considered to be eminent scholars in various fields of learning and

many enjoy worldwide reputations. Directing the work and research of some 250,000 Soviet scientists, the Academy has no counterpart in America or elsewhere of remotely comparable power and importance. Contrary to much opinion in this Country, Soviet scientists and engineers are accorded the widest freedom and encouragement to develop new and original ideas. So long as they avoid politics, they have professional freedoms which may be fully comparable to those of Western scientists.

3. Incentives and Rewards. The Soviets astutely further this entire program by an ingenious system of incentives and rewards. This, indeed, was one of the most surprising lessons of our visit last summer. Most Americans think of Capitalism as the system which best stimulates and rewards individual initiative. We likewise think of Communism as the exact opposite in this respect. The truth is the Soviets have in fact adopted many Capitalistic ideas. As President Mallot of Cornell University recently said, in many respects "the Soviets are becoming Capitalistic almost faster than the western world is embracing Socialism".

In any event, incentives to individual effort and achievement (backed in many instances by compulsion in various forms) are applied generally to stimulate the Soviet economic system. There is no such thing as a "classless society" in Russia. Incomes and position in society vary widely. Article 118 of the Soviet Constitution not only provides that all citizens have "the right to work" but that

they are "guaranteed employment and payment for their work in accordance with its quantity and quality".

Although the Constitution does not so specify, the "quantity and quality" of work becomes uniquely valuable if it is in science or engineering. The new aristocracy in Russia today -- enjoying privileges and positions comparable to the nobility under the Czars -- includes scientists and engineers at the very top level, second only to the inner circle of the Communist Party who actually control the country.

Full members of the Academy of Sciences may earn \$50,000 or more per year, depending upon their position, their original writing and research, and other factors. These incomes are to be compared with the average wage of skilled workers ranging from \$2,000 to \$3,000 per year.* The top bracket of the income tax in Russia is only 13%!

Not only are scientists and engineers compensated extremely well (even by Western standards) but they enjoy positions of prestige and privilege; they are entitled to larger apartments; they may travel more freely, including limited travel abroad; they may enjoy the "private enterprise" right of receiving royalties on books and publications; and

* Figures are based on the official exchange rate of 4 Roubles per dollar.

talented young scientists are exempt from military service.

4. Utilization of Western Knowledge. Like the Japanese, the Russians make the widest use of the inventions, knowledge and experience of others. If, for example, there is an American or German machine or device that does the job satisfactorily, the practical Soviets see no sense in wasting time and efforts to build one of original Russian design. They simply copy the foreign model, and devote their energy and resources to pressing forward into new and unmastered areas.

Shortly after Stalin's death, the Soviets set up an "abstracting service" with the objective of translating, abstracting and disseminating everything of scientific and engineering interest published anywhere in the world. This service, operated by the Academy of Sciences, is well financed and staffed, and functions so efficiently that most western scientific publications are reproduced and circulated in Russia within three months after their initial publication.

There is believed to be nothing fairly comparable to this in America or elsewhere. The result is that Russian scientists are kept fully abreast of the knowledge of the world, on a current basis, whereas American scientists remain relatively ignorant of the accomplishments of their opposite numbers in the Soviet Union. There are some 2000 Soviet scientific and engineering journals and periodicals which are generally available. We apparently have no adequate counterpart of the Russian system for translating and

disseminating this wealth of material.

* * *

The success attained to date in Russia's massive campaign to promote science and engineering is difficult to measure. The "show piece", of course, is Sputnik and all that it implies. While we finally succeeded in putting satellites in orbit, our largest weighs only 30 pounds as compared with the 3,000 pounds of Sputnik III. Our recent conspicuous success with Pioneer is heartening, and yet it is believed that the Soviets are well ahead in many areas leading to mastery and control of outer space. They are certainly ahead in long range missilery, and are believed to be rapidly closing the gap in the development of hydrogen power both for military and peaceful purposes.*

* * *

The Soviets are also rapidly attaining a leadership in an area which receives little attention in the western world. This is in the "export" of scientists and engineers to the relatively undeveloped countries. It may seem surprising, in view of domestic needs and the high priority

* Both the Soviets and we have enjoyed new "space age" successes since the above was written, but there is no evidence in these that America is closing the alarming "gap" that obviously exists in this critical area.

assigned to attaining industrial and military supremacy, that Russia should have enough trained manpower to send this type of personnel to other countries.

The truth is that the Soviets are training scientists, engineers and technicians at an appreciably faster rate than the United States and western Europe combined. Allen Dulles, Chief of our Central Intelligence Agency, has estimated that in the decade 1950-1960, the USSR will have trained 1,200,000 engineers as compared with about 800,000 trained by the United States. There is reason to believe that this discrepancy becomes wider each year. Indeed, former Senator William Benton, in his recent book entitled "This is the Challenge", states that the Soviet Union today is "producing almost 3 times as many new engineers" as the United States.

The Kremlin is astutely and deliberately producing a surplus of highly skilled persons for export. This is a studied part of the plan for world domination. It may be as important as the training of key military personnel. It is a clever move in the cold war of propaganda, subversion and economic infiltration.

It is difficult to think of more effective missionaries for Communism than well trained scientists and engineers who will provide the technical "know-how" which Asia, Africa and other undeveloped areas of the world are so eager to receive.

* * *

It is disquieting in the extreme to reflect that America is not yet meeting its own urgent requirements. This was the conclusion of the Select Committee of the House of Representatives on Astronautics and Space Exploration, following months of testimony on this subject last winter. After discussing the minimum requirements of survival in the space age, this Committee concluded as follows:

"If a stumbling block exists (to American survival), it will probably be found in one of two directions, namely (1) within our educational program where, relative to the Soviet Union, too few scientists and engineers are being trained ...".

The Committee's report then stated that "no witness disagreed" with the conclusion that America is training too few scientists and engineers.

* * *

The question naturally arises as to why America -- at the peak of her power and prestige -- should appear to be seriously threatened in a long range contest for survival by a nation which, only 40 years ago, was comprised largely of ignorant workers and peasants.

There are many answers to this perplexing question, and this is not the time to explore them. I will merely venture the following thoughts. The Soviet Union, where all policy is controlled by a few Party leaders, is affirmatively

committed to a course of world domination. The total resources of that powerful country are dedicated toward this end. They consider the "cold war" to be as much of a mortal contest as we have considered our shooting wars.

But most of us in America give little thought to this contest. Indeed, it is suspected that the average American really cannot believe that the United States is in a contest for survival. Our responsible leaders understand this, and from time to time bring it to the attention of the public. But it is inherently difficult, in a democracy, to dramatize the long range seriousness of this situation to the point where the people are willing to demand and sustain the national sacrifice and effort which are essential.

There must be a vastly greater public willingness to support education, scientific research and development, national defense, and foreign aid and information programs. We eagerly accord this support in time of hot war. In some way the public must be made to realize that the contest with Communist Russia is potentially more menacing to our lives and liberties than all of the hot wars in our history. It is the duty of every citizen to promote this kind of realization.

Lewis F. Powell, Jr.

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