Science in the News

Transfer of Projects Gives Air Force Major Role in Military Space Activities

A new assignment of areas of responsibility, made last month by the Department of Defense, has given the Air Force the major role in military space activities. The move gave the Air Force responsibility for development, production, and operation of all military space vehicles, including the Saturn booster, the Army's major project.

Secretary of Defense Neil McElroy, in signing the new policy order, effectively removed the Advanced Research Projects Agency from the space systems field. Four satellite programs that had been under ARPA have been assigned to the military services, with the Air Force the big gainer. With the projects will go more than half of ARPA's budget of $455 million for fiscal year 1960.

Programs Transferred

The four satellite projects that were transferred from ARPA to the military services are all in the development stage. The two that were assigned to the Air Force were Midas, a satellite system employing infrared reception to give early warning of ballistic missile attack, and Samos, a system of satellites to be used for reconnaissance. Transit, a project which would use satellites for improved navigation, was transferred to the Navy, the service which had been working on it as the primary agent for ARPA. Responsibility for Project Notus, a large satellite system designed for use in communications, was given to the Army. The project calls for instantaneous and delayed relay of messages by satellites hovering above a fixed point on the earth.

The major program retained by ARPA is Project Discoverer, which is involved more with development of space flight techniques than with purely military objectives. Eventual transfer of this program, probably to the Air Force, is also planned, however. Despite the various transfers ARPA will continue to operate, but with a new role. The agency was established in 1958 to coordinate and manage advanced research projects, particularly those of the military that cut across the traditional service missions. The agency's new role, it is believed, will be to organize basic research in space techniques that will eventually bear on the country's military programs. It will be, the observers suggest, a relatively small technical group to study and evaluate advanced projects.

Civilian Space Agency

These developments in the Department of Defense are expected to have no immediate effect on the National Aeronautics and Space Administration. A call has been made, however, for closer liaison with NASA. The need for a better method of securing such cooperation became evident during Senate hearings conducted last spring by Stuart Symington (D-Mo.).

Informed observers of the Pentagon's various space programs suggest that the new assignment represents the beginning of a slow transformation of the country's military space program from the confused state that became evident during a number of Congressional inquiries to a more orderly and sound state. Congressional pressure, recent Soviet successes, and the influence of Herbert York, defense director of research and engineering, are reported to be the major forces behind the change.

U.S. Specialists Describe Soviet Commitments to Education

Last month the U.S. Office of Education released Soviet Commitment to Education, *a 135-page report of the first official United States education mission to the U.S.S.R., which took place 8 May-6 June 1958. An 11-member team headed by Laurence G. Derthick, U.S. commissioner of education, visited approximately 100 Soviet educational institutions. Excerpts from the report's sections on primary and secondary education, with particular emphasis on science education, follow:*

The one fact that most impressed us in the U.S.S.R. was the extent to which the Nation is committed to education as a means of national advancement. . . . Tremendous responsibilities are therefore placed on Soviet schools, and comprehensive support is provided for them by all segments and agencies of Soviet society. . . .

Wherever we turned we heard the slogan: "Reach and over-reach America." And everywhere, the people seem to respond in the conviction that education, in addition to hard work and the postponement of many creature comforts, is the best means of winning world supremacy.

Education reaches far beyond school-age children and youth and is eagerly sought by hundreds of thousands of full-time workers who are also full-time students; hundreds of thousands of others take correspondence courses. Many of these correspondence students also hope to qualify for university entrance. They do this because being well educated is the key to advancement.

And they have been building schools and universities at a rapid pace. Down on the borders of China where only a half-century ago the people were almost 100 percent illiterate, we saw thriving schools, an impressive scientific academy, and other institutions that have reduced illiteracy and advanced knowledge to an astonishing degree. From the shores of the Black Sea to remote Siberia we found the attitude summed up in the expression of a Soviet education official: "A child can be born healthy, but he can't be born educated."

There is still a considerable shortage of buildings resulting in part from . . . damage during World War II. . . .

Administration

Even though education in the U.S.S.R. is controlled by the Government and is therefore standardized and regimented, there is some flexibility of operation. Furthermore, decisions on policy, on textbooks, on teacher training, on curriculum, and on similar matters are not always made arbitrarily. We found fairly widespread evidence that

before making decisions on education, the Government seeks opinions from specialists at all levels of education. . . .

The fact that Soviet educational administration is centralized has often been commented upon. In outward form, however, the Soviet school system is decentralized, with 15 Republic Ministries of Education and many regional and local departments of education. The official pattern before one's eyes is therefore diversity, not uniformity; diffusion, not centralization. This is so even if we disregard the variations deriving from a system of such vast dimensions. Uniformity in educational policies and methods is nonetheless real. . . .

Educational policies (including those on science and research) and administration are controlled at three different political centers by appropriate bodies responsible for these fields: By Federal governmental agencies (ministries and bureaus), by Federal organs of the Communist Party, and by Republic bodies of both Government and Party. . . .

Primary responsibilities for the administration and operation of schools lie with the Ministries of Education at both Federal and Republic levels of jurisdiction and with other governmental agencies concerned with them. . . .

Organization

At the bottom of school organization are the nurseries which serve children up to 3 years of age and at the top the research institutes. . . . Between these two extremes are the main institutions of the Soviet school system: The kinder-

(Top) Laboratory class in a Soviet 10-year school of general education. (Middle) School greenhouse. In urban areas, most Soviet schools have greenhouses; in rural areas each school has a garden plot. (Bottom) Members of the first official United States education mission to the Soviet Union. Henry Chauncey, president, Educational Testing Service, Princeton, N.J.; Laurence G. Derthick, U.S. Commissioner of Education; Harry C. Kelly, assistant director for Scientific Personnel and Education, National Science Foundation; Lane C. Ash, assistant director, Division of Vocational Education, Office of Education; John R. Ludington, director Aid to State and Local Schools Branch, Office of Education; Helen K. Mackintosh, chief, Elementary Schools Section, Office of Education; Herold C. Hunt, Charles William Eliot Professor of Education, Graduate School of Education, Harvard University; A. John Holden, Jr., Vermont State Commissioner of Education; John B. Whitelaw, chief, for Teacher Education, Office of Education. Not shown: George Z. F. Bereday, professor of comparative education, Teachers College, Columbia University, and Oliver J. Caldwell, assistant Commissioner for International Education, Office of Education.

[U.S. Office of Education]

garten, serving children between the ages of 3 and 6; the general education school, offering grades from 1 to 10; and the universities and institutes. . . .

Parallel to the upper 3 grades of the general schools are varieties of technicums and pedagogical schools, which are increasingly giving post-secondary education, and schools for urban and rural youth which offer a general education course to young workers. Other institutions such as labor reserve schools, which teach vocational skills, also provide elements of general education. In addition, educational programs are offered through circles or clubs in Pioneer palaces, camps, and other projects sponsored by municipalities or industrial plants and collective farms.

Financing

. . . While exact figures on the total cost of education annually in the U.S.S.R. are difficult to obtain, it is generally conceded that from 10 to 15 percent of the total national income is channeled into education. . . .

The State budget for education provides for building construction and maintenance, supplies and equipment, salaries of teachers at all levels, stipends for students in institutions of higher education, special programs in education, and miscellaneous expenses. Industrial enterprises and collective farms also provide considerable supplementary support for education, primarily in equipment and facilities. . . .

Schools of General Education

The Soviet system of education is built basically around the general school. . . .

The program of general education consists of 4 elementary school years and 6 secondary school years. A single unified curriculum is planned for the elementary or 4-year school, for 7-year (incomplete secondary), and for the 10-year (secondary). . . .

All general schools are coeducational, attendance is compulsory through the 7th grade, and attendance records are carefully checked. [Under a recent Soviet educational reorganization plan for 1959–1963, compulsory education has been increased to 8 years.]

We were impressed with the abundance of equipment—charts, maps, three-dimensional teaching aids—and by the quality and quantity of laboratory and shop facilities. . . .

The school year begins on September 1 and ends between May 20 and June 20, with a 12-day winter holiday and a 10-day spring holiday. . . . Since the Soviet pupil puts in 6 days a week at school, in 10 years he spends about the same number of days in school as the United States pupil does in 12 years.

Curriculum

The standard curriculum offered in the RSFSR schools is shown below:

Grades 1–3: Russian language and literature, arithmetic, drawing, singing, physical education, and introduction to manual training.

Grade 4: History, geography, and elementary biology—largely nature study—are added to subjects taught in grades 1 to 3.

Grades 5–10: Russian language and literature, foreign language, history, arithmetic, algebra, geometry, trigonometry, physics, chemistry, botany, zoology, anatomy, Darwinism, geography, astronomy and drafting, polytechnical training (agricultural and industrial training), drawing, singing, and physical education. . . .

Mathematics, Russian language and literature, and physical education are required in all grades. Mathematics and science are particularly emphasized throughout the general school. . . .

Only one foreign language is required in the basic curriculum (instruction begins in grade 5 and continues through grade 10), and a pupil has a choice. . . . He may study a second language in an extracurricular language club. . . .

Mathematics and Science

In the 4-year primary school, the arithmetic curriculum is designed to carry Soviet children through a program covering the four operations of arithmetic, . . . real and imaginary numbers, the metric system, the measurement of time, decimals, and the rudiments of geometry.

The mathematics course, which includes arithmetic (grades 5 to 6), algebra and geometry (6 to 10), and trigonometry (9 to 10), is particularly designed for polytechnical education. . . .

Science education for Soviet children includes scientific training through in-school and out-of-school programs. . . .

Science education for Soviet pupils begins in the kindergarten. There a groundwork for scientific habits in the observation of natural phenomena and plant and animal life is laid. . . . In the elementary grades courses in biology, chemistry, and physics are comparable to good elementary science courses in U.S. schools. . . .

Physics—Among the subjects of particular importance is physics, which aims at acquainting the pupil with natural phenomena *and the basic principles of production processes.* The italicized phrase points up an important phase of the Soviet educational system. . . .

In grades 6 and 7 pupils become acquainted with principles of mechanics and heat and electrical phenomena. In grades 8 to 10 the principles of mechanics, acoustics, molecular physics, as well as heat, electricity, optics, and the structure of the atom are covered. . . .

Chemistry—The study of chemistry begins in the 7th grade with elementary instruction on substances and their transformation; on atomic and molecular studies and the principal laws of chemistry; on oxides and the bases of acids and salts; and on the properties of oxygen, hydrogen, the air, and water. After this, pupils prepare for a systematic course in grades 8, 9, and 10, where the work plan calls for a study of chemical elements. . . .

Biology—A systematic course in biology includes the study of botany (grades 5–6), zoology (grade 7), human anatomy and physiology (grade 8), and the principles of general biology (grade 9) which stresses the practical aspects of agriculture. . . .

Astronomy—In the 10th grade an introduction to astronomy is given.

Polytechnical influence—The polytechnical emphasis in the general school has modified the content of physics, chemistry, biology, and mathematics. Science subjects, although important in the training of "future" scientists, now have the major function of establishing an educational foundation for a polytechnical system of training which prepares a large number of students for practical industrial work. . . .

During the last few years the Soviets have been planning, experimenting with, and now are gradually adopting what they call a polytechnical program. The polytechnical program was used in 25 percent of the Soviet schools in 1957–58 in addition to the general education program, which was reduced slightly. In 1958–59 the plan will be followed in 50 percent of the schools. . . .

Teachers

More than 180,000 teachers are employed in schools at all levels in the

U.S.S.R. and all have had some pedagogical training, at least after beginning their careers. . . .

Soviet educators are very much concerned with teaching methods; methods are emphasized in teacher-training institutes, in textbooks . . . , in published literature, and in inservice training. . . .

The teaching we observed, the recitations we heard, and the copybooks we saw indicated that there was much rote learning.

Salaries of teachers in general schools are fixed . . . but the scale varies according to the region and the teacher's position and years of service. . . .

Salaries of beginning teachers are equal in general to those of doctors and engineers, and they can make extra money by increasing their teaching load or serving as group leaders in Young Pioneer circles. Merit teachers get higher salaries or a bonus. There are periodic increases, according to length of service, after 5 and 10 years. Pensions are granted after 25 years, but a teacher with more than 25 years of service who continues to work receives both pension and salary. . . .

All teachers work for 10 months of the year, with a 2-month vacation in the summer at regular pay. They are required, however, to spend 2 weeks in August preparing for the next school year. . . .

In all of the general schools we visited we were favorably impressed by the pupil-teacher ratio and by the number of teaching assistants available. . . .

Soviet school authorities make a determined effort to work closely with parents. . . . We got the impression that generally parents need no urging to cooperate in school activities. . . .

Special Secondary Schools

Considerable attention is given to the preparation of semiprofessional technical personnel in the U.S.S.R.—technicians whose competence lies between that of the skilled worker and the professional specialist. . . . Such workers are trained in special secondary establishments called technicums. Thus there are technicums for training workers for the power industry, the medical profession, light industry, and for others. . . .

Technicums have undergone remarkable growth over the years. In 1914 there were 450 technicums in 72 cities with a total enrollment of 54,000 students and a staff of 4950 teachers. In 1955 there were 3757 technicums in 852 cities with a total enrollment of 1,961,000 students and a total staff of 96,000 teachers.

Teacher Education

Soviet educators are in the process of achieving two major objectives that have in recent years been the concern of our own teacher educators in the United States: (1) To unify all teacher education, and (2) to bring all teacher education to a college or university degree-level status. . . .

In the preparation of both elementary and secondary school teachers, there appeared to be an increasing emphasis on solid subject-matter content, with relatively less emphasis on pedagogy as such.

Soviet teacher educators consider practical work, that is—observation of teaching, student participation in the classroom situation, and student teaching—to be of the highest importance for teachers-in-training for both elementary and secondary schools.

The selectivity in teacher education is approximately 5 to 1; that is, out of approximately 5 students who apply for admission to an institution of teacher education, 1 is accepted.

At this time there appears to be no numerical shortage of teachers in the Soviet Union. . . .

Teachers are not overburdened with extracurricular work. Their clerical duties are minimal. Extra teachers, or tutors, are available to work with slow learners, and to assist generally as teachers' aides. Although schools in the Soviet Union meet 6 days a week, each teacher has 1 work day a week completely free. . . .

Academy of Pedagogical Sciences

Perhaps the most important influence in Soviet educational progress is the Academy of Pedagogical Sciences of the RSFSR, an institution which has no counterpart in the United States. The Academy is the research, development, and resource organization that keeps the educational system moving ahead and improves curriculum and methods of teaching. It is a part of the Russian Republic, not the Soviet Union generally, but as none of the other Republics has such an academy its work is used throughout the country.

Although the Academy is only 14 years old, it is of considerable size and complexity. Its members, who are elected for life, are some of the most distinguished scientists in the U.S.S.R. New members may be proposed by individuals, organizations, or institutions, and are elected every 3 years by secret ballot of members only. It is presently staffed by 34 full members who devote full time to Academy work, 54 corresponding members who devote part time to it, and 550 research workers. The staff is directed by a presidium of 9 members. Members receive a stipend of 3500 rubles a month and corresponding members, 1750 rubles a month in addition to their regular salaries.

The Academy of Pedagogical Sciences has no direct relationship to the Academy of Sciences except that some persons may be members of both and at times members work together in planning research. The Pedagogical Academy also cooperates closely with other academies, like the academies of medicine and of agriculture.

It maintains 8 research institutes, 7 in Moscow and 1 in Leningrad. The 1958 budget for support of these institutes was 44 million rubles, which it received directly from the Government, although its budget is presented by the Minister of Education. It may request additional money from time to time. . . .

Of the many aspects of the work of the Academy of Pedagogical Sciences, three are of particular interest—the development of textbooks, the development of teaching aids, and the work of the department of comparative education [which studies education programs in other countries]. . . .

Due very largely to the work of the Academy of Pedagogical Sciences, education in the U.S.S.R. is not static but is constantly changing and improving.

Conclusion

We cannot afford to be apathetic about educational developments in the U.S.S.R. Clearly the Soviet Union is bent on overtaking and surpassing us as a world power, and it proposes to use education as one of the primary means of obtaining this objective. . . .

We want to emphasize that what we saw in the U.S.S.R. only served to renew our confidence in our better schools. But, at the same time, what we saw increased our concern for our poorer schools, suffering from neglect.

In the light of all we saw, we cannot stress too firmly our conviction that our nation must never forget nor underestimate the power and potential of education.