Space INTELLIGENCE NOTES

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AUTOMATION OF INDUSTRY GOAL OF SOVIETS, RIAS PANEL STATES The Soviet Union is mounting a major scientific effort toward ultimately converting its industrial production to automation, a report recently released by the Mathematics Center at RIAS (Research Institute for Advanced Studies) reveals.

An 11-man panel of mathematicians was organized by RIAS to survey recent Soviet contributions to mathematics, to evaluate their research, and to attempt to discern special features of Soviet mathematical research indicating the objectives of Soviet science.

"There is reason to believe that the U.S.S.R. can achieve a rapid acceleration in its rate of technological progress by an all-out scientific program in the field of automatic control," the report says.

"It seems clear," the report further states, "that they intend to make the effort and it is unwise to assume that they will not be successful."

The conclusion on Soviet automation goals, with its implication of Russian bid for world supremacy in industrial production, was reached after 12 months of intensive study of Russian scientific journals and books, and from personal contact and scientific correspondence with Russian mathematicians over a period of years.

Dr. Joseph LaSalle of RIAS, chairman of the special panel, said that the field of Russian mathematics is revealing "because the level of mathematics of a country is an important measure of the strength of its science and technology."

The panel concluded that "in mathematics the Soviet Union and the United States lead the world and are about at the same level." But the report predicts the Soviet Union will move at a faster rate than the United States in advancing the application of mathematical theories.

The mathematical studies that are building the foundation for automation of Soviet industry also could apply to the field of missiles and space vehicles, according to the 350-page report prepared for limited distribution within the scientific community and made available to interested government agencies.

RIAS, an institute established by The Martin Company in 1955 to conduct basic research, publishes in scientific journals the results of its studies in physics, chemistry, metallurgy and the biosciences, as well as in mathematics. The research center's headquarters is an ivy-covered brick mansion situated in a residential area on the outskirts of Baltimore.

Dr. LaSalle revealed that no attempt had been made in preparing the report to estimate how long it would take the Russians to achieve the goal of complete industrial automation. "Our purpose has been simply to determine the direction of their efforts, based on a study of their mathematics," he added.

Other panel members, in addition to Dr. LaSalle, were Dr. Solomon Lefschetz and Dr. Lajos Pukanszky, of RIAS; Dr. J. B. Diaz and Dr. R. A. Good, of the University of Maryland; Dr. Eugene Lukacs, of Catholic University; Dr. Robert Fortet, Henri Poincare Institute, Paris; and Dr. J. H. Giese, Dr. Tadeusz Leser and Dr. Ceslovas Masaitis, of the Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland.

Dr. Arnold P. Stokes, of RIAS, served as secretary to the panel.

Commenting on a portion of the report, pointing to belief by the Russians "that only a Communist Society can carry out automation of industry without a breakdown in its economy," Dr. LaSalle declared that historically there is no reason to believe this because the use of automatic machines has not necessarily created unemployment in the Free World. However, he explained, automation can create short-term dislocations and it does involve the retraining of workers.

"The Russians apparently believe they can do this more effectively than we can, because the state can control the lives of the workers completely, moving them about freely from one city to another, from one factory to another," Dr. LaSalle stated.

He also said that their needs are different and the difficulties faced are many. With the Soviets, the RIAS mathematician added, the problem is not to modernize factories that already exist, but to build new factories which are designed for automation.

Of Soviet work in control theory and numerical analysis, the report states, "In quality they match the United States. In quantity of output and in numbers they lead the world."

While one group of pure mathematicians in Russia works on a general theory of control, another group of mathematical engineers is working with them on applications in the same area, according to the report.

"In the hierarchy of institutes in the U.S.S.R. there are also those whose function it is to use the ideas of other institutes to develop practical systems," the panel's report declares. "One such impressive institution is the Institute of Automation in Kiev. Four branches of this institute are planned and it is said that within three years the institute and its branches will employ from 6000 to 10,000 people."

The expansion at Kiev from roughly 2000 employes to as many as 10,000 might mean that successful applications are beginning to appear, the panel believes, but they point out that it might mean just the opposite--that the intensified effort is caused by dissatisfaction with the rate of progress.

The panel predicts that the Soviet Union will move faster than the United States in the practical application of mathematical theories, because communication seems to be better between Russian mathematicians and the engineers who seek to apply basic scientific knowledge.

Pointing out that all too many American mathematicians write only for each other, the report states, "Leading Soviet mathematicians have an interest in and contribute to both pure and applied mathematics. Soviet mathematicians make serious and successful efforts to communicate the latest theoretical advances to engineers and scientists." (RIAS News Bureau)

NEXT RUSSIAN SPACE "SPECTACULAR" LINKED WITH INAUGURATION DATE. A United Press International news release from London states that "Western scientists" and "Western intelligence" believe the Soviets may rocket a man into orbit or land a robot laboratory on the moon to coincide with the inauguration of President John F. Kennedy on January 20.

The release states that according to intelligence information from behind the Iron Curtain, both projects were in their final stages some months ago and unusual activity currently taking place at Soviet satellite launching bases and movements of Russian missile monitoring ships indicate a major space project will take place within the next month.

Western experts speculate that the Soviet scientists are not worried about achieving orbit--the multistage rocket tested in the Pacific this year can handle a 10-ton satellite--but they are concerned about the propaganda effect of losing a man if the spaceship does not react accurately to the radioed command for re-entry. Therefore, they have been studying the death of Space Ship II and its cargo of animals to find out what went wrong and to correct it. This may involve one more animal satellite firing and re-entry experiment. (UPI News Release)

ISAKOV PREDICTS "MAN IN SPACE" IN NEAR FUTURE. P. K. Isakov, Chairman of the Committee on Space Medicine of the Section on Astronautics of the Aviation Federation of the USSR, in the September 1960 issue of Priroda,

comments rather sketchily on the implications of the return of the passengers from the second Soviet spaceship. He appears to feel that there is no impediment to such a flight from the viewpoint of space medicine. As a specialist in that field his comments may be quite significant, but this article was probably written in August, before the biological specimens and animals had been fully studied. ("Man Will Fly into Space," by P. K. Isakov, Priroda, No. 9, 1960, pp. 4-5)

SPACE GOALS LISTED BY HUNGARIAN. A brief summary of a recent article by Erno Nagy, Secretary of the Hungarian Space Travel Society, is given below.

The first experiments with humans in the atmosphere are expected within a few months. Actual recovery of a man from space is expected within a year or two.

The development of the new Soviet propulsion rockets having a thrust capable of launching a three-ton lunik will make possible the establishme of space stations manned by a sizeable research staff, provided the prope procedures for assembling and transport are developed. However, this program still requires many years of work.

Experiments are in progress using atomic reactors as a source of heat energy. The goal is to develop a rocket propelled by atomic energy, but this is an unusually difficult problem and will require a very precise solution.

In the field of ion rockets, electrical propulsion units, which are experimental and unsuitable for space flight, are already being tested. As a result of the tests, propulsion units of this type may actually be tested and introduced for space flight in 10 or 15 years.

Photon rockets belong in the realm of science fiction for the time being.

The most immediate goals of space travel are: first, a safe return to Earth; second, a landing on the Moon after it has been thoroughly investigated by probes, and after rockets of the right dimensions have been constructed; third, the exploration of Mars and Venus, which are within the range of our present-day rockets. A trip to other planets would require an atomically propelled rocket. ("Three Triumphant Years," by Erno Nagy; Budapest, Technika, Vol. IV, No. 10, October 1960, p. 1, 10)

THE PROBLEMS OF INTERPLANETARY TRAVEL DISCUSSED. The time is approaching, writes N. Varvarov, when flights will be made around Mars and Venus and artificial Venus and Mars satellites will be a reality. A later step will be actual rocket landings on the surface of those two planets. These rockets will carry research apparatus and mobile automatic stations. These "wandering robots" will report back to Earth by radio and television.

The author then discusses the character of space flights to Mars--along a trajectory of 586 million kilometers in 259 days, and to Venus--along a path of 401 million kilometers in 146 days.

The first stage in the flight will be the takeoff from Earth and the attainment of the necessary acceleration--a stage which can last but a few dozen minutes. The motors will then be switched off and the second stage of flight will begin. In this section of the flight, more than 99% of the entire route, movement will be by inertia. The third stage begins when the spacecraft enters the field of attraction of the body to which it is travelling. The motors will then be activated and the braking process will begin. This final pre-landing stage may last from several dozen minutes to several hours. None of this can be achieved except by carrying rocket motors and rocket fuel aboard for use in correcting the trajectory in midflight.

Flight can be undertaken only at the most rigidly predetermined times. The slightest error in calculation can lead to tragic consequences--the ship may become lost in space forever. In the case examined, no return from Mars could be undertaken until 455 days had elapsed on that planet (or 470 days, in the case of Venus). Thus a round trip to Venus would require about 2 years, and to Mars--approximately 3 years.

Favorable conditions for a flight to Mars will occur in September-October of this year and November-December 1962. The next favorable period for a flight to Venus will occur in the middle of January 1962, and thereafter--in August 1962.

One of the notable peculiarities of space flight is that even a small increase in the velocity of flight leads to a considerable decrease in the duration of flight.

However, the power sources presently available do not make such interplanetary flights possible. But the solution, in turn, is to create intermediary fueling stations.

The ideal shape for a spaceship is a sphere, because it is the shape which combines minimum surface with maximum volume.

Future interplanetary expeditions will not consist of a single spaceship, but two at the very least. The author reminds us that the interplanetary travellers face more hazards than did Columbus and Magellan; only one ship returned of the three Columbus had, whereas all but one of Magellan's five vessels were lost.

After listing these difficulties, Varvarov concludes as follows: "There is no question that these difficulties can be overcome provided the material and intellectual resources of the peoples of different countries be joined together. Therefore, the sooner the arms race is ended, the sooner the world replaces the sword with the plowshare, the sooner we

will solve the many problems of vital importance for humanity, including flights to the planets of our Sun and those of other stars." ("To Unknown Worlds," by N. Varvarov, Ekonomicheskaya Gazeta, 9 October 1960, p. 3)

ACADEMICIAN FESENKOV REVIEWS THE SIGNIFICANCE OF SPACESHIPS IN THE STUDY OF THE ATMOSPHERE. V. G. Fesenkov, writing in a recent issue of Priroda, considers that an observatory in space will be a reality within a reasonably short period of time. Initially, such an observatory will be maintained relatively close to the Earth. The manned vehicle will describe an elliptical or circular orbit around our planet at altitudes of 500 to 600 km and be controlled from the Earth. These flights, near the Earth, but beyond the limits of the atmosphere, will make it possible to undertake much research which is impossible or extremely difficult from the Earth's surface due to the interference of the atmosphere.

The author then describes the possibilities offered by a spaceship circling the Earth at an altitude of 500 km, in an approximately circular orbit, and inclined 65° to the plane of the equator.

For example, the author suggests that by photographing the sunset from such a height with an ordinary camera with a telescopic lens and a focal length of about one meter and through various filters, it would be possible to easily determine the vertical distribution of ozone over a wide range of latitudes.

Likewise, highly fruitful research could be conducted in the field of twilight phenomena. Photometric observations of the twilight could provide valuable data on the structure of the Earth's atmosphere up to altitudes of 150 km or more.

It would be interesting, states the author, to use a small spectrograph to record the emission spectrum of the ionosphere on the unilluminated side of the Earth and constantly record how the various emission lines change in dependence on the time various layers of the ionosphere are reached by the direct rays of the Sun.

Among the other phenomena which Fesenkov advocates be included in the observatory's research program is that of Zodiacal light; we have had only a limited view of this phenomenon and in several respects it remains virtually unstudied.

By ingenious adaptations to the spaceship and its equipment, Fesenkov suggests that the complex structure of the Sun's corona can be photographed in a manner to reveal information hitherto inaccessible.

Finally, telescopic observations of the Sun, planets and stars from aboard the spaceship will reveal much detail previously unseen due to the optical barrier imposed by the Earth's atmosphere. ("Spaceships and Astrophysics," by Academician V. G. Fesenkov, Priroda, No. 9, 1960, pp. 6-9)

INTELLIGENCE BRIEFS:

It is believed that Soviet scientists are working to discover the secrets of anti-gravitation in an attempt to develop a weightless aircraft or space vehicle that would revolutionize flight. Their work is probably highly theoretical--with practical models still a long way off.

Could it be true that Russia is waiting for a U. S. failure with project MERCURY before making their first attempt to put their so-called "manned spaceship" in orbit? Some western scientists speculate that the Soviets feel they can bide their time--and possibly insure an initial success--with their first man-in-space project because it is so much more ambitious than is the U. S.'s MERCURY plan.

A recent article entitled "Cabin of a Space Rocket" by Soviet scientist Kabina Kosinicheskoy states that comparisons of the work conditions of deep-sea divers and of pilots in a chamber filled with water show that the ideas of Konstantin Eduardovich Tsiolkovsky for an anti-g chamber based on the buoyancy principle of Archimedes are well founded. Such a chamber could apparently be a rigid, hermetically sealed cabin built of a durable thin and transparent material. All controls would be inside of it, with hermetically sealed outlets leading outside. Astronauts could fill the chamber with liquid when they expect a greater g-force; during takeoff, braking, landing, and sharp changes in flight direction. Quick removal of water could be accomplished with compressed air.