



Space

INTELLIGENCE NOTES

SPACE SYSTEMS INFORMATION BRANCH, GEORGE C. MARSHALL SPACE FLIGHT CENTER

These notes contain information gathered primarily from foreign communications media. The publication of this unclassified material does not necessarily constitute approval and no responsibility is assumed for its accuracy or reliability.

February 1963

Vol. 4 No. 2

FROM THE WORLD PRESS

Page

- ◆ RUSSIAN OUTLINES SOVIET LUNAR PLANS 2
- ◆ USSR DETERMINES TEMPERATURE OF VENUS 3
- ◆ SOVIETS REPORT MARS PROBE ON TARGET 3
- ◆ TOP RUSSIAN SPACE SCIENTIST DIES 4
- ◆ COSMONAUTS' TRAINER HONORED 4
- ◆ NASA SAYS NO SECRET AGREEMENT WITH USSR ON MOON PROJECTS 4
- ◆ SOVIETS CLAIM LARGER MILITARY ROCKETS 5
- ◆ RUSSIANS USE SWEDISH SPACE FLIGHT SIMULATORS 6

FROM THE SEMITECHNICAL LITERATURE

- ◆ WILL USSR MARS PROBE HAVE COMMUNICATIONS TROUBLE? 6
- ◆ WEST GERMAN RESEARCH GROUPS BID FOR EUROPEAN SPACE SCIENCES LEADERSHIP 8
- ◆ RUSSIANS REFUTE CLAIM OF OTHER RUSSIANS 9
- ◆ SOVIET SCIENTIST SEARCHES FOR LIFE IN SPACE 9

FROM THE TECHNICAL LITERATURE

- ASTROBIOLOGY
 - ◆ WEIGHTLESSNESS CONSIDERED 11
- ASTROPHYSICS
 - ◆ SOLAR AUREOLES MEASURED 11
- COMMUNICATIONS
 - ◆ RADIO WAVES BOUNCED OFF VENUS AND MARS 12
- GEOLOGY
 - ◆ SOVIETS CLAIM EARTH'S CORE IS LIQUID 13
 - ◆ RUSSIAN COMPARES EARTH AND MOON 14
- LIFE SUPPORT
 - ◆ LONG TERM LIFE SUPPORT SYSTEMS 15
 - ◆ SOVIET WORK ON HUMAN ENGINEERING IN SPACECRAFT 15
- METEOROLOGY
 - ◆ SODIUM CLOUD EXPERIMENTS IN ARGENTINA 16
- PHOTOGRAPHY
 - ◆ INFRARED PHOTOGRAPHS OF THE MOON 17
- PHYSICS
 - ◆ SHAPE OF A BODY FOR MINIMUM DRAG AT HYPERSONIC SPEEDS 18
 - ◆ SOVIET HEAT CONDUCTION INVESTIGATION 18
- PRODUCTION ENGINEERING
 - ◆ NEW AUTOMATIC METHOD OF METAL FORMING 19
- SPACE FLIGHT
 - ◆ SOVIET MARS PROBE REPORT 20
 - ◆ SOVIETS TO USE DIRECT FLIGHT TO MOON 22
- TELEMETRY
 - ◆ DATA TRANSMISSION FROM SPACECRAFT 23

BOOKS

- ◆ WHAT RUSSIAN SCIENTISTS SAY ABOUT FALLOUT 24
- ◆ SPACE LABORATORIES 24
- ◆ THE METHOD OF FUNCTIONALS IN THE QUANTUM THEORY OF FIELDS 25

BIBLIOGRAPHIES

26

FROM THE WORLD PRESS

RUSSIAN OUTLINES SOVIET LUNAR PLANS. According to a news item dated January 3, 1963, the Soviet Union will send complex instrumented robots to the Moon this year in preparation for a manned circumlunar flight in 1964-65.

This is a prediction by Anatoly Blagonravov, a top member of the Soviet Academy of Sciences' Interdepartmental Commission for Interplanetary Communications, the Russian space agency.

Writing in the Soviet government newspaper Pravda, Blagonravov says the manned flight around the Moon would last "about three days" and would take place "during the Period of the Quiet Sun (1964-65), when solar eruptions will be absent."

Manned flight to the Moon, at least from a biomedical standpoint, is possible even now, Blagonravov says.

The Soviet scientist leaves an impression that the Russians don't yet have the booster hardware to land men on the Moon and get them off again.

As far as unmanned lunar spacecraft go, the Soviets are believed to be able to soft-land a 590 kg (1,300 lb) payload, the size of a Volkswagen, on the Moon with their present rocket boosters. Some U.S. scientists suspect the Russians have tried no lunar shots since 1959 because they are preparing a spectacular tracked lunar vehicle which will explore a part of the Moon in great detail.

Blagonravov hints a multiman space station is a top-priority project. "Last year's broad (Soviet) space program can be viewed as a preliminary stage for the creation of a manned space station," he says.

Space stations could have a multitude of uses, including perhaps some military tasks such as reconnaissance and missile defense. Blagonravov, like some other Soviet space scientists, is a military man, with the rank of lieutenant-general in the Red army's artillery. The Russians do not split up their space program in civilian and military parts as the U.S. has done, and this has enabled the Soviets to move faster into space.

What's more, orbiting space stations could serve as launching platforms for manned expeditions to the Moon.

In contrast, the U.S. has no firm plans to build a space station. The U.S. lunar exploration program envisions a "lunar rendezvous" approach in which a three-man ship would be launched into a lunar orbit. Two astronauts would land on the lunar surface in a smaller spacecraft. They would then try to rejoin the mother ship for return to Earth.

This is considered by many scientists a far more complex technique than a direct trip to the Moon from a space station in Earth orbit. Some scientists think the lunar rendezvous technique might prove unworkable.

Blagonravov says "it's difficult to predict right now" whether Russian will attempt prolonged and far-ranging manned space flights this year. But preparations for such flights are in progress. Cosmonauts are being trained, booster rockets are being improved, and Soviet scientific satellites are making a detailed analysis of space near Earth.

The 12 Cosmos-series Sputniks launched in 1962 will help Soviet scientists design reliable automatic devices which should function "for years" aboard weather, communications, and astronomical satellites, according to Blagonravov.

The Russian scientist says the high cost of space exploration should lead to wider international cooperation in space research.

Even so, his emphasis is on the Soviet space program. He predicts exploration "along new cosmic trails and new successes" in the Russian space program this year. (Source: The Huntsville Times, January 3, 1963)

USSR DETERMINES TEMPERATURE OF VENUS. On December 15, 1962, an article appearing in Komsomolskaya Pravda stated that Soviet astronomers had solved one of the problems that the American Venus probe failed on. After pointing out that one of Mariner 2's main missions was to find out what the temperatures of the Venus surface and atmosphere are, the article claimed Soviet investigations conducted at Pulkovo by means of their radio telescope have already answered these questions.

According to the report, they determined the Venusian surface temperature to be between 300° and 400°C. Also, the planet's atmosphere was said to have a temperature within the limits of 0° to 100°C and, therefore, Venus should be defined as a "red hot planet."

Credit for conducting these unique observations of our nearest planetary neighbor should be given to the associates of the Pulkovo Observatory: D. V. Korolkov, Yu. N. Pariyskiy and G. M. Timofeyeva. (Source: Russian News Brief, publication of Electro-Optical Systems, Inc., December 20, 1962)

SOVIETS REPORT MARS PROBE ON TARGET. A news item from Moscow reports the Russian Mars-1 probe is expected to rendezvous with Mars in June.

The Soviet space probe was reported past the 7 million-mile mark on its photographic mission to the planet Mars.

The Soviet news agency Tass said the space laboratory launched November 2 from an orbiting space platform was sending back radio reports to Earth.

It said latest calculations showed the vehicle would pass within 200,000 km (120,000 mi) of the distant planet that swings within 55 million km (35 million mi) of Earth.

Tass said all equipment on board is working normally.

Its purpose is to take photographs of Mars, radio them back to Earth, and continue its orbit to become an artificial planet. (Source: Washington Star, December 6, 1962)

TOP RUSSIAN SPACE SCIENTIST DIES. A recent news dispatch from Moscow reports the death of Alexander Topchiev, 56, a leading Russian research chemist believed to have been closely connected with the nation's space program.

Topchiev, vice-president of the Soviet Academy of Sciences, was graduated from the Moscow Institute of Chemical Technology in 1930.

Topchiev declared recently that "war is no longer possible." The burly scientist, married and a father, said while in the United States in 1961 that any nuclear conflict "would result in the destruction of all mankind." (Source: Chicago Tribune, December 28, 1962)

COSMONAUTS' TRAINER HONORED. On November 28, Křídla vlasti reported that N. Nikitinov, who trained the first two Soviet cosmonauts, Yu. Gagarin and G. Titov, in parachute jumping, has been awarded the title of Honored Coach of the USSR. The same title was awarded N. Kuzin, the parachute instructor of A. Nikolayev and P. Popovich, cosmonauts 3 and 4. (Source: Library of Congress, A.I.D. Press, No. 861, December 19, 1962)

NASA SAYS NO SECRET AGREEMENT WITH USSR ON MOON PROJECTS. The newspaper Paris-Presse, on January 1, 1963, said the United States and the Soviet Union have signed a secret agreement to work together and pool their resources in future space research.

The front-page dispatch said the joint program being worked out is aimed at putting a mixed team of Americans and Russians on the Moon by 1970.

They would plant the UN flag on the Moon's surface, Paris-Presse said.

The dispatch, by Lucien Barnier, was not solidly sourced but contained logical arguments.

It said the accord "has just been signed" by top aeronautic officials Hugh Dryden for the United States and Anatoli Blagonravov for the USSR.

It said the accord followed secret negotiations which have been going on for six months and would be continued through 1963.

The National Aeronautics and Space Administration in Washington denied that the United States and Russia have signed any agreement to physically assist each other toward putting a man on the Moon. Observers recalled, however, that the two countries have said they will exchange information on three space projects: communications, ether-spotting, and mapping the Earth's magnetic field.

A UPI dispatch from the United Nations on December 5 reported that "no provision was made for cooperation on manned space missions, as (President Kennedy) originally proposed" to Soviet Premier Nikita Khrushchev.

"From now on the two countries are putting an end to the race for the conquest of space and their scientists will collaborate in launching satellites and cosmic vessels," Paris-Presse said. "The discussion should put an end to the great East-West space battle." (Source: Birmingham Post-Herald, January 1, 1963)

SOVIETS CLAIM LARGER MILITARY ROCKETS. The commander of the Soviet rocket forces claimed that Russia continues to lead the United States in the field of powerful military rockets.

Marshal Sergei Biryuzov's statement in the military newspaper Krasnaya Zvezda (Red Star) on December 4 apparently was an answer to recent statements by American leaders that it is the Soviet Union, and not the United States, which suffers from a missile gap.

The British Institute for Strategic Studies, in a report published November 9, estimated that the Russians had about 75 operational inter-continental ballistic missiles, compared with 450 to 500 in the hands of the West. The report said Soviet leaders apparently had decided to concentrate on building a bigger strategic striking force.

The institute said, however, that the Soviet rockets can carry more destructive warheads than such United States equivalents as the Titan. It added that the Russians now have developed a more accurate ICBM, and it should be deployed by next year.

Marshal Biryuzov declared the Soviet Union is increasing its arsenal of nuclear warheads for global rockets, "the biggest of which are gigantic yield--50 or 60 or more megatons." A megaton is the equivalent of 1 million tons of TNT.

He then referred to Western newspaper reports saying the United States had rocket warheads of only five megatons.

"The Soviet Union," Marshal Biryuzov said, "still confidently leads the United States of America in the creation and development of powerful rockets."

The marshal also repeated Soviet claims that Russia has solved the problem of destroying rockets in flight. (Source: Washington Star, December 4, 1962)

RUSSIANS USE SWEDISH SPACE FLIGHT SIMULATOR. A Swedish scientist said on December 5 that Russian cosmonauts were being trained in a Swedish built space flight simulating centrifuge that subjects them to 15 times the weight of gravity.

The Swedish ASEA company, which manufactures electrical equipment, disclosed that it delivered the super-centrifuge secretly to Russia a year ago. This disclosure was believed to be the first indication that Russia had been forced to seek help elsewhere in its space projects. (Source: Chicago Tribune, December 6, 1962)

FROM THE SEMITECHNICAL LITERATURE

WILL USSR MARS PROBE HAVE COMMUNICATIONS TROUBLE? According to Dr. I. M. Levitt, Director of The Fels Planetarium of the Franklin Institute, the Soviet Mars probe may have trouble when it attempts to relay information back to Earth via television pictures recorded on tape.

Skepticism exists in the minds of some of our space scientists as to whether the one-ton Soviet space probe now on its way to Mars will return significant information after its 500,000,000-km (approximately 300,000,000-mile) trip. The principal reason for this doubt is the critical problem of life of the components making up the instrument and communications payload.

A Moscow dispatch has indicated that the probe might return to the Earth before relaying back its findings. This would mean that the signals would have to be transmitted after an almost eight-month delay between taking and transmitting. And even if the stored pictures did not deteriorate, there remains an acute problem which deals with guiding the probe back to the Earth.

If the Soviets try to return the probe to the Earth after a close Mars passage, they encounter an almost unsurmountable task of knowing what instructions to relay to the probe to undertake this maneuver. Let us suppose that they can achieve the same accuracy with their probe that we achieved with Mariner 2. This means it will pass within 10,000 km (approximately 6,000 miles) of the planet. Because the planet is a massive body, it will perturb the probe and perhaps start it off in another direction. The question then becomes: How did the planet disturb the probe and what must be done to return it to the vicinity of the Earth? These questions must be analyzed and answered from a distance of 250,000,000 km (approximately 150,000,000 miles).

If the Russians program the probe so that the gravitational field of the planet will not disturb it, it cannot pass closer than about one-half a million miles from Mars. This is about twice the Earth-Moon distance, and unless there is a good, long focus telescope aboard, the value of the probe will be minimal. If Mars does not disturb the probe, it may be possible for them to program the return to retrieve the desired information.

The other approach, and the one which will most likely be used, will be to relay information concerning the planet surface from a distance of 250,000,000 km.

The manner in which this may be done is to take television pictures and record them on tape. Once this tape is available, it can be played back on demand to have the pictures transmitted by a scanning device. In the case of Lunik 3, the Moon picture was recorded on film, and when the probe returned to the Earth, the film was scanned. In this manner a picture of the hidden side of the Moon was obtained. The Lunik 3 process may be unsatisfactory in this procedure because long exposure to space radiations may adversely affect the film.

The logical approach appears to be the relaying back of pictures by radio signals from a distance of 250,000,000 km. Despite the fact that this has not yet been done communications engineers believe this relay is feasible.

If we could assume that the optical system aboard Mars 1 took a picture approximately 10 cm by 10 cm (4 in. by 4 in.), and if this were scanned by a 250 line-per-cm (100 line-per-in.) television system, it would mean that the picture had roughly 400 lines. In the other direction we would also have 400 lines so that approximately 160,000 "bits" of information are contained on the photograph. How do they get this information to the Earth?

The ability to transmit a picture depends on the band width used for transmission. This band width can vary from a single cycle to many thousands of cycles. Our Ranger probes have a band width of about 2,000 cycles per second while the Mariner 2 interplanetary probe will relay back information at about 10 cycles per second.

If we are to assume that the Soviets will use the same band width as the Mariner, they will have to transmit the 160,000 bits for 16,000 seconds or over four hours to acquire a single picture. However, this rather lengthy time interval should not present a problem to communications engineers.

Engineers assume that the world's largest radio telescope may be available to pick up these faint signals and that the Mars 1 probe antenna will be pointed at the Earth. Under these conditions only one watt of energy at the transmitter near Mars will suffice to have this signal received on the Earth. They also point out that present batteries can yield up to 50 watts for one hour for every pound of battery carried along. Thus ample power for broadcasting is present. Even with this narrow band width the Soviets can take literally hundreds of pictures and transmit them to Earth over a period of many weeks hoping that some features will be sharp on different pictures and the final composite picture of Mars will be a definite one.

While this indicates that no problem involved in the acquisition of the Mars pictures is insoluble, actually a serious problem is present, and that is: How do you maintain equipment in the alien environment of space for a period of at least eight months and have the equipment perform perfectly? The critical problem in this probe will be maintaining the life of the many components--optical, electronic, efficiency of batteries, etc.

Theoretically, getting a probe to Mars to photograph the surface and then relaying that information to the Earth appears easy. In light of what is happening to our Mariner 2 and what happened to Russia's Venus probe, the outcome is not too encouraging. If the Russians succeed in this, they will have overcome a major hurdle in the maintenance of equipment in space, but we really shouldn't be too surprised if the Mars 1 does not fulfill its inspirations. (Source: Daily Press, December 9, 1962)

WEST GERMAN RESEARCH GROUPS BID FOR EUROPEAN SPACE SCIENCES LEADERSHIP.

Two West German industry research groups are proposing that West Germany make a definite effort to become a leader in European space sciences.

The program, now under review by the Ministry for Atomic Energy, restricts immediate hardware to a limited number of projects within present capabilities. One feature of the plan is the training of "no less than 3,700 scientists and technical men" in space technology.

Industry, under the plan, would have three specific objectives--"recover the technical lead achieved by other countries, implement a systematic working program, embracing the entire field of space travel as a basis for European and/or Atlantic cooperation," and provide new solutions to problems with a view of cutting costs. (Source: Aviation Week & Space Technology, October 22, 1962)

RUSSIANS REFUTE CLAIM OF OTHER RUSSIANS. Ch. Bayriyev and S. Mamedov of the Turkmen Medical Institute claimed, as reported in the September, 1962, issue of Space Intelligence Notes, that they had discovered microorganisms of extraterrestrial origin in the Sikhote-Alinist meteorite. Academicians V. Fesenkov, A. Imshenetskiy, and A. Oparin, the last the director of the Institute of Biochemistry, Academy of Sciences USSR, now refute that claim.

Investigation by the Institute of Microbiology, Academy of Sciences USSR, of which Imshenetskiy is director, showed that the work of Bayriyev and Mamedov was based on incorrect premises and was very poorly conducted. There were no grounds for assuming that the thermophilic bacteria found were of extraterrestrial origin. Studies of the meteorite showed a carbon content of only 0.017 percent.

In addition to this refutation, the three academicians report that the organic content of meteorites is being studied at the Institute of Geochemistry and Analytical Chemistry, Academy of Sciences USSR, and at the Ukrainian Academy of Sciences. The Committee on Meteorites, Academy of Sciences USSR, of which Fesenkov is chairman, is studying the structure and mineral and chemical properties of meteorites. Research on organic substances in meteorites will be undertaken in the near future by the Institute of Microbiology. The purpose of all these studies is to determine the true origin of microspores encountered on meteorites and to determine whether the organic content of meteorites is of biological or chemical origin. (Source: Izvestiya, December 20, 1962)

SOVIET SCIENTIST SEARCHES FOR LIFE IN SPACE. A recent article in the New York Times states that a 46-year-old Soviet astronomer, Dr. Iosif Shklovsky, believes that the first place to look for signs of intelligent life, other than on Earth, is the Great Spiral Nebula of Andromeda.

The Times goes on to report that the Andromeda Nebula is the nearest galaxy visible to the naked eye.

The article quotes Dr. Shklovsky's reasoning:

"A supercivilization, such as those that some believe populate our own galaxy, should be able to harness enough energy from its own sun to power a radio beacon of formidable range. In fact, such a beacon should be "visible" not only throughout its own galaxy but also at far greater distances, such as that lying between us and the Andromeda galaxy.

"The fact that we have not already detected such a pinpoint of strong radio emissions in our own galaxy suggests that highly evolved technologies are rare. We must look out at least 700 light years to have a reasonable expectation of seeing one.

"This means that only one in tens of thousands of stars would be likely to have such a civilization in orbit around it. Such a paucity of advanced life, in the galaxy, would force super civilizations to construct radio beacons of great power to attract attention to themselves.

"Dr. Shklovsky feels that the American effort of early 1960, known as Project Ozma, was the wrong approach. It scanned two comparatively close stars for radio signals on a wave length familiar to all radio astronomers: the 21 cm emissions from hydrogen clouds in space.

"The project was carried out at the National Radio Astronomy Observatory, in West Virginia, not in any real expectation of hearing signals but as a test of the problems involved in such monitoring. The results were negative.

"The wave length of 21 cm was chosen because it is widely scanned in studies of the galaxy. It is suitable also in that it passes freely through the Earth's atmosphere and through vast reaches of space. In other words, it would be a logical channel to be chosen by an advanced civilization seeking to make contact with an emerging technology.

"The argument, in this respect, is that ours (Earth) is an emerging technology. Against the time span of life's evolution on Earth--about two and a half billion years--the few decades of our electronic technology are but an instant. Assuming a continuation of the present rate of growth, the technology, in thousands, millions or billions of years could reach levels quite beyond our imaginations.

"Dr. Shklovsky cited a proposal by Dr. Freeman J. Dyson, of the Institute for Advanced Study in Princeton, N. J., that such a civilization would be capable of redistributing all the material of the planets to form a solid shell, enclosing its parent star.

"Being thus enclosed, according to Dr. Dyson, the star would be invisible. However, its heat would radiate from the outer surface of the shell in the deep infrared. He has therefore suggested that we scan the sky for objects emitting such infrared light.

"Dr. Shklovsky has carried this reasoning one step further. He says that, to attract attention, such a civilization could--and would--convert as much as 1 or 2 percent of the energy captured from its parent star into radio energy.

"He agrees with the American proposal that 21 cm is a logical wave length and says such a civilization should be able to pump out signals of almost incredible power. He proposes that the scanning be done up to two megacycles per second to each side of the characteristic hydrogen frequency.

"Because no signals have been observed, he concludes that if any such civilizations exist, they are very far away. If such a beacon is seen in Andromeda, he argues, then a major effort can be made to scan the vast reaches of our own galaxy.

"If a beacon, pulsed, modulated or otherwise made to bespeak intelligent life, is detected in Andromeda, it will be difficult to answer. To send a message there by radio (at the speed of light) and receive a reply should take 3,000,000 years.

"Dr. Shklovsky is not optimistic on seeing such signals. He is somewhat skeptical that any civilization is yet able to enclose its parent star, or sun, and harness a substantial fraction of its energy. However, like many others, he wants to look." (Source: The New York Times, December 3, 1962)

FROM THE TECHNICAL LITERATURE

ASTROBIOLOGY

WEIGHTLESSNESS CONSIDERED. Soviet experiments in space, conducted by N. M. Sisakyan, O. G. Gizenko, and A. M. Genin, have indicated that weightlessness of short duration (1 to 4 days) does not have a negative effect on the vitality of bioorganisms and that coordination and orientation (in humans) need not be disrupted. What is not known is (1) whether prolonged weightlessness (weeks) will affect the functional state of bioorganisms to a point where they will no longer be able to withstand the stress of a normal gravitational field on returning to Earth; and (2) what effect weightlessness will have on cellular physiology, particularly in regard to cell division in early embryonic stages, which is normally oriented along gravitational axes. (Source: Library of Congress, A.I.D. Press, No. 859, December 17, 1962)

ASTROPHYSICS

SOLAR AUREOLES MEASURED. Akademiya Nauk Kazakhskoy SSR. Astrofizicheskiy institut published an account recently of work done by T. P. Taropova, P. N. Bayko, and G. A. Kharitonova in measurement of solar aureoles.

They state that aureoles in the vicinity of the Sun have been measured with an instrument consisting of a special aureole photometer and spectrophotometer. Brightness was measured at three angular distances from the Sun, 1°, 4°, and 6°. Measurements made on two clear days show that the solar aureole increases for short waves near the Sun with a decrease in the wavelength and light scattering in the atmosphere does not obey Rayleigh's law. At wavelengths higher than 488 mμ the aureole does not depend on the wavelength and has two maxima, at 514 mμ and 580 mμ.

Measurements on a cloudy day made after the sky was free of clouds show a larger aureole around the Sun. The scattering indicatrix of that day did not depend on the wavelength, and the aureole gradient changed slightly. Aureole intensity changes greatly with the distance from the Sun. (Source: Library of Congress, A.I.D. Press, No. 848, November 30, 1962)

COMMUNICATIONS

RADIO WAVES BOUNCED OFF VENUS AND MARS. On December 29, Pravda, and on December 30, Krasnaya Zvezda announced that until recently, the investigation of the planets of the solar system was conducted with astronomical methods, which are based on observations of the reflection of solar light from the planets and the thermal radiation of the planets themselves. The development of powerful transmitters, large antenna installations, and sensitive receiving systems has made it possible at present to obtain radar reflections of signals, which were sent from Earth, via our nearest planets--Venus and Mercury.

The first successful radio location of Venus was accomplished in 1961 simultaneously by the Soviet Union, England, and the USA. The purpose of those experiments was to determine the astronomical unit--the basic scale for cosmic distance measurements and to evaluate the period of rotation of Venus and to obtain data about its surface.

The astronomical unit which was accepted until recently and all the distances within the solar system determined with its help, were accurate only within 0.1 percent. Such a "high" degree of accuracy may seem sufficient for astronomical observations, but it is quite insufficient for guiding interplanetary spacecrafts. The error in the determination of the distance to Venus, for instance, amounted to several diameters of that planet, i.e., on the order of 50,000 km.

For the purpose of radio observations of Venus the Soviet Union used radio signals on a frequency of about 700 mc. In these observations the distance to Venus (about 45 million km) was 120 times the distance to the Moon.

The value of the astronomical unit, which was determined with these measurements, was 149,599,300 km, the possible error not exceeding 2000 km.

The reflection coefficient of Venus, as determined by the received radio signals, amounted to 8 percent.

In the summer of 1962, a further step was taken by the Soviet Union for the purpose of defining more precisely the scale of the solar system. Thanks to the improvement of receiving and transmitting installations,

and to the utilization of the latest methods for weak signal detection, success was achieved for the first time in obtaining a radio location of the planet Mercury, which at the time of those observations was at a distance of 84 to 88 million km from the Earth. This experiment verified the value of the astronomical unit obtained in 1961 and showed that the reflection of radio waves from the surface of Mercury was about the same as during the radio location of the Moon.

The next step in radar study of the planets was the October-December, 1962, repeated radio location of Venus. During that period, measurements of the distance to Venus as well as observations of its surface were conducted at regular intervals. The results of these measurements are now being processed.

At the same time, Soviet scientists claim to have succeeded in conducting the first radio communication with the planet Venus. The word "Peace", transmitted from Earth in telegraph code on November 19, 1962, is supposed to have reached the planet Venus, was reflected from it, and was received back on Earth 4 minutes 32.7 seconds later, having traveled 81,745,000 km.

On November 24, by the same method, the words "Lenin" and "USSR" were claimed to have been transmitted to the planet Venus. Reflected from the planet's surface, the words were received on Earth 4 minutes 44.7 seconds later. The total distance traveled by these words was 85,360,000 km.

The detailed results of the radar observations of Mercury and Venus which were made in 1962 will be published in scientific journals.

The construction of a powerful cosmic radar station in the Soviet Union and the completion of observations of the planets Mercury and Venus with its help is the result of extensive work by a pool of representatives of science and technology. (Source: Russian News Brief, Publication of Electro-Optical Systems, Inc., January 7, 1963)

GEOLOGY

SOVIETS CLAIM EARTH'S CORE IS LIQUID. On December 8, Pravda Ukrainy reported that Candidate of Physics and Mathematics N. Popov, a Poltava astronomer, has stated that the core of the Earth is liquid and does not participate in the oscillations of the shell, the so-called "free nutation" (sic). This finding is the result of a 23-year observation of the complex spiral pattern traced by the wandering of the Earth's pole on the background of the stars.

Approaching the same problem from a different standpoint, M. Molodenskiy, Corresponding Member of the Academy of Sciences USSR, has theoretically calculated that a liquid core would require a daily free nutation of 23 hrs 52 min 58 sec.

Z. N. Aksent'yev, Corresponding Member of the Ukrainian Academy of Sciences, remarks that if the Earth's core has a spherical shape and if there is no friction on the discontinuity between the core and its shell, the core will have no influence on the rotation of the shell. However, it can be assumed that there is a complex process of gravitational interaction and hydrodynamic pressure on the discontinuity which influences the Earth's shell, causing its nutational movement. (Source: Library of Congress, A.I.D. Press, No. 861, December 19, 1962)

RUSSIAN COMPARES EARTH AND MOON. K. Benesh disclosed his beliefs on the differences and likenesses of the Earth and the Moon in a November issue of Izvestiya.

He reported that in a general review of the Earth-Moon system it is stated that comparisons of their geological development should take into account that the evolution of the Earth's crust and its surface proceeded under conditions of an antagonistic interaction of endogenous and exogenous geological factors, while the development of the Moon was determined mainly by endogenous forces.

Basically, however, the development of the hard crust of both bodies was affected by magmatic, metamorphic, and volcanic processes. The conditions for the development of lithospheres were not the same, and as a consequence the two surfaces differ greatly. The lithosphere of the Moon has apparently been preserved more or less in the "inchoate planetary state," making it possible to look into the development of the Solar System at some depth.

On the other hand, since its formation the Earth's crust has been in a state of continuous motion, transformation, regeneration, and "heterogenization," particularly in continental zones. The fact that the Moon does not have and apparently never had a dense atmosphere rules out the possibility of interaction of the lithosphere, atmosphere, hydrosphere, and biosphere. From the structural standpoint the surface of the Moon is consequently not at all similar to that of the Earth. Differences in the energy processes and in particular features of the space surrounding the Earth and Moon are responsible for the radical differences in the development of these two bodies. While the Earth continued to develop, the Moon was arrested rather quickly in its development. (Source: Library of Congress, A.I.D. Press, No. 862, December 20, 1962)

LIFE SUPPORT

LONG-TERM LIFE-SUPPORT SYSTEMS. N. M. Sisakyan, O. G. Gzenko, and A. M. Genin reported recently that under the assumption of a daily requirement of 640 g of food, 2200 g of water, and 882 g of oxygen per man, a five-man crew going on a three-year voyage would require 19 tons of supplies, not counting the weight of storage containers and regulatory equipment. This weight requirement can be substantially reduced by using a regeneration system based on solar energy. The most substantial saving in weight can be effected by recycling water, a procedure which does not present any technical difficulties or require complicated or heavy equipment.

Oxygen regeneration presents a more difficult problem, and several methods are being considered: (1) photolysis of CO_2 by hard UV rays, with utilization of a copper catalyst; (2) electrolysis of water, followed by interaction of H_2 and CO_2 , which can produce O_2 under certain conditions, a procedure considered attractive because the amount of potentially extractable O_2 exceeds basic oxygen requirements of man; and (3) biochemical regeneration based on anaerobic bacteria, which absorb H_2 and CO_2 and yield O_2 . (Source: Library of Congress, A.I.D. Press, No. 859, December 17, 1962)

SOVIET WORK ON HUMAN ENGINEERING IN SPACECRAFT. A paper was presented at the International Symposium on Basic Environmental Problems of Man in Space at the UNESCO House in Paris France, by I. T. Akulinichev and V. G. Denisov. The paper states that the work of Soviet scientists engaged in human engineering for space flight is based on the assumption that the conquest of the planets is unthinkable without actual participation by man in space flight.

Up to now Soviet engineers have provided an automatic system of control for spaceships which relieves the cosmonaut of tedious and monotonous tasks and enables him to give full attention to scientific research in space. Also, human engineering specialists have developed trust in the cosmonaut towards the spaceship by providing reliable systems and components embodying the fail-safe principles and manual controls to prevent the cosmonaut from feeling imprisoned by the machine.

Soviet scientists are currently working on human-engineering problems related to space flights measured in terms of months and even years. In approaching these problems, they assume that cosmonauts will have to repair the spaceship and its components in flight; that sections of spaceships will have to be assembled in orbit, a task which includes at least two sections of a system (each of which has 6 degrees of freedom) and which will require remote control manipulation of hardware by the cosmonauts; that operations will be performed under varying conditions of gravity (overloads, zero G, partial G); that cosmonauts will suffer

emotional strain and loss of vigilance owing to the monotony of constraint within the parameters of a small cabin, effects of the microclimate, and detachment from the diurnal cycle; that spaceships respond to correction of trajectory very slowly; and finally, that in case of accident en route there will be a "deficit" of time.

Psychophysiological capabilities of man as an element in the systems of regulation and control of the ship are being studied with special attention to the ability of man to process information he receives via his sensory organs.

The following other human-engineering problems are currently being worked out in the USSR:

1. Requirements for information systems which will enable cosmonauts to assimilate incoming information more rapidly without loss of essential data.

2. Distribution and placements of handles, levers, and buttons for the control and operation of the space vehicle, including possible systems of control by bioelectric impulses and by human voice.

3. Layout, furnishing, decorating, and lighting of the space cabin, including the placement of control and indicator panels possible grouped by function, employing logical, sequential "presentation" of controls to the cosmonaut by means of movable shutters which would open one group of controls after another as they are required by the sequence of sectors in flight.

4. Methods of training of space crews for their tasks in flight, including development of mockups, simulators, and other training aids. (Source: Library of Congress, A.I.D. Press, No. 846, November 28, 1962)

METEOROLOGY

SODIUM CLOUD EXPERIMENTS IN ARGENTINA. From November 27 to December 9 four launchings of Centaur rockets took place from the Argentine Rocket Range at Chamental.

These firings were a joint cooperative effort of the French National Committee on Space Studies and the Argentina National Commission on Space Research and formed part of a world wide program of simultaneous measurements of winds and turbulence in the ionosphere by means of the sodium cloud experiment. Firings were made from seven different launching sites: Chamental (Argentina), Wallops Island (Virginia), Eglin AFB (Florida), Ile du Levant (France), Hammaguir (Algeria), Ft. Churchill (Manitoba, Canada), and Woomera (Australia).

The Argentine firings took place at dawn on November 30 and December 9 and at sunset on November 27 and December 8. The sodium vapor trail ejected by the rockets on the ascending and descending branches of their

trajectories was photographed from five different locations, one of them Villa Dolores, a Smithsonian Institution Satellite Optical Tracking Station. The Baker-Nunn camera used for satellite tracking was also used for photographing limited areas of the sodium cloud to study turbulence phenomena.

With their joint Argentine and French scientists effort, the Argentine National Commission on Space Research has started implementing the proposal for international cooperation in the field of space research which had been put forward at different international meetings. (Source: Argentine National Commission on Space Research release)

PHOTOGRAPHY

INFRARED PHOTOGRAPHS OF THE MOON. On December 28 Izvestia reported that the senior scientific associate of the Pulkovo Observatory, N. F. Kuprevich, using a television system designed by himself, obtained pictures of the visible side of the Moon in the infrared range of the spectrum, which reveal a series of heretofore unknown features of its topography. In an interview with a Tass correspondent N. F. Kuprevich said:

"The latest atlases and maps comprise a detailed list, enumerating over 30,000 individual features of the Moon."

"In the compilation of those atlases and maps, the scientists availed themselves of all the photographs taken by the largest astronomic telescopes. Comparison of results of numerous photographic and direct observations led to conclusions that no significant changes were discovered in the Moon's topography for over half a century. It was natural therefore for scientists to consider the task of obtaining new information on the Moon's topography or discovery of new mountain formations, craters, etc., as a practically hopeless undertaking."

"As it was made public earlier, our observatory produced, with the help of a television system, photographs of the Moon in the spectral wave length range of 0.8 to 2.3 μ . The technique of such observations was recently greatly improved, with the cooperation of N. L. Artiemyev, B. Sc. In particular, the spectral band of the light receiver was shifted somewhat towards the region of longer waves."

"A series of lunar photographs obtained with infrared rays proved quite remarkable. These photographs show many hitherto unknown features of the Moon's topography.

"Here are a few examples: Mare Nubium on the Moon's surface is usually presented as a plain with some undefined spots and a few craters. In our new photograph the plain is replaced by circular mountains which surround

the central portion and cover the entire area of the sea. The bright strip extending from the crater Tycho is usually shown as a luminous double line. In our new photograph that band splits up into a series of craters extending along one line. The other part of the strip has the appearance of a mountain range."

"Closer to the center of the Moon's disc, in the region of the Copernicus crater dark spots were recorded until now. It became clear now that these are craters of a sharply defined structure. The Mare Imbrium appears quite different. It proves to be an uneven, hilly area, clearly showing the structure of circular mountains in the upper part of the Mare Imbrium (near the Copernicus crater). The existence of circular mountains in other parts of the Moon's surface was also discovered." (Source: Russian News Brief, Publication of Electro-Optical Systems, Inc., January 8, 1963)

PHYSICS

SHAPE OF A BODY FOR MINIMUM DRAG AT HYPERSONIC SPEEDS. A. L. Gonor, in the Digest of Translated Russian Literature, reports that in recent years several variational problems for the shape of a body for minimum drag at hypersonic flight speeds have been solved on the basis of Newton's law of resistance. Solution of the variational problem in a more exact formulation, using A. Busemann's law of resistance, was proposed in other papers.

However, as was shown by Hayes, in the improved formulation the contour of the body of minimum drag should have a discontinuity in slope at the end point, because then, according to Busemann's law, an infinite negative pressure appears at that point, reducing the drag by a finite amount. The physical pressure cannot be negative, and a change in slope at the end-point should not, in supersonic flow, influence the pressure distribution upstream and hence the drag.

This disagreement with the physics of supersonic flow requires a new formulation of the variational problem with revised conditions, so that the pressure on the body contour will be everywhere nonnegative. (Source: ARS Journal-Supplement, November, 1962)

SOVIET HEAT CONDUCTION INVESTIGATION. In a recent article by G. A. Varshavskiy in the Referativnyy zhurnal, Matematika, No. 3, 1962, a method is described for the solution of problems of heat conduction with a variable heat transfer coefficient $\lambda = \lambda(T)$. The method is that

instead of the temperature, a new unknown function $\phi \int_0^T \lambda(T) dT$ is

introduced. Thereby the equation of heat conduction is in the stationary

case reduced to the equation $\text{div grad } \phi = q$, q being a given function. For the solution of concrete problems one uses the well-known solutions of ordinary problems with constant heat transfer coefficients. In the non-stationary case the equation of heat conduction gets the form

$$\text{div grad } \phi = \xi(\phi) \frac{\partial \phi}{\partial t}$$

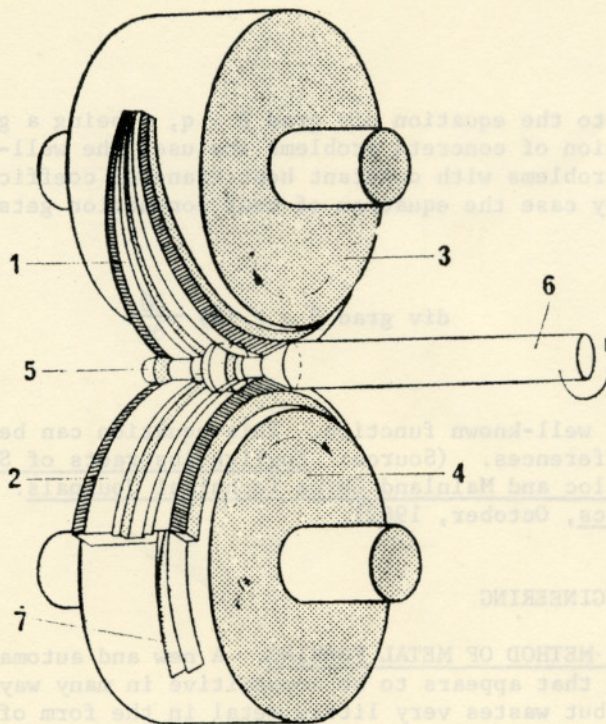
$\xi(\phi)$ being a well-known function. This equation can be solved by the method of differences. (Source: English Abstracts of Selected Articles from Soviet Bloc and Mainland China Technical Journals. Series I---Physics and Mathematics, October, 1962)

PRODUCTION ENGINEERING

NEW AUTOMATIC METHOD OF METAL FORMING. A new and automatic method of metal forming that appears to be competitive in many ways with the automatic lathe, but wastes very little metal in the form of swarf, has been patented in Prague. Called the Holub method--after the inventor, Jirí Holub--it is basically a roll-forming technique that the inventor describes as "transversal rolling." It differs from accepted rolling practice, as used for instance to roll splines on shafts in the motor industry, inasmuch as the metal is rolled hot, in continuous lengths and with unusual accuracy for this type of operation. The prototype of a new type of forming machine that operates on this transversal rolling principle has been put into trial operation at the Letnany Automobile Works, Prague.

Transversal rolling involves the feeding of long bars of metal, of the same diameter as the greatest diameter of the component, continuously into the special rolling mill. The bars would be induction-heated continuously too in full-scale production. Finished components are automatically "parted-off," or separated, from the bar. The bar feeds between two dies, which are either flat or curved segments; these move in opposite directions, and they rotate the bar as they crush it. One type of tool, with V-shaped forming flanks, is illustrated.

Each die has two "cutting" faces, both of which are finely knurled to improve their grip on the metal. By means of such tools it is possible, the inventor claims, to achieve an accuracy of the same order as that achieved on an automatic lathe--at far greater speeds. Figures quoted are about .01 cm (0.004 in.) on diameters up to 3 cm (1.2 in.), and 0.2 cm (0.008 in.) on diameters up to 5.1 cm (2 in.). Often, no further machining is necessary. Moreover, the methods can form such contours as flutes, grooves and splines along the axis of the part.



V-shaped rolling dies used in a new method of forming metal automatically.

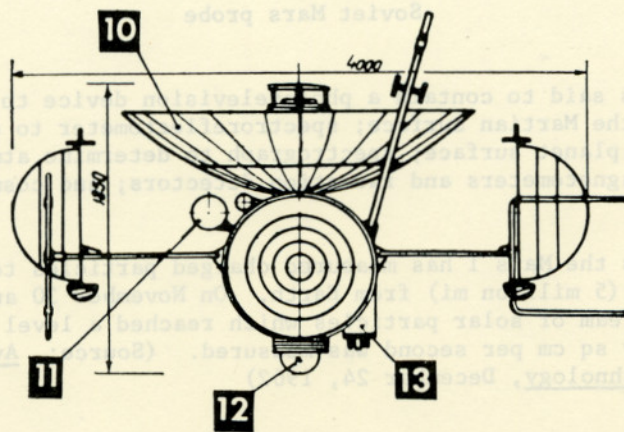
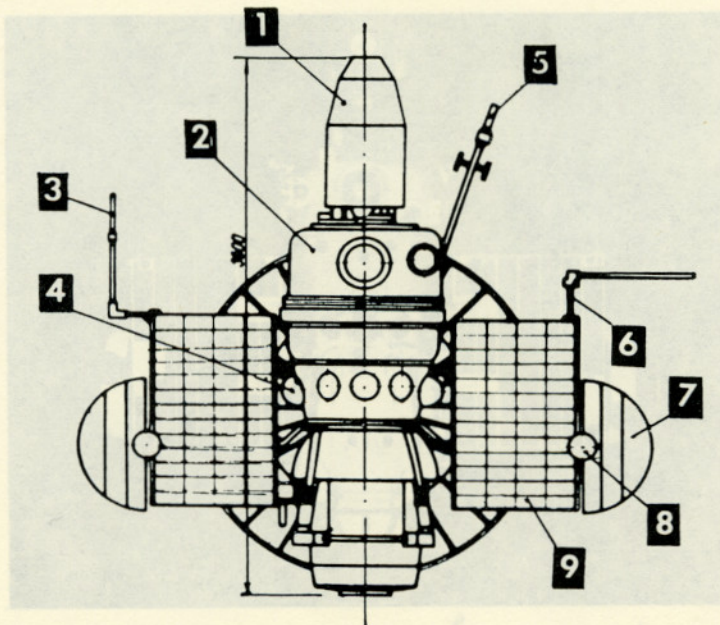
- | | |
|-----------------|-----------------------|
| 1. Upper tool | 5. Component |
| 2. Lower tool | 6. Stock bar |
| 3. Upper roller | 7. Parting-off cutter |
| 4. Lower roller | |

(Source: New Scientist, October 18, 1962)

SPACE FLIGHT

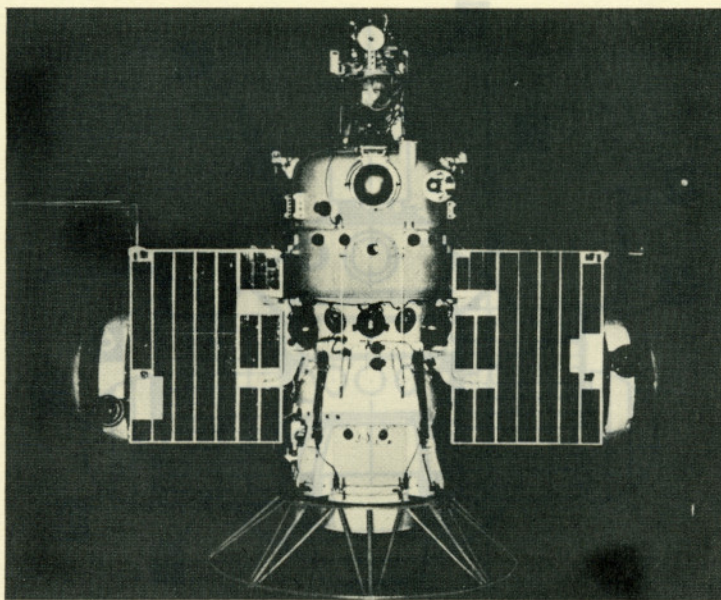
SOVIET MARS PROBE REPORT. Pravda recently reported that the Soviet Mars probe has been interrogated 37 times during the first month of flight and returned valuable information.

The report gave the first details of the probe. The maximum dimensions are 406 cm (160 in.) by 335 cm (132 in.), and the weight is 893 kg (1966 lb). The payload is divided into two compartments, one called an orbital compartment containing guidance and on-board propulsion, and the other a planetary compartment containing scientific instruments to be activated as the probe passes Mars. Diameter of the orbital compartment was given as 112 cm (44 in.). The dimensions of the planetary compartment were not stated.



Schematic of Soviet Mars Probe

- | | |
|---|--|
| 1. Correcting engine (uncovered in photo) | 9. Solar battery panels |
| 2. Orbital compartment | 10. High-gain directional antenna |
| 3. & 6. Omnidirectional antenna | 11. Spectro-reflectometer |
| 4. Orientation system container | 12. Precise star and solar orientation data unit |
| 5. Magnetometer shaft | 13. Constant solar orientation data unit. |
| 7. Thermal regulation system radiators | |
| 8. Low-gain directional antenna | |



Soviet Mars probe

The probe was said to contain a phototelevision device to obtain video pictures of the Martian surface; spectroreflectometer to detect organic cover of the planet surface; spectrograph to determine atmospheric constituents; magnetometers and radiation detectors; and cosmic dust detectors.

Pravda claims the Mars 1 has measured charged particles to distances of 8 million km (5 million mi) from Earth. On November 30 an exceptionally intensive stream of solar particles which reached a level of 600 million particles per sq cm per second was measured. (Source: Aviation Week and Space Technology, December 24, 1962)

SOVIETS TO USE DIRECT FLIGHT TO MOON. Soviet manned flights to other planets will be made direct and not by means of orbital rendezvous, according to an article by Prof. V. V. Dobronravov in the October issue of Aviatsia i Kosmonautika. Prof. Dobronravov has in the past given more accurate and specific hints regarding the nature of Soviet intentions than probably any other Russian spokesman. He now writes:

"The group flight of Vostok 3 and Vostok 4 has shown that a most important problem has been solved--a space flight of several days, coordination of the actions of the cosmonauts, two-way communication in space. Thanks to

the free approach of space vehicles there arises the possibility of assembling large satellite stations flying around the Earth, and also spaceships. Launch of spaceships to other planets will be made easier, by comparison with launch from the Earth...

"But this does not mean that the launch of the first spaceships with cosmonauts to other planets must necessarily take place from orbital stations, for such a course would delay the beginning of flights to other planets for quite a long time. Science is able to offer the means by which the first flights of people to other planets will take place directly from the Earth."

It is interesting to recall that, more than a year before Lunik 3 brought back the first pictures of the far side of the Moon, Prof. Dobronravov wrote in Literaturnaya Gazeta for May 29, 1958: "...a flying apparatus could be sent to the Moon...In the gravity field of the Moon its trajectory would be disturbed but would remain closed with respect to the Earth, and it would return to the vicinity of our planet. If such a satellite were equipped with perfected scientific apparatus, such as an automatic photo-laboratory and a television-transmitter device, it would be able to photograph the side of the Moon invisible to inhabitants of the Earth. There is no doubt that in the future, Soviet technology will show itself capable of launching such an apparatus." (Source: Flight, November 8, 1962)

TELEMETRY

DATA TRANSMISSION FROM SPACECRAFT. I. T. Akulinichev, R. M. Bayevskiy, and O. G. Gzenko jointly presented a paper recently at the International Symposium on Basic Environmental Problems of Man in Space.

They feel that current conditions of space flight impose severe limitations in respect to the weight, size, and energy consumption of on-board telemetric systems and devices. The main difficulty, however, lies in the limited number of channels available for the transmission of collected data to ground stations. To help overcome this difficulty, on-board computers are used which combine data on several different physiological parameters into a single coded scale which reflects the seriousness of the pathological condition of the cosmonaut. This single scale, in turn, requires fewer telemetric channels.

Transition to longer flights will require wide use of internal (i.e., on-board) telemetry. Miniature transmitters will relay data from body sensors to on-board equipment for broadcast to ground stations. (Source: Library of Congress, A.I.D. Press, No. 846, November 28, 1962)

BOOKS. The following book reviews have been selected from various publications as noted:

Lebedinsky, A. V., What Russian Scientists Say about Fallout, published by Collier Book Co.

"While highly technical in part, this paperback offers some interesting insights for the general reader into Russian scientists' views on fallout. It was written during the period of the nuclear-test moratorium, and the views expressed do not coincide with the recent statements by Russian Premier Khrushchev in de-emphasizing the test peril.

"The Soviet scientists are strongly opposed to the views of U.S. physicist Edward Teller and proponents of continued testing. In noting specifically the long-range peril, the scientists do not resist the opportunity to insert propagandistic jibes against American test policies.

"In spite of this, the articles point up the need to relate policies of continued atomic testing to the real dangers created by radiation and fallout." (Source: San Francisco Chronicle, December 2, 1962)

Zhdanov, G. and I. Tindo, Space Laboratories. Published by Foreign Languages Publishing House. 197 p.

"It is easy to suppose that in Russia science is thought of as a disinterested and humble search for truth. This view is exploded by Space Laboratories. It is true that the 'search for truth' is glorified in the third paragraph, but never once in this eulogy of Soviet science is the real truth suggested, that the tremendous achievements of Soviet space technology not less than those of America are the direct outcome of research aimed at accurate delivery of H-bombs and at national aggrandizement through the threat of such delivery.

"The Russians have not been slow to remark, quite rightly, that humility befits the scientist while his experiments are in the planning stage. It is a pity if some of this humility is not carried over to the success. If N. S. Khrushchev has rejected the doctrine that 'the meek shall inherit the Earth', his countrymen have made it abundantly clear that it is to be the proud who inherit the heavens.

"It is not clear for whom this book is intended. The authors find it necessary to express large numbers without the help of indices (incidentally the help of an index is denied the reader too), and to define a logarithm, though much of the material would be very heavy reading for anyone not educated in science.

"Some of the chapters have introductions reminiscent of nineteenth century moral tales; section headings have emotional overtones, for example, "A Comfort to Give Up," "The Allies You Can Trust," "A Formidable Rival." It is pointed out that Tsarist Russia could not have achieved Tsiolkovsky's dreams.

"The vital question of why go in for space travel, and whether it is at present justifiable in view of its economic burden is never raised. The 21st Congress of the Communist Party said it was a "most important problem," and this is given as "a vivid example of the advantages of socialist over capitalist economy." This reviewer cares little for socialism or capitalism. He likes his science neat.

"Several well-known experimental systems, for example, Penning's ionization gauge, the principle of vertical incidence, radio sounding and the RF mass spectrometer are presented as if developed specially for the Sputniks. While great credit is given to Van Allen, several other important cases of non-Soviet precedence are implicitly denied (almost certainly, to judge from the tone of the book, from ignorance rather than malice). Examples are Singer's detection of the equatorial electrojet and the first recovery from orbit, which was achieved by an American Discoverer satellite.

"Very properly there is widespread admiration of the technical excellence of Russian work, but the emphasis on perfection can become ludicrous, as with too frequent use of the words faultless and infallible, and such phrases as "instrumentation proved capable of collecting absolutely exact information" (pace Heisenberg).

"Customs and manners vary with locality. The book was intended for Russians. Western readers will find it to contain a comprehensive outline of Russian space science together with a fair amount of disingenuous error and a sprinkling of bad taste." (Source: New Scientist, July 26, 1962)

Novozhilov, Yu. and A. V. Tulub, The Method of Functionals in the Quantum Theory of Fields. Published by Gordon and Breach, New York. 79 p. \$4.50.

"This book is one of a series of translations of USSR monographs, tracts, and texts on advanced mathematics and physics. It affords English-speaking students an opportunity of reading Soviet works first-hand (almost). The present subject will not have much popular appeal; it is very specialized. For this reason alone any authoritative book is a welcome addition to the literature in this field.

"The authors discuss particularly the method of the generating functional, which was originally formulated by V. A. Fock (1928, 1934) and later developed by Tamm (1945) and Dancoff (1950) et al.--as well as by Schwinger,

Feynmann, Dyson et al. This method makes possible a rigorous formulation of the equations for the field functions with the implicit hope of obtaining exact solutions or relations in field theory.

"A helpful, clear lecture by N. N. Bogolyubov on "Equations with Variational Derivatives in Problems of Statistical Physics and of Quantum Theory," introduces the subject. The operator method of the type of secondary quantization is shown to be applicable both to quantum systems and to classical systems (i.e., it deals with a group of particles whether they be real or virtual).

"The work of the authors is divided into two parts. The first deals with the method functionals in the Quantum Theory of Fields, including the generating functional for probability amplitudes and its relation to Fermi statistics, as well as the generating functional for amplitudes of the Tamm-Dankov method. Part II concerns the "Generating Functional for Relativistic Functions and Functional Integration."

"There is a discussion also of T functions, Feynmann amplitudes, P functions, and the generalized Fock Functional. The book concludes with the variation of the operator and with functional integration in the case of a Fermi field. (It would be helpful if Russian names were spelled consistently--at least in a Russian book, cf. Dankov, Dankoff, and Dancoff; Fok and Fock.)

"It is regrettable that the cost of such a book is relatively so high for its type of production as compared with that of the original Russian material, or even of similar British publications." (Source: American Journal of Physics, December, 1962)

SELECTED BIBLIOGRAPHIES. The following translations were selected from the U. S. Department of Commerce, Office of Technical Services, Technical Translations. Persons within MSFC desiring information on ordering and cost of translations should contact M-MS-IPL, telephone 876-8386.

ASTRONOMY

Nikol'skii, A. P., The Planetary Distribution of Magnetic Ionospheric Disturbances. April 6, 1962, 28 p. 17 refs. (62-25666/0260)

Fesenkov, V. G., The Beginning of a New Era in the Study of Space. February 13, 1962, 13 p. 2 refs. (62-15933/0160)

Mandel'shtam, S. L., Tindo, I. P. and others, Investigation of Solar X-Radiation. I. Measurements Made by Geophysical Rockets. 1962, 13 p. (11 figs. omitted) 20 refs. (62-14228/0160)

ASTROPHYSICS

Zotkin, I. T., The Anomalous Optical Phenomena in the Atmosphere Associated with the Fall of the Tunguska Meteorite. January 16, 1961, 3 p. (62-19121/0110)

Barkasz, Emit and Tarczy-Hornoch, Antal, Algebraic Solution of the Kepler Equation without Iteration. March 8, 1961, 6 p. (62-19238/0110)

Burunsuzyan, E. S., Threshold of Reliable Detection and Limiting Sensitivity of Radio Telescopes. 1961, 12 p. (62-11566/0050)

BEHAVIORAL SCIENCES

n.a., Decree on Training of Technical Assistants in the Field of Natural Sciences, 10 December 60. April 10, 1961, 5 p. (62-19439/0110)

n.a., Trends in Science and Technology in Communist China. Pt. IV. Scientists. March 15, 1960, 35 p. 27 refs. (61-28368/0360)

Petrov, E., Cosmonauts (Pts. 1-2). April 5, 1962, 17 p. (62-24340/0160)

BIOLOGICAL SCIENCES

n.a., Soviet Literature on Life Support Systems. May 31, 1961, 25 p. 10 refs. (61-27306/0260)

Sisakyan, N., Biology and the Conquest of Space. May 10, 1962, 12 p. (62-24739/0160)

ORDNANCE, MISSILES, AND SATELLITE VEHICLES

Kuniewski, Henryk, Transmitting Equipment of a System of Nonperiodic Impulses in Long-Range Telemetry. August 24, 1961, 22 p. (62-19472/0260)

Nikolaev, Yu., Rockets Fly on Course. March 5, 1962, 15 p. (62-23419/0160)

Sergeev, B., Before a Rocket Launch. March 19, 1962, 6 p. (62-24025/0110)

ORDNANCE, MISSILES, AND SPACECRAFT

Isaev, V. K., Pontryagin's Maximality Principle and Optimal Rocket Thrust Programming. February 14, 1962, 24 p. 13 refs. (62-19162/0260)

Sergeev, K., The Soviet Land has Become the Shore of the Universe. January 23, 1962, 9 p. (62-19645/0110)

PHYSICS OF THE ATMOSPHERE

n.a., Phenomena in the Upper Atmosphere: Review of Soviet Literature.
July 31, 1961, 37 p. 18 refs. (61-27741/0360)

n.a., Phenomena in the Upper Atmosphere: Review of Soviet Literature.
August 31, 1961, 20 p. 13 refs. (61-28483/0160)

RADIOBIOLOGY

Zhemkova, Z. P. and Perumova, N. D., A Contact Radiographic Study of
the Up-Take of Some Isotopes into the Organs of Animals of Different
Species, Age, and Individual Characteristics. 1962, 25 p. 62 refs.
(62-14794/0260)

n.a., Medical Radiology, 1962, Vol. 7, No. 5: Selected Articles.
August 17, 1962, 22 p. 27 refs. (62-32455/0260)

BIOLOGICAL SCIENCES

n.a., Soviet Literature on Life Support Systems. May 31, 1961, 22 p.
10 refs. (61-27306/0260)

Slavyan, M., Biology and the Conquest of Space. May 10, 1962, 12 p.
(62-24739/0160)

ORDNANCE, MISSILES, AND SATELLITE VEHICLES

Kulawski, Henryk, Transmitting Equipment of a System of Nonperiodic
Impulses in Long-Range Telemetry. August 26, 1961, 22 p. (62-19872/0260)

Nikolaev, Yu., Rockets Fly on Course. March 2, 1962, 12 p. (62-23419/0160)

Sergeev, B., Before a Rocket Launch. March 19, 1962, 6 p. (62-24025/0110)

ORDNANCE, MISSILES, AND SPACECRAFT

Lanev, V. K., Panovskii's Maximally Principled and Optimal Rocket Trajectory
Programming. February 14, 1962, 24 p. 13 refs. (62-19162/0260)

Sergeev, K., The Soviet Land has become the Shore of the Universe.
January 23, 1962, 9 p. (62-19645/0110)