



Space

INTELLIGENCE NOTES

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

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SOVIETS PLAN INDUSTRIAL COMPLEX ON MOON. Broad outlines of Russia's lunar space flight program were reported in December issues of TASS, PRAVDA, and IZVESTIA in which manned Earth orbital flights, manned circumlunar flights, instrumented lunar landing packages, and manned lunar landings are charted for the next few years.

The USSR instrument landing mission, according to IZVESTIA, will be followed by "manned flight to the Moon, establishment of a permanent scientific station on the Moon, and ultimately by an industrial-type installation." The latter goal is in line with numerous statements made by Soviet officials in the past few years concerning Russia's intention to capitalize upon the natural resources they expect to find on celestial bodies in space. (Source: AVIATION WEEK and SPACE TECHNOLOGY, January 8, 1962, p. 26)

WORLD'S WORST WEATHER FORECASTERS. In a report on long-range forecasting at a meeting of the American Meteorological Society in New York, Dr. Donald Gilman, a research meteorologist with the United States Weather Bureau, compiled "skill scores" for American, British, West German, and Soviet long-range forecasters. On a scale from zero (a score any could get by guessing) to 100 (a perfect score), the Western forecasters ran in the respectable 20-30 bracket. The Soviets, however, got minus two. "This means they were not only unskilled," Dr. Gilman explained, "but unlucky, too."

Despite the Russians' poor showing, he went on, the forecasting method they used is most promising. It is called the "dynamic model" system in which a mathematical model of the weather is drawn up using the classical laws of hydrodynamics and thermodynamics, and the current weather readings. "You simply run the data through a computer," Dr. Gilman said, "and stop at anything from a 24-hour to a seasonal projection. We use this method for the five-day forecasts--but we think that's the limit of its reliability. The Soviets made a brave attempt to carry it all the way out to monthly and seasonal forecasts." Next year, however, the Russians may be doing as well as everyone else, for they have apparently decided that they were pushing their mathematical technique too far. Now they have abandoned it for the more reliable "empirical" method.

Empirical forecasts are made largely by comparing current readings with past records. The system is safer, Dr. Gilman noted, "but potentially not as powerful as the dynamic model, which could change forecasting from an art to a physical science."

To accomplish this, Dr. Gilman recommended these goals for his colleagues: First, better theories of atmospheric physics; second, more data-collecting devices such as high-altitude balloons, rockets, and robot weather stations in remote areas; third, faster computers. But even as long-range forecasting techniques improve, Gilman said, "the best we can hope for is to sharpen the probabilities. It's hard to get this across to the public, but forecasts should not be taken literally, they are only probabilities." (Source: NEWSWEEK, February 5, 1962, p. 52)

RUSSIAN VIEWPOINT ON ECONOMIC EFFECTS OF SPACE ACTIVITIES. General Georgii Iosifovich Pokrovskiy, of the Red Army, when asked to comment on the practical significance of satellites and rockets replied with a listing of well-known applications of these vehicles for studies of great importance to the USSR and world economics. In particular, he specified meteorology, geomagnetism, geodesy, communication, and television. In respect to the use of rockets for transportation, he noted that rocket flights between any two points on the Earth (maximum distance of 20,000 km) should require no more than 1 hr. However, the average flight would be 5,000 to 15,000 km, for which 30 to 52 min would be needed. Suitable rockets will be developed for mass transportation of goods and passengers. Theoretically, flights of the range mentioned would be more economical than present-day aircraft. (Source: USSR CIVIL AVIATION MAGAZINE, No. 8, 1961, pp. 21-22)

JAPAN INCREASING EFFORTS IN ROCKETRY. Recent news releases indicate that Japan may soon become the world's third-ranking power in rocketry. A new solid fuel rocket, the Lambda, will enable Japanese scientists to study outer space in the near future. Experts say that only the U. S. and USSR space vehicles will be able to do better.

Lambda, successor of the Kappa rocket used for IGY research, is just less than 26 ft in diameter and will develop a thrust of 42 tons. The Kappa develops a thrust of 10 tons. The new rocket, equipped with four nozzles, has a horizontal flight capability of nearly 1900 miles and can rise to an altitude of 620 miles. In comparison, the Kappa has a horizontal flight capability of only 62 miles and can rise to 217 miles. Britain's Skylark can rise to a maximum elevation of 149 miles while France's Veronique can reach only 87 miles.

The first ground test of the Lambda, using one-third of its power, was successfully carried out in April of 1961.

Professor Itokawa, Japan's leading rocket authority, stated that the first flight test of a one-stage Lambda is scheduled for March 1963. This flight will be made from the new Kagoshima Space Center now under construction on the Pacific Coast of southern Japan. The center is

expected to cost about 500,000,000 yen (\$1,400,000). He also expects the completion of a three-stage Lambda by 1964 or 1965. Another rocket, called the Mu, capable of carrying a man into space will be ready for testing by 1965, the Professor stated. (Source: NEW YORK TIMES, March 4, 1962)

USSR CONFERENCE ON WEATHER CONTROL. A conference on the problem of modification of climate was held in Leningrad during the period 25-28 April 1961 under the sponsorship of the Main Geophysical Observatory and the Institutes of Applied Geophysics and Geography of the Academy of Sciences.

Academician Ye. K. Fedorov, in a paper titled "The Future of Research on the Problem of Modification of Climate," noted that knowledge in this field is still extremely limited, and it is impossible to predict the final results of interference in particular climate forming processes. He believes some 5 to 10 years of work will be required to adequately define the problem and to suggest possible ways in which the climate can be altered. He feels that the best way to bring about such changes is by altering the underlying surface. One way would be to erect major hydraulic structures which would alter the currents in the sea; another way is to remove the ice and snow from the Earth's surface or change its albedo. The annihilation of ice cover from the Arctic would be permanent; once destroyed it would never be reestablished. There are indications that precipitation can be stimulated by the erection of artificial barriers no higher than 20 to 30 m. The dispersing of clouds over a great area can lead to temperature changes of the order of 10° (C), or even changes in pressure.

Academician I. P. Gerasimov gave a report on "Changes in Climate in the Quaternary," one of a number of reports emphasizing that future climate modification can scarcely be brought about without a comprehension of such events in the past. He states that an examination of the direct causes for the glacial periods indicates that there were no changes in the composition of the atmosphere and no justification for postulating volcanic activity as causes for the glacial periods. And there were not less than 20 significant variations in insolation during a 1 million year period, which greatly exceeds the number of glacial cycles. It is not only total insolation that counts but also variations in ultraviolet and corpuscular radiation. The need for further study in heliophysics and paleogeography is obvious.

L. A. Vitel has predicted climatic changes for the last three decades of the 20th century and the beginning of the 21st century. He anticipates a period of especially low solar activity during this period, accompanied by a weakening of circulation of the atmosphere, a southward displacement of cyclone tracks, an increase in the continentality of the European part of the USSR and western Siberia and an increase in the natural runoff of the Volga.

The paper presented by M. I. Budyko, "The Heat Balance of the Earth and the Problem of Modification of Climate," gave numerous computations of the heat balance, both as of today and in coming decades. The amount of energy produced by man in 1952 was 30 times less than that produced by photosynthesis and 3,000 times less than that of the radiation balance. Vast increases in population and the production of energy by man can result in

raising the temperature of the atmosphere by several tens of degrees, to the point where all humanity would perish. He also reported on the changes that would be brought about by annihilation of the ice covering the Arctic Seas (he believes if the ice is destroyed it could never be reestablished under present-day conditions). At the present time, the temperature of the water surface should be $+10^{\circ}$ (C) in summer and $+5^{\circ}$ (C) in winter. Accordingly, the air temperatures should be $+10^{\circ}$ (C) in summer (now below 0°) or $+1^{\circ}$ (C) in winter (now -33°). He has even computed that the melting of this ice by artificial methods would require an expenditure of energy equal to that now produced by human society in 30 years.

M. Ye. Shvets reported on "The Modification of Climate by Creating a Dust Curtain in the Stratosphere." These and other papers are discussed in considerable detail. (Source: IZVESTIYA, SERIYA GEOGRAFICHESKAYA, No. 5, 1961, pp. 128-133) H/V

PROPOSAL FOR "STATIONARY" SATELLITE. In an article appearing in PRAVDA, the popular Russian scientist-writer Ari Shternfeld proposes a satellite which would move in respect to the stars but would remain in a fixed position relative to an Earth-based observer. According to Shternfeld, the Earth-fixed position would be achieved by orbiting a satellite at the precise distance above the Earth required for the satellite to have a period of revolution of exactly one day. The satellite would be put into a circular orbit in the plane of the Earth's equator at a distance of 42,190 kilometers from the center of the Earth--35,800 km above the equator. It would be given a velocity of 3.08 km/sec and would be oriented in a vigorously horizontal easterly direction so that it would orbit the Earth in precisely 24 hr.

Shternfeld explains that although the Moon's attraction would cause certain orbital perturbations which would in time disrupt this balance, such perturbations could be corrected by appropriate correction of the trajectory. At least three such satellites would be required to observe the entire Earth. (Source: PRAVDA, August 13, 1961, p. 3) S/V

MANNED SATELLITES WILL SOLVE PROBLEMS. Many problems which have defied scientific investigators in the past can now be solved by spacecraft carrying trained observers. These include the phenomenon of gegenschein and nightglow according to Soviet Academician V. G. Fesenkov in an article entitled "The Beginning of a New Era in the Study of Space."

Fesenkov says gegenschein may be caused by the dust cloud surrounding the Earth, extending in a direction away from the Sun, in a way similar to that of a comet's tail. This hypothesis can be confirmed or rejected by a simple examination of the sky from the vantage point of space. And a cosmonaut (astronaut) can readily determine the nature and intensity of the atmospheric component called nightglow.

The nature of twilight phenomena and the optical properties of the interplanetary medium can also be resolved by observations from orbit. In addition, the study of meteorites can be advanced by capturing them in space before they have been radically altered by passage through the dense layers of the atmosphere. Fesenkov discusses these and other problems that can be solved by manned satellites. (Source: PRIRODA, No. 6, 1961, p. 3)

BRIGHTNESS TEMPERATURE OF VENUS. The Physics Institute imeni P. N. Lebedev measured radio emission from Venus at wavelengths of 4 mm, 8 mm, and 9.6 cm during the period of inferior conjunction from March through June 1961 and at 3.3 cm from May 26 to July 10, 1961. Data obtained at 4 mm, 8 mm, and 3.3 cm show a regular rise in brightness temperature with an increase in the illuminated portion of the planetary disk. The minimum temperature values at the 4 and 8-mm wavelengths were $390 \pm 120^\circ\text{K}$ and $374 \pm 75^\circ\text{K}$, respectively, and were obtained before the true moment of inferior conjunction. Measurements at 3.3 cm, relating to the illuminated parts of the disk in the interval $k = 0.33$ to 0.6 , show the brightness temperature to vary from 500° to 600°K . The temperature of the totally dark disk at true inferior conjunction, derived by linear extrapolation, is $372 \pm 55^\circ\text{K}$. Radio emission at 9.6 cm shows an irregular change in the brightness temperature of some hundreds of degrees from day to day. These changes are attributed to the influence of the sporadic component in the Venusian ionosphere, while the shifting of minimal temperatures to the eastern elongation is attributed to the different periods of rotation and revolution. (Source: A.I.D. PRESS, No. 651, February 23, 1962, p. 6)

AURORA OBSERVATIONS. V. I. Dzyubenko and Yu. A. Nadubovich, writing in GEOMAGNETIZM I AERONOMIYA, reported that simultaneous radar, photographic, and photoelectric observations of the aurora borealis have been made at the Tiksi Bay geophysical station. The radar operates at a frequency of 73 Mc; the antenna aperture in the azimuthal plane is about 35 deg, and the elevation angle is of the order of 4 deg. An automatic motion-picture camera and an electrophotometer with an **ФЭУ-19М** photomultiplier were fastened to the antenna and moved with it; their elevation angle was equal to that of the radar beam. Reflections were observed visually on the radar indicator; the type of signal, its azimuth and range, and its amplitude were noted. The motion-picture camera operated continuously, with exposures of 10 or 5 sec, depending on the brightness of the sky at the northern horizon. The electrophotometer operated within 3500 to 6000 Å. The following conclusions are drawn: (1) Reflections occur only when the aurora possesses sharp gradients of brightness; (2) No reflections are observed from bright auroras; (3) The moment of reflection-amplitude maximum lags by 3 to 6 min behind the moment of the maximum of the luminous flux radiated by the aurora; and (4) Apparently

only the central part of the radar radiation pattern takes part in the formation of the reflection, since the motion pictures show that small shifts from the center of the frame cause reflections to disappear, even though the aurora continues to have a radiant form. (Source: A.I.D. PRESS, No. 637, February 2, 1962, p. 6)

DEVICE FOR IONOSPHERIC INVESTIGATION. A transmitter-receiver for the investigation of phase and amplitude variation of signals reflected from the ionosphere has been developed at the Department of Physics of Moscow State University, according to Yu. V. Berezin reporting in GEOMAGNETIZM I AERONOMIYA. The device consists of a synchronization unit, a transmitter, and a receiver and is able to perform simultaneous study on three frequencies in the 1 to 15-Mc range. The synchronization unit operates with a power-supply frequency of 50 cps, switching the transmitter and receiver from one frequency to another by means of a 15- μ sec synchropulse. The transmitter, a wide-band amplifier, operates with \sim 30-kw pulse power and a 40 to 100- μ sec pulse duration. It is fed consecutively by three trigger generators with a 1-v signal of the chosen frequency; trigger generators are switched by each third synchrosignal. RF signals are balanced by a phase-inverter transformer employing a ferrite ring with $\mu = 100$. The receiver has three consecutively switched frequency converters (corresponding to the trigger frequency) sending their output signals to the IF amplifier (465 kc); the IF amplifier output signals pass through electronic switches to the recording units where the instantaneous signals of the fundamental frequency and the secondary harmonics are recorded simultaneously on a film. The average amplitudes (for 2 min) of these harmonics are recorded with the aid of a recording voltmeter and the phase shift is recorded with a phase photo-recorder. (Source: A.I.D. PRESS, No. 655, March 1, 1962, p. 2)

RADIATION HAZARD FOR ASTRONAUTS. Analysis of data obtained by Sputnik 5 (August 19, 1961) at about 320 km has made it possible to delineate the position of the radiation belts and to estimate the amount of radiation hazard present. Scintillation counter data show that the radiation in the belts is anisotropic and that the energy flux under a layer of matter of $2 \cdot 10^{-3}$ g. \cdot cm $^{-2}$ is 10^{10} ev. \cdot cm $^{-2}$ \cdot sec $^{-1}$. The mean energy released per quantum in the scintillation counter crystal is computed at $2.0 \cdot 10^5$ ev and the intensity of electrons in the outer belt at $5 \cdot 10^4$ particles. \cdot cm $^{-2}$ \cdot sec $^{-1}$. The radiation dosage absorbed inside Sputnik 5 was determined simply by dividing the amount of energy liberated in the sodium iodide crystal of the scintillation counter by the weight of the crystal (36.4 g) without the need of a detailed examination of the composition and spectrum of the radiation. A dosage value of 7 mrad/24 hrs was obtained; in terms of the RBE (relative biological effect) of the cosmic charged particles this amounted to 50 mrem/24 hrs. This dosage is considered relatively safe for astronauts during flights along

trajectories similar to that of Sputnik 5 when the Sun is quiet. Solar flares, however, could bring about an increase in radiation. Owing to latitude and longitude effects and the specific distribution of radiation at this height, the dosage per orbit ranged from 0.35 to 0.70 mrad.

This note is based on an article by I. A. Savenko and others which appeared in ISKUSSTVENNYYE SPUTNIKI ZEMLI, No. 9, 1961, p. 71. (Source: A.I.D. PRESS, No. 661, March 9, 1962, p. 6)

A COMPARISON OF MAGNETIC STANDARDS IN THE USSR. This article, by L. G. Mansurova, generalizes all data collected during recent years by the Central-Magnetic Observatory relating to comparison of the geomagnetic standard of the USSR with the standards of other countries, with instruments used in the magnetic observatories of the USSR, and with the newly introduced proton magnetometers.

This article, which includes seven tables, appeared in TRUDY INSTITUTA ZEMNOGO MAGNETIZMA, IONOSFERY I RASPROSTRANENIYA RADIOVOLN, No. 18 (28), 1961, pp. 68-76.

The Shmidt normal magnetic theodolite No. 115930 has been used since 1951 as the geomagnetic standard of the USSR. The constants of this instrument have not been redetermined since 1950, but this is to be done soon. Changes in their values can only be judged from indirect evidence; the text thoroughly discusses how this was done. Summarized data for 1951-1959, in Table 1 of the original article, indicate that errors in measurement remain at the same level (on the average) as in 1950. Indications point to a drop of 2 Y in the level of the USSR geomagnetic standard in the years 1951-1958. The standard was transported from temporary to permanent quarters in 1957 but was apparently unaffected. The normal geomagnetic theodolite was compared with the national standards of the German Democratic Republic and Denmark (Table 4); quartz H-magnetometers were employed in this investigation. It has also been compared with instruments with observatories in Yugoslavia and Poland (Table 5). Magnetic instruments at 13 observatories in the USSR were also compared against the standard (Table 6); this was done by comparison with the quartz H-magnetometers of the Central Magnetic Observatory and subsequent reduction of their readings to the standard. This required the introduction of corrections for certain stations (Table 7). (Source: TRUDY INSTITUTA ZEMNOGO MAGNETIZMA, IONOSFERY I RASPROSTRANENIYA RADIOVOLN, No. 18 (28), 1961, pp. 68-76)

CAVITATION IN THE DESIGN OF AXIAL-FLOW PUMPS. A partly graphic method developed to increase the efficiency of design of axial-flow pumps offers a remedy for the tendency to design excessive pump impeller lattice densities in an effort to obtain high cavitation characteristics - a practice

disadvantageous in other respects. The new method facilitates the selection of correct densities and is reported on in ENERGETIKA by A. N. Papir. A characteristic curve showing the relation between the optimum power characteristics of a pump and the density of the peripheral lattice of its impeller is plotted on the basis of test data applicable to the majority of high efficiency axial-flow pumps. The curve makes it possible to design impellers with maximum efficiency values which fall within the design range of pump operation. By means of a calculated relationship between the cavitation coefficients of pumps and their reduced rpm values, the expected cavitation behavior can be evaluated for those specific values of the l/t ratio which insure maximum efficiency within the design range of pump operation (l being the length of the vane cross section and t the pitch of the lattice). The use of this curve also makes it possible to determine the expected optimum point of the characteristics of a pump in case its lattice density does not fall within the limits of the curve. The method has been used successfully to design a circulation axial-flow pump; both a pump impeller designed according to the conventional method and two impellers in which the l/t ratio was chosen by the new method have been compared with good results at a hydraulic-machine laboratory. (Source: A.I.D. PRESS, No. 652, February 26, 1962, p. 3)

THERMOMECHANICAL PROPERTIES OF UNFILLED AND GLASS FIBERFILLED POLYSTYRENE.

In the January 1962 issue of the Soviet journal POLYMER SCIENCE, Yu. S. Lipatov and R. P. Khoroshko discuss a study on the thermomechanical properties of polystyrene films, both unfilled and filled with finely cut (0.1 to 2 mm long) glass fiber, which was performed at the Institute of General and Inorganic Chemistry, Belorussian Academy of Sciences. The unfilled films, ~0.2 mm thick, were prepared by pouring 3 per cent styrene solution in benzene onto a cellophane sheet. Addition of filler to the solution in amounts of 30 and 60 per cent by weight of polymer resulted in films 0.4 to 0.6 mm thick, depending on the amount of filler. The thermomechanical properties, including the dependence of relative elongation on temperature, were determined with a device designed and described by Lipatov, Kargin, and Slonimskiy (ZHURNAL FIZICHESKOY KHIMII, Vol. 32, No. 1, January 1958, p. 131). Loads from 2 to 10 kg/cm² were used. It was found that: (1) the softening temperatures of the specimens increased almost linearly with decrease in the load, which made possible the extrapolation of the softening temperatures at zero load, and (2) zero-load softening temperatures rose linearly with increase in the filler content from 106.5°C for pure styrene to 126°C for styrene with 60 per cent filling. A similar rise was observed for the glass transition temperature, which was found to be 87° and 91°C, respectively, for 30 and 60 per cent filled styrene. The higher activation energy of deformation shown by the unfilled polymer is attributed to disruption of the bond between the filler's surface and the polymer's molecular packets and to change in the shape of the latter in the deformation process. In general, the differences in the properties of unfilled and glassfilled polystyrene arise

from the fact that the properties of a filled thermoplastic polymer are determined by the interaction of the secondary polymer system (i.e., molecular packets) with the filler surface and by the structure of the molecular packets adhering to the surface, which differs from that of the packets in the bulk of the polymer. For polystyrene films, the differences in structure may result from the limited mobility of polymer chains in contact with the surface during the formation of films from the solution. (Source: A.I.D. PRESS, No. 656, March 2, 1962, p. 656)

LACQUER REVEALS CRACKS (CZECHOSLOVAKIA). A means of detecting cracks, invisible to the eye, in brittle materials under test has been developed and tried. It has been used primarily on concrete components but is put forward as suitable for use with other brittle materials. The method consists of applying a thin conductive lacquer to the surface and making it part of a circuit of relatively high intensity--2 to 15 amp.

The lacquer is applied in strip form. The current heats it, but most of the heat is dissipated through the mass of the material under test. When a crack occurs, the heat conduction is greatly reduced at that point, the lacquer strip there becomes overheated and finally fuses. After fusing, sparks indicate the course of the crack. By this means, cracks as small as 0.003 mm have been revealed.

Lacquer for this purpose is made from an aqueous dispersion of synthetic resin (polyvinyl) filled with powdered contact silver, iron, or other conductive material. The current should be sufficient to heat the strip from 40° to 60°C. The lacquer is applied with a small brush after the surface has been cleaned and degreased, and the film should be of a thickness of 0.05 to 0.15 mm. The method was developed at the Institute of Theoretical and Applied Mechanics in the Czechoslovak Academy of Sciences. (Source: NEW SCIENTIST, Vol. 12, No. 267, December 28, 1961, p. 789)

NEW HIGH-SPEED STEELS. The following information was originally obtained from an article by A. G. Ivanov appearing in STAL', No. 1, January 1962, p. 69.

The Central Scientific Research Institute of Ferrous Metallurgy, in cooperation with other research institutes, has developed new high-speed steels, which are included in ГОСТ9373-60 and specification ЧМТУ ЦНИИЧМ 257-60. Compared with the P9 and P18 conventional high-speed steels, the new types have a higher red hardness and 1.5 to 3 times greater wear resistance. Their composition is as follows (%):

Steels	C	Cr	W	V	Co	Mo max
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ГОСТ 9373-60

P905	1.4-1.5	3.8-4.4	9.0-10.5	4.3-5.1	--	0.4
P1404	1.2-1.3	4.0-4.6	13.0-14.5	3.8-4.1	--	0.4
P1802	0.85-0.95	3.8-4.4	17.5-19.0	1.8-2.4	--	0.5
P9K5	0.9-1.0	3.8-4.4	9.0-10.5	2.0-2.6	5.0-6.0	0.3
P9K10	0.9-1.0	3.8-4.4	9.0-10.5	2.0-2.6	9.5-10.5	0.3
P10K505	1.45-1.55	4.0-4.6	10-11.5	4.3-5.1	5.0-6.0	0.3
P18K502	0.85-0.95	3.8-4.4	17.5-19.0	1.8-2.4	5.0-6.0	0.5

ЧМТУ ЦНИИЧМ 257-60

(ЭИ917) P1802M	0.85-0.95	3.8-4.4	17.5-19.0	1.8-2.3	--	0.8
(ЭИ918) P24	0.85-0.95	4.0-4.6	22.5-24.0	0.9-1.3	--	0.4
(ЭИ705) P9K50	0.8-0.9	3.8-4.4	9.0-10.5	1.6-2.1	5.0-6.0	0.3
(ЭИ919) P9K100	0.8-0.9	3.8-4.4	9.0-10.5	1.6-2.1	9.5-10.5	0.3

A maximum of 0.4% Mn, Si, and Ni, and 0.03% S and P is permitted for all new steels, except that up to 0.035% P is permitted for steel with 4 to 5% V. (Source: A.I.D. PRESS, No. 656, March 2, 1962, p. 6)

CERAMIC COATINGS (CZECHOSLOVAKIA). This note on ceramic coatings is from an article by M. Turek appearing in SKLÁŘ A KERAMIK. He states that techniques for the preparation and spraying of ceramic coatings for protecting steel and alloys against high-temperature oxidation have been developed at the Research Institute of Electrical Ceramics, Hradec Králové. One such coating, PI, was applied to the roughened surfaces of 50 x 50-mm specimens of CrTiNi-steel and NiCr and CoCrMo-alloy sheet. The coating contained (in percentage of content): 28.34 SiO₂, 30.30 BaO, 27.18 Cr₂O₃, 4.48 B₂O₃, 3.45 ZnO, 1.72 BeO, 2.76 CaO, 1.67 Al₂O₃, 0.02 MgO, 0.05 Fe₂O₃, and 0.03 TiO₂. The density of the coating was 1.66 to 1.70; thickness was 30 to 50 μ. After application, the coating was dried in air and then in an oven at 100 to 120°C or by infrared rays, followed by firing at 1010° ± 10°C for 3 to 5 min in an electric oven. PI provides adequate protection at temperatures up to 950°C and its thermal shock resistance is satisfactory up to 900°-930°C. (Source: A.I.D. PRESS, No. 649, February 20, 1962, p. 5)

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MAGNETOHYDRODYNAMIC GENERATORS (POLAND). W. Brzozowski reports in NUKEONIKA that three experiments on the conversion of thermal energy into electrical by means of magnetohydrodynamic generators were carried out at the Institute of Nuclear Research in Świerk at the beginning of 1961. The experimental installation consisted of a BD-1 plasmatron (instead of a combustion chamber) with maximum power of 50 kw at approximately 100 v and 500 a, a generator chamber, and a magnet with an induction range from 1600 to 5000 gauss. The operating gas was argon. The first experiment was carried out with a generator made entirely of graphite and with argon 95 to 96 per cent pure; the generator operated for about 30 min. The maximum no-load voltage (~ 0.32 v) was reached 0.5 to 1 min after start. The results show that the voltage and current produced by the generator depend very strongly on the speed of the gas flow through the generator. Under optimum conditions the power generated was 0.1 mw at a current of 0.6 a. In the second experiment a very simple generator, consisting of quartz and graphite tubes and graphite electrodes, was used to determine the effect of seeding the flowing gas with KCl and K_2CO_3 . No effect was produced by KCl; however, K_2CO_3 increased the conductivity of the gas approximately 100 times, resulting in a yield of about 0.4 w at 0.7 a. The third experiment was unsuccessful. Plans for 1962 call for experiments with MHD generators using combustion chambers instead of arc jets to heat the gas.

A discussion on a more popular level was made by Z. Celiński in HORYZONTY TECHNIKI on MHD generators with open and closed cycles. Schematic drawings are included. The use of a nuclear reactor as the source of heat for a closed-cycle generator is proposed, with cesium to be applied for seeding. The fact that the thermal ionization of cesium occurs at a comparatively low temperature is important from the point of view of construction-material requirements. The possibility of developing an MHD generator of alternating current is also considered. Such a generator would contain a pulse-jet type combustion chamber similar to that used in the V-1, and an induction coil connected with the condensers and collector and wound over the gas-flow channel; a periodic flow of the ionized gas would generate electric pulses in the coil. Work on MHD generators is also being conducted at the Institute of Gas-hydrodynamic Machines in Gdańsk and the Poznań Polytechnic Institute. (Source: A.I.D. PRESS, No. 652, February 26, 1962, p. 1)

DIFFUSION AND THERMALIZATION OF NEUTRONS IN LIQUIDS. A. V. Antonov and others have reported in ATOMNAYA ENERGIYA their findings after investigation of the dependence of diffusion parameters of water on temperatures at 0.5 to 286°C, as well as the process of unsteady diffusion and thermalization of neutrons in ice at a temperature of -196°C. The study was focused on the interaction of neutrons with various substances in order to obtain a deeper understanding of the physical processes taking place in a nuclear reactor. Fast neutron flux pulses of 250 cps and 15 μ sec

duration were produced by the reaction $T(d,n) He^4$. The neutron fluxes were recorded by a $B^{10}F^3$ proportional counter. Analysis of the results led to the following conclusions: (1) anisotropy in an angular scatter of neutrons in water increases with a rise in temperature; (2) the neutron thermalization process in water at room temperature, with small deviations of neutron temperature from the equilibrium values, takes place in accordance with Dardel's theory; (3) in ice at the temperature of liquid nitrogen, an equilibrium is established between the neutron gas and the medium; (4) the neutron attenuation time in ice at a temperature of $-196^\circ C$ is considerably higher than that in water, reaching 45 to 75 μsec . A description of the experimental apparatus and graphs of the results were included with the original report. (Source: A.I.D. PRESS, No. 651, February 23, 1962, p. 3)

EXPERIMENTAL LOOP IN THE IRT-2000 NUCLEAR REACTOR. An article in INZHENERNOFIZICHESKIYA ZHURNAL by V. S. Yermakov and U. S. Sokol'chik discusses an experimental loop for research on liquid organic coolants which is to be installed in the IRT-2000 nuclear research reactor being completed at the Power Institute, Belorussian Academy of Sciences. The coolant will be monoisopropyldiphenyl (and others), heat power 150 kw, coolant consumption 25 m^3/hr , outlet temperature $400^\circ C$, and working pressure 20 atm. The loop will be used to conduct investigations on the following subjects: (1) dissociation of various coolants under conditions of radiation and high temperatures; (2) heat transfer between organic coolants and fuel elements; (3) fuel elements of various designs; (4) corrosion characteristics of coolants in contact with various construction materials; (5) effect of the experimental loop on the performance of the reactor; (6) performance of various instrumentation and control systems of the loop; and (7) problems connected with biological shielding. (Source: A.I.D. PRESS, No. 651, February 23, 1962, p. 3)

PULSE-DISCHARGE PLASMA JET. L. I. Grechikhin and collaborators have reported in the Soviet journal OPTICS AND SPECTROSCOPY, Vol. 12, No. 1, January 1962, on the properties of a plasma beam penetrating an orifice during a pulse discharge in air at atmospheric pressure. The discharge occurred between a flat electrode with a 2-mm orifice and a sharp-pointed electrode positioned along the axis of the orifice, and was fed from a 60- μf condenser battery charge to 2 kv. The discharge was photographed by a high-speed camera and the discharge current determined by means of oscillographic registration of voltage across a $1.1 \cdot 10^{-4}$ ohm inductionless resistance in the discharge circuit. The discharge was ignited by a signal from the camera mirror position. The slit of the camera was parallel to the axis of the beam in order to photograph its continuous development. It was found that the luminosity of the beam varies with the distance of the beam from the flat electrode. There is an area of brightness at the electrode orifice, followed by an area of weak luminosity with a subsequent sharp transition into another bright area, and then

a further gradual decline in luminosity. After the discharge subsides, there remains an afterglow of considerable duration ($\sim 10^{-4}$ sec). The photographs showed that the plasma beam consists of discrete small currents both in the negative and positive phases of the discharge. The velocity of the discharge beam undergoes a discontinuous change at the distance from the electrode where the area of weak luminosity changes to one of strong luminosity. The intense area near the flat electrode, where the individual small currents are weakly defined, is explained as an area of overlap of the discharge column with the beam. As the small currents move outward, each undergoes its own density discontinuity, a phenomenon which is evidenced by a sharp increase in luminosity and decrease in velocity. The greater the initial velocity of the small plasma current, the farther is the position of density discontinuity from the plane of the flat electrode. The velocity of the beam changes with the phase of the discharge and follows changes in the discharge current. The absolute values of velocity depend on the metal used in the electrode; lighter metals produce greater velocities. (Source: A.I.D. PRESS, No. 663, March 13, 1962, p. 1)

LASERS. In an interview in PRAVDA, Lenin Prize laureate N. G. Basov, Deputy Director of the Physics Institute, Academy of Sciences USSR, states that some Soviet laboratories have operating lasers. The basis of the first laser was a ruby crystal in the form of a cylinder 0.5 cm in diameter and several cm long, with silver-coated ends. Pumping was provided by a powerful helical gas-discharge lamp surrounding the crystal. Basov mentions the following possible future applications of lasers: the concentration of energy in a small area with a very high light pressure (a million atmospheres), for precise working of various materials; acceleration of charged particles; control of chemical reactions; communication across light years; high-resolution radar for minutely detailed mapping of the Moon's surface; underwater "radio" communications; and transmission of very large volumes of information in a short time (e.g., 10,000 television programs simultaneously). According to Basov, the most difficult among the many scientific problems which must be solved before sophisticated devices can be produced is the production of pure and homogeneous crystals for operation at various points of the visible and infrared spectrum. Solution of the majority of these problems will require 5 to 10 years, barring breakthroughs which would accelerate laser development sharply. He notes that at present only the basic principles of quantum radiophysics have been determined and tested and only preliminary steps taken to incorporate the discoveries into technology. (Source: A.I.D. PRESS, No. 636, February 1, 1962, p. 2)

DENDRITIC GROWTH OF TWIN CRYSTALS OF GERMANIUM. In the January 1962 edition of SOVIET PHYSICS--SOLID STATE, M. A. Medvedev and collaborators state that in an attempt to establish optimum conditions for the growth

of long perfect dendritic crystals of germanium, dendrites were grown from a melt supercooled to 15° to 20°C below the crystallization point by the Czochralski method. Twinning was determined by studying twin sections of dendrites subjected to a short period of chemical etching and by the Faust-John method. In almost all cases, including dendrites grown from melts with impurity concentrations as high as $10^{20}/\text{cm}^{-3}$, the twinning of the seed was reproduced exactly by the crystal grown from the seed. The dependence of the effective segregation coefficients (K_{eff}) for In, Ga, Sb, and B on the concentration of impurities was determined for the 10^{13} to $2 \times 10^{20}/\text{cm}^{-3}$ range and plotted on a graph. It was noted that when the melt contained an impurity concentration of the order of $10^{14}/\text{cm}^{-3}$, K_{eff} for Ga, In, and Sb exceeded 1. The distribution of impurities in the crystal (excluding the area of the twinned dendritic core) along the width of the dendrites was observed to exhibit preferential segregation toward the crystal edges for Ga, In, and Sb; impurities in B are distributed evenly throughout the crystal cross section. (Source: A.I.D. PRESS, No. 661, March 9, 1962, p. 4)

FIRST CASE OF CONTINUOUS CONVERSION OF ELECTROMAGNETIC TO MECHANICAL ENERGY. R. A. Valitov reported in the Soviet journal of TECHNICAL PHYSICS, Vol. 31, No. 12, December 1961, that the energy of a 9375-Mc CW has been used to drive a rotating mechanical system to establish the feasibility of continuous conversion of electromagnetic energy to mechanical work. The experimental apparatus consisted of a magnetron CW oscillator, a circular resonant cavity operating in a traveling-wave mode and containing the rotating system, and a detector circuit. The rotating system consisted of a lightweight transverse beam supported by a low-friction pin in the center and terminating in circular microwave-reflecting vanes. To overcome air-resistance problems, the vanes could be replaced by thin wires parallel to the electric field. While the input power varied from 10 to 40 w, the speed of rotation ranged from 0.5 to 1.5 rpm for the vanes and from 1 to 4 rpm for the wires. Although the efficiency of this system is extremely low, reaching 10^{-9} per cent, it is claimed that this is the first case noted in the literature of any direct and continuous conversion of electromagnetic to mechanical energy. (Source: A.I.D. PRESS, No. 660, March 8, 1962, p. 1)

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

Kats, A. L., Seasonal Changes of the General Circulation of the Atmosphere and Long-Range Forecasts, Leningrad: Gidrometeoizdat. 1960.

This book was reviewed by G. V. Gruza in the METEOROLOGIYA I GIDROLOGIYA, No. 11, 1961, pp. 58-61.

The book, largely based on the author's own research, is more restricted in content than the title would indicate, but the research methods and results are said to be valuable and unique. This 270-page book has a brief introduction, five chapters, and a conclusion. A total of 320 references are contained in the bibliography. An appendix provides factual data on atmospheric indices. Chapter I is "Seasonal Changes in the Horizontal Components of the General Circulation of the Atmosphere and Their Quantitative Evaluation." It introduces the system of indices of circulation which the author has devised. These "Kats circulatory indices" are the basis of all the work which follows. His three indices make it possible to evaluate, in comparable units, the intensity of horizontal, zonal, and meridional components. The reviewer discusses these at some length. Chapter II is "Forms of Zonal and Meridional Circulation." Here Kats classifies synoptic processes on the basis of his circulatory indices. The reviewer feels that Kats' classification of macroprocesses is the most objective yet developed. Chapter III is "Aerosynoptic and Climatic Characteristics of Zonal and Meridional Processes"; it gives much statistical data on zonal and meridional processes; the author's analysis is said to be valuable in the development of the theory of long-range forecasting. Chapter IV is "Long-Term Variations of Atmospheric Circulation and Climate." Changes in circulation are compared with solar activity. Chapter V covers "Some Aspects of the Problem of Long Range and Extra-Long-Range Hydrometeorological Forecasts." It discusses the possibility of using data on solar activity for making extra-long forecasts. (Source: U. S. JOINT PUBLICATIONS RESEARCH SERVICE, JPRS: 11914, January 15, 1962, p. 7)

Pushkov, N. V., Magnetism in Space, (Magnetizm V Kosmos), Moscow: Znaniye Publishing House. 1961.

This popular science booklet tells of investigations of terrestrial magnetism and of the magnetism of bodies in space made with the aid of sputniks and space rockets. The author acquaints the reader with results of measurements of the magnetic fields of the Earth and the Moon which were made with artificial Earth satellites and rockets, and of their value for science.

The booklet, according to the foreword, is intended for a large circle of readers, not for specialists. It does, however, present interest for those who know little about the phenomenon of terrestrial magnetism. The work is based for the most part on materials of lectures given by the author in the Polytechnic Museum in Moscow during the summer of 1960.

Following is a table of contents: Introduction; what we know concerning terrestrial magnetism; sputniks and rockets investigate the permanent magnetic field; magnetometers detect electrical currents in the ionosphere; magnetic storms and exo-ionospheric current systems; radiation zones of the Earth; magnetic investigations of the outer radiation zone and in interplanetary space; magnetism of cosmic bodies; and a conclusion.

Academician Nikolay Vasil'yevich Puskov is the Director of the Institute of Terrestrial Magnetism, the Ionosphere, and Propagation of Radio Waves and is also a Lenin Prize winner. (Source: U. S. JOINT PUBLICATIONS RESEARCH SERVICE, JPRS: 11914, January 15, 1962, p. 27)

ON 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

Krat, V., The Mass of the Sun in the Era of Planet Formation. June 1960, 7 p. (60-23600/180).

Koprovich, Nikolay F., Television Technique in Astronomy. November 1, 1960, 73 p. (60-41727/200).

Nefed'yev, A. A., Relief Map of the Edge of the Moon on a General Zero Reference Level. October 28, 1960, 273 p. 95 refs. (60-41689/400).

Kosachevskiy, M. P., Approximate Magnitudes of Masses of Martian Satellites, tr. by P. Kazakov. 1960, 1 p. 4 refs. (61-13961/180).

BIOLOGICAL SCIENCES

n.a., Soviet Literature on Life Support Systems. April 28, 1961, 12 p. 6 refs. (61-19867/160).

n.a., Spectacles for Cosmonauts. March 31, 1961, 2 p. (61-23857/110).

Koshtoyants, Kh., Science Fiction and Reality: Manned Space Flights (And) Research Program Successfully Completed. June 8, 1960, 4 p. (61-28366/110).

CHEMISTRY

n.a., Research on Ion-Exchange Chromatography. 1960, 179 p. (CB/3500).

Gouskov, L., On the Oxidation of Germanium Surfaces of Different Orientation for Temperatures Varying from 500° to 800°C and Oxygen Pressures of 10^{-3} and 10^{-4} Hg. 1960, 5 p. 3 refs. (61-1092/180).

Miyazaki, Shozo, On Decomposition by Molybdenum. Rept. 2 of Studies on the Catalytic Decomposition of Ammonia Gas. 1960, 7 p. 3 refs. (61-10003/180).

Miyazaki, Shozo, On Decomposition by Platinum. Rept. 3 of Studies on the Catalytic Decomposition of Ammonia Gas. 1960, 7 p. 1 ref. (61-10002/180).

Ryabinin, Yu. N., Markevich, A. M. and Tamm, I. I., The Formation of Nitric Oxide on the Adiabatic Compression of Burning Mixtures, tr. by Lionel Mote. 1960, 10 p. 9 refs. (61-13166/180).

EARTH SCIENCES

Burkard, O., Studies for a New Model of the Ionosphere, I. 1960, 8 p. 8 refs. (MDF B-169/450).

Avvakumov, V. A., The Location of the Level of Maximum Wind Speeds in Different Parts of the Jet Stream. October 1959, 4 p. (61-15159/180).

Gal'perin, B. M. and Kuchumova, L. S., The Influence of Cloudiness on Atmospheric Radiation. October 1959, 11 p. 11 refs. (61-15142/240).

Pogosyan, Kh. P., The Stratospheric Jet Stream During the Warm Half-Year. October 1959, 14 p. 6 refs. (61-15140/240).

Stepanov, A. S., The Quality of Meteorological Instruments and Installations. July 25, 1960, 2 p. (60-31435/050)

Voskresenskiy, A. I., Morachevskiy, V. G., and Nikandrov, V. Ya., Use of Dry Ice for Cloud Seeding in the Arctic. November 1959, 9 p. 1 ref. (61-13880/180).

ENGINEERING

Deschamps, R., Double Diffused Germanium NPN Transistors. August 1960, 35 p. 4 refs. (60-18901/300).

Videnov, N., Development of the Chemical Industry in the Bulgarian People's Republic. October 18, 1960, 7 p. (60-41624/050).

Iontov, L. Y., Kovalev, S. M. and others, New 12-Channel Equipment Type V-12-2 for High-Frequency Telephony by Aerial Communication Lines. October 18, 1960, 166 p. (60-41630/300).

Schmidt, K. O., Some Observations Concerning Speech-Secrecy Equipment. 1960, 17 p. 38 refs. (MDF S-171/900).

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Cherendnichenko, V., The Rocket of the Future. June 1960, 7 p. (60-23602/180).

Kachuriner, Yu. Ya., Investigation of Double-Crown Velocity Stages in Steam Turbines. 1960, 14 p. 2 refs. (61-13207/240).

Kirillov, I. I. and Kuzmichev, R. V., Effect of Degree of Reaction on Energy Losses in Turbine Stage. 1960, 15 p. 5 refs. (61-13071/240).

Kryanin, I. R., Hydraulic-Turbine Blades, Cavitation Destruction, Selection and Investigation of Materials: Contents, Chap. 1 and Chaps. 2-4 (Excerpts). October 1960, 63 p. (61-13905/390).

Uvarov, V. V., Chernobrovkin, A. P. and others, Manufacture of Large Gas Turbine Plants. 1960, 18 p. 4 refs. (61-13122/240).

Zavadovski, A. M., On the Leakage Through the Axial Clearance in a Turbine Stage. 1960, 8 p. 2 refs. (61-13072/180).

MATERIALS

n.a., Quality Check of Fuels and Lubricants. May 1960, 15 p. (60-23606/240).

Chertkov, Ya. B., On the Mechanism of Sediment Formation in T-Type Fuels. October 7, 1960, 2 p. (61-13899/180).

Zuyeff, Y. S. and Kuz'minski, A. S., On the Breakdown of Stretched Rubber Under the Action of Ozone. 1960, 6 p. 15 refs. (61-13681/180).

MATHEMATICS

Krasovskiy, N. N., On a Particular Problem of Optimum Control. 1960, 13 p. 12 refs. (60-18806/240).

Mikhaylov, G. A., Shitikov, B. N., and Yavlinskiy, N. A., TsEM Digital Electronic Computer. July 27, 1960, 28 p. (60-41030/100).

MECHANICS

Rabinovich, I. M., ed., Structural Mechanics in the USSR, 1917-57, tr. ed. by G. Herrmann. November 1960, 450 p. (PP/800).

Kats, Sh. N., Creep and Rupture of Tubes Under the Action of Internal Pressure. 1960, 10 p. (foreign text included) 11 refs. (61-13470/180).

METALLURGY

Albert, Ph., Very High Degree of Refining of Uranium by the Zone Melting Method. 1960, 900 words. (LSA/925).

Raub, E. and Plate, W., Iron-Ruthenium Alloys. 1960, 7 p. (ATS-53M45G/1090).

Mayer, K(arl) and Knüppel, H(elmut), The Lining of an 800-Ton Mixer with Chemically Bonded Magnesite Bricks. 1960, 2 p. (4 figs. omitted). (60-18255/180).

NUCLEAR PHYSICS AND CHEMISTRY

Zel'dovich, Ya. B. and Zysin, Yu. A., Theory of Nuclear Breakup. November 22, 1960, 11 p. 6 refs. (61-11514/050).

n.a., Reactors Developed in the USSR and Its Bloc Countries. October 31, 1960, 77 p. 146 refs. (61-15190/450).

PHYSICS

Forestier, H(ubert) and Guiot-Guillain, G(eorges), New Series of Ferromagnetic Substances: Rare Earth Ferrites. 1960, 630 words. (LSA/650).

Yakovlev, N. V., Use of Mirror-Lens Objectives in Photographing Artificial Earth Satellites. October 18, 1960, 15 p. 10 refs. (60-41610/050).

RESEARCH METHODS AND EQUIPMENT

Garmash, A., Seminars on Reading Devices. December 2, 1960, 2 p. (61-15187/180).

n.a., Knowledge is Power, 1957 (Vol. 32) No. 11: Selected Articles. October 11, 1960, 58 p. (Illus. omitted) 3 refs. (61-15257/360).