CIA/PB 131632-73

JULY 3 1959

UNCLASSIFIED- SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

PB 131632-73

(74)

INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION - 1959

July 3, 1959

U. S. DEPARTMENT OF COMMERCE
Office of Technical Services
Washington 25, D. C.

Published Weekly
Subscription Price $12.00 for the Series

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1

INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM -- SOVIET-BLOC ACTIVITIES

Table of Contents

		Page
I.	General	1
II.	Rockets and Artificial Earth Satellites	1
III.	Upper Atmosphere	16
IV.	Meteorology	18
V.	Arctic and Antarctic	23

I. GENERAL

Astronautics Commission Created in Czechoslovakia

According to an article in the No 4, April 1959 issue (p 232) of Veda a Zivot, published in Prague, attributed to the Bulletin CSAV (Bulletin of the Czechoslovak Academy of Sciences), the presidium of the Czechoslovak Academy of Sciences has established an astronautics commission in its technical section which will direct and coordinate scientific research work in these areas, arrange scientific lectures, establish contact with similar foreign institutions and represent Czechoslovakia in the International Astronautical Federation. It will bring together the representatives of individual scientific branches which have a close tie-in with astronautics. Rudolf Pesek, a Corresponding Member of the Czechoslovak Academy of Sciences, was named chairman of the commission, and its members include E. Buchar, F. Link, F. Behounek, and J. Stransky, all corresponding members of the academy and Docent Dr Z. Servit, Dr Engr S. Djadkov, and Dr Vl. Kopal. The Slovak Academy of Sciences sent V. Guth, a Corresponding Member of the Slovak Academy of Sciences, to the commission. The astronautics commission declared that while in the foreseeable future Czechoslovakia is not considering direct participation in launching satellites and cosmic rockets, conditions do exist for work in relevant areas, and research on indirect means should be expanded. Work will continue in the optical, photographic, and radio observation of satellites and other cosmic bodies, and the methods will be gradually perfected. Upper atmosphere research, assisted by observation of meteor trails and research on meteor dust fall which is well organized in Czechoslovakia according to the article, are closely connected. Work has started in planetary astronomy with, e.g., study of atmospheric and other conditions on the Moon and Venus. Theoretical and experimental work is being done on research directed toward the development of rocket motors. Further, theoretical and experimental work will continue on chemical fuels research and biological areas research. The commission's area of activity also includes the legal aspects of ruling cosmic space. (Prague, Veda a Zivot, No 4, Apr 59, p 232)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Soviet Techniques for Satellite Observations Described

A complete translation of a recent journal article follows:

> Artificial Earth satellites have become permanently established in our lives. Very few realize, however, that the artificial satellite is a rather unusual cosmic object from the viewpoint of astronomy and that observation and study of its motion has raised many new problems.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1

First of all, the Earth's atmosphere exerts a very strong influence on the motion of artificial satellites, as distinguished from ordinary heavenly bodies. For a considerable portion of their orbit, in the region of the perigee, satellites pass within the limits of the Earth's atmosphere to various levels, experiencing thereby a deceleration. The effect of the Earth's atmosphere is different at different points in the orbit. It varies very irregularly and is not yet subject to exact analytical calculation. This means that the ordinary methods of celestial mechanics are applicable in calculating the orbits of such a satellite only in the first approximation. In other words, there does not yet exist an exact theory of the motion of Earth satellites which are intended for use in solving geophysical problems. Such a theory can be developed only after the most difficult geophysical problem has been completely solved, namely, thorough investigation of the Earth's atmosphere.

Since there is no analytical theory of the motion of satellites, it is impossible to give exact predictions of their position over extended periods of time. The motion can be predicted only for several days, since such predictions must be constantly corrected on the basis of observations. The method consists of calculating a certain average orbit for the geophysical satellite and improving the elliptical elements of the orbit and their secular variations on the basis of observations over 10 to 20 days. It is very essential here that the observations on which the improvements are based be taken over as large a segment of the satellite's orbit as possible. From the viewpoint of astronomy, this indicates that it is essential to conduct regular observations at various points on the globe and to transmit the results of these observations to a computing center in as short a time as possible.

In conjunction with the program of the IGY, there was organized a network of special observation stations, making in almost all countries, the unique "satellite service." Chiefly, visible observations were conducted at these stations, using wide-angle astronomical "satellite" telescopes. Visual observations do not require specially trained observers and do not need extensive processing. Within an hour after the observation, the results can be transmitted to a computing center and used to calculate the motion of the satellite. This makes visual observations extremely valuable for a short-run service, although they do not have great accuracy. From the moment the First Soviet satellite was launched on 4 October 1957, 70 visual stations were continuously operating in the USSR, more than 100 stations of the "Moon Watch" system in the US, 59 stations in Japan, 18 in the Netherlands, 14 in China, 13 in Czechoslovakia, 10 in Poland, and 8 in

East Germany. At almost all station, the observations were made enthusiastically by volunteers, including students, scientific workers, amateur astronomers, and school children. By 1 January 1959, the computing center of the USSR had received data from more than 42,000 observations on the first, second, and third Soviet satellites; of these 17,000 were from 35 foreign countries. Information on their observations is regularly received from stations in Czechoslovakia, China, Poland, Holland, and Japan and from observatories in Finland, France, South America, Australia, and East Germany.

The AT-1 telescope is used to make observations in the USSR. These telescopes are mounted on tripods or bench-stands. The AT-1 consists of a small wide-angle telescope with an entrance-pupil of 50 millimeters, a magnification of six, and a visual field of about 11 degrees. In the visual field, there is a system of rings at one-degree intervals and cross-hairs marked off in 20 degrees of arc. To insure sighting the satellite which has a low luminosity and moves through the sky with a velocity of one degree per second, when its orbit is known only approximately and even sometimes completely unknown, one or two "optical barriers" are organized at the stations. These consist of 20 or fewer telescopes, depending on the accuracy of the preliminary ephemeris of the satellite. The barriers are placed along a meridian and along a vertical circle perpendicular to the visible orbit of the satellite.

To determine the moment of passing, with an accuracy exceeding one second, the stations use a printing chronograph. The null-point is determined from an exact time signal transmitted by radio. The coordinates of the satellite are determined from star maps.

Experience in the stations has shown that the majority of the observations determine the position of the satellite with an accuracy of up to one degree. The determination of the moment of passage is much less accurate and is given within fractions of a second only at the best stations. Excluding clearly erroneous results, (such as when meteors or the exhaust from an aircraft is taken for the satellite, the section of the sky in which the satellite was observed is incorrectly identified, or the time signals were read incorrectly,) the average departure of the observations from the computed orbit was within one or two degrees of the right ascension and declination. A systematic analysis of the quality of the observations began in December 1957, when a group of scientific workers of the Institute of Theoretical Astronomy undertook the task. Since February 1958, special bulletins have been distributed to the stations indicating the departures of individual observations from the computed orbit. Six issues have already been distributed, in which appeared the results of observations on the second satellite and the rocket of the third satellite. Three more issues are in process.

After the launching of the first US satellites, our stations were prepared for observations. Ephemerides which arrived from the US were regularly obtained by the southern stations. Unfortunately, we were never once successful in observing even one of the first three US satellites. Although optical barriers were set up in such a manner as to "intercept" them, even if very low over the horizon, the brightness of these satellites was too weak for observations from our latitudes. The inclination of their orbits to the plane of the Earth's equator was less than 34 degrees and they did not pass over the territory of the USSR. Conditions for observing the fourth US satellite in 1958, which was also weak in brightness and whose orbit had an inclination of 50 degrees, were for a long time unfavorable and only in December of 1958 did the first observations begin to come in.

In the succeeding half year, apparatus and observation methods were considerably improved. For example, a simple sight designed by B. E. Tumanyan (Yerevan) and attached to the AT-1 Telescope facilitates finding the object and identifying the section of the sky, and helps the observers to check their work. The site consists of a ring, two rods, and two diopters and can be made at the stations.

In the northern regions of the country, a considerable portion of the observations was made during the early evening, when it is difficult to determine the position of the satellite; in the visual field of the telescope, there are either no stars visible, or only a small number of stars. In this situation, theodolytes were used in certain stations to observe the satellites in the azimuthal system of coordinates without directly connecting it to the stars. Since the visual field of a theodolyte is very small, AT-1 telescopes were mounted on the theodolyte stands at Khabarovsk, Kzyl-Orda, and Tartu. Such an installation retains all the qualities of a theodolyte and, in addition, offers the large visual field of the AT-1 telescope. On this basis, Ya. E. Eynasto of Tartu prepared an experimental, automatically recording theodolyte. Attached to the body of the theodolyte is a photographic device which takes a picture of the readings of both circles of the theodolyte through a microscope; up to 20 positions over the whole visible trajectory of the satellite can be obtained. A careful investigation of satellite observation methods for use with theodolytes was conducted at the station under the Pulkovskiy Observatory (D. Ye. Shcheglev) and exposed possible sources of error.

Finnish astronomers provided valuable results of their observations on Soviet satellites in the azimuthal system of coordinates. In addition to visual observations, many stations took photographs of satellites with small cameras of the "Tfkiyev" or "Zorkiy" type. The beginning and end of the exposure was timed with stop watches, chronographs, or magnetophones or tape-recorders.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1

To be sure of photographing the satellites with the small cameras, the Yuzhno-Sakhalinsk (K. N. Kan) used the AT-1 telescope as a telescopic viewfinder. The photographic equipment was installed parallel to the axis of the telescope. The axis of the objective of the photographic equipment forms an angle of 45 degrees with the plane of the telescope mirror, as does the axis of the AT-1 telescope itself. This makes it possible to see the object simultaneously in the visual field of the telescope and in the viewfinder of the photographic equipment and positively to locate the object in the sky and photograph it. On 1 January 1959, the cameras were used to obtain 23 pictures of the rocket-carrier of the first satellite, 192 pictures of the second satellite, 342 pictures of the rocket-carrier of the third satellite, and 10 photographs of the third satellite, Photographing the third satellite with the small cameras presented an extremely complex problem, since its brightness varied greatly, and it was seldom visible to the naked eye. Considerable success in this respect was had by the observation station under the Vologodsk Pedalogical Institute (A. P. Poletayev). During February 1959 alone, this station obtained 6 photographs of the third satellite.

Exact photographic observations are necessary to solve scientific problems connected with investigation the Earth's atmosphere, the shape of the Earth, and geodesical problems. (Footnote:) It is interesting to note on the basis of 47 observations of the second Soviet satellite (chiefly visual), which were made from 5 November 1957 through 21 March 1959 at the stations in Czechoslovakia, Czechoslovak scientist E. Bukhar determined the position of the ascending node of the orbit of the satellite and calculated the coefficients of dynamic contractions K and the contraction of the Earth, α as $K = 0.0010852 \pm 0.0000013$ and $\alpha = 1/297.90 \pm 0.18$ (Studia Geophysica et Geodaetica 2, 306, 1958).

On the basis of the photographs of the track of the satellite among the stars, it is possible to determine very accurately the position of the satellite in the sky. In photographing satellites, astronomers came up against another new problem. The satellite moves through the sky relatively rapidly, on the average of one degree per second. This means that if we wish to determine the position of the satellite with an accuracy to one minute of arc, then the time of the passing of the satellite must be determined with an accuracy of approximately 0.01 second. For accuracy in the coordinates to one second of arc, the time reading must be accurate to within 0.002 seconds. Consequently, photographic observations must be made with an astronomical telescope which has special provision for exact time measurements. The existing large astronomical telescopes in the observatories have not until now needed such very exact "time" capabilities since the motion of ordinary heavenly bodies is extremely slow. New instruments and modifications on existing instruments would be needed to photograph satellites. In the US, special wide-angle telescopes of the Baker-Nunn type were constructed for this purpose with a diameter of 50 centimeters.

A quartz clock attached to these makes it possible to determine the time of passing of the satellite to an accuracy of thousandths of a second. These cameras have high optical properties, which make it possible to photograph the very weak American satellites. Twelve such cameras are operating at present and are situated along the equatorial belt. Photographs obtained in these are sent to the Smithsonian Observatory in Cambridge, which is the co-ordinating center for all optical observations in the US. Here, the photographs are measured, using a single method, and the results are analyzed. As a result of the high optical qualities of the Baker-Nunn camera, the second US satellite (1958 β), which is a sphere of a diameter of 15 centimeters, was successfully photographed on 10 January 1959 in New Mexico at a distance of more than 600 kilometers.

In the USSR, NAFA-3c/25 wide angle aerial-photography cameras are used to photograph satellites. These have uran-9 objectives with a 25-centimeter focal length, 10-centimeter objective, and a visual field of 32 degrees by 52 degrees. Using highly sensitive film (1,100 units according to the national Soviet standard for aerial photographs), such a camera can photograph an object of the third stellar magnitude moving with a velocity of one degree per second. A receiver, a pulse output unit, and a printing chronograph are used to denote the exact time.

Before the satellite passes, the camera is aimed at the required section of the sky; then, the observer, using a pocket viewfinder for the AT-1 telescope, after he is satisfied that the satellite has entered the visual field of the camera, opens the shutter several times for short time intervals. Special contacts installed in the shutter mechanism send signals which are recorded on the chronograph tape at the instant the shutter opens and closes. Time signals transmitted by radio are recorded on the same tape. The rhythmic time signals transmitted from the time services of the observatories may also be used. Specially constructed pulse outputs have been installed in stations not having their own time service so that time signals might be recorded on the tape of the printing chronograph.

The position of a satellite on the photographs, taking into consideration the complexity of determinging the exact time of exposure can be determined with an accuracy up to one minute of arc. The final stage of photograph analysis is done on special measuring instruments, using ordinary astronomical methods. The majority of stations used the method of A. N. Deych and A. A. Kiselev (Pulkovo) to determine the position of satellites. The method is based on interpolating the equatorial coordinates of two reference stars situated on different sides of the track of the satellite or rocket to the point of intersection of the line connecting these stars with the track. The results of the exact analysis were made public in the bulletin of the Optical Observation Stations for Artificial Satellites, published by the Astronomical Council. By 1 January 1959, the 26 stations for photographic observations with the NAFA-3C camera had obtained 16 photographs of the rocket carrier of the first satellite, 265 photographs of the second satellite, 82 photographs of the third satellite, and 1,524 photographs of the rocket carrier of the third satellite.

Even more exact coordinates of the satellites could be obtained by adding to the large astronomical telescopes a special device which would insure the exact recording of the time of exposure. The first such equipment was made at the Astrophysical Institute of the Academy of Sciences Kazakh SSR.

A special adaptation to the telescopes was developed at the Astronomical Observatory imeni Engel'gardt, close to Kazan. This makes it possible to record the times of passage through certain points on the photographic plate. A plane parallel glass plate is placed in front of the photographic plate. The glass plate is marked with a network of parallel lines. The frame of the plate turns relative to the photographic plate during the time of exposure. The position of the lines of the grid is then recorded at certain times on the photographic plate. A pulse illuminator is used to produce the images.

The velocity of the plate is selected in such manner that it moves through 20-30 millimeters during the time of exposure. There are discontinuities in the track of the satellite on the photographic plate where the image of the satellite crosses the lines of the network. The times of these discontinuities are determined by measuring their positions and the positions of the lines at the fixed times at which the illuminator operates. An analagous method of photographing satellites was developed by Ye. Ya. Bugoslavskaya at the Astronomical Institute imeni Sternberg (Moscow.)

A method was developed at the same institute for photographing weak satellites, using electron optical converters. The idea of using such converters and thus considerably increasing the sensitivity of the instrument, was extremely far-sighted. However, there is no real gain from using them unless the object is observed against a dark background. Since the existing satellites are observed only against a twilight background, this difficulty has unfortunately not yet been circumvented and no photograph of the relatively weak third satellite has yet been obtained.

At the main astronomical observatory (Pulkovo), a camera with a moving film was constructed which makes it possible to record satellites which are weaker than can be photographed by ordinary methods (L. A. Panayotov).

This interesting method was proposed by M. K. Abele, a scientist at the Rizhskaya Station. The satellite is photographed on an oscillating plate through a telescope. The direction of the line along which the photograph plate oscillates, coincides with the direction of motion of the satellite. As a result the track of the satellite obtained on the plate is not in the form of a streak but in the form of individual points at which images of the satellite are superimposed, one on the other. This method makes it possible to photograph the weaker satellites. The moment of the individual exposures is recorded with an accuracy of within 0.001 seconds.

CPYRGHT

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1

Soviet satellites are regularly photographed abroad. By 1 January, 36 photographs of the rocket carrier of the first satellite had been obtained, 272 of the second satellite, 1,800 of the rocket carrier of the third satellite, and 270 of the third satellite. The great majority of the latter were obtained on Baker-Nunn cameras in the US.

Good photographs of the satellites were taken by astronomers of the Potsdam observatory (East Germany). The German astronomers sent a fortunate photograph on which was caught the track of the rocket carrier of the third satellite and the track of the US satellite 1958 c [Explorer 4]. The photograph points up the relative brightness of these objects.

Study of the change in brightness of artificial satellites presents interesting problems. The visible brightness depends on the change in the phase of the satellite, i.e., the fraction of its visible surface irradiated by the Sun, on the change in the distance to the observer, on the absorption of light in the segment of the path from the satellite to the observer, on the rotation and tumbling of the satellite, and on the change in the state of its surface. Large-scale observations with subsequent statistical analysis are required to obtain useful results. Visual photographic and photoelectric methods may be used for such observations.

The photographing is done with still cameras. The brightness of the satellite is determined by comparing its track with the track of the surrounding stars. The difference in the velocities of the satellite and the stars must be taken into consideration, as must the dependence of the sensitivity of the photographic-emulsion on exposure time. Because of the difficulties of accounting for these factors, the photographic method results in an error to several hundredths of a stellar magnetude. Analysis is made easier if the photometric error of the field is known. The Pickering method used in observing variable stars is used to estimate the brightness of a satellite in comparison with the brightness of stars situated along its path. The brightness of the object is given in tenths of the brightness of the stars to which it is compared. In satellite observations, such an estimate must be made over 2 to 3 seconds. Since mid-March, about 50 visual stations have been engaged in these observations. Analysis of the observations obtained at various points on the Earth is being done at the Odessa Observatory. Also being developed is a method for determining the position of the axis of rotation of the satellite in space.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1

Even during observations on the rocket car... er of the first Soviet satellite, the attention of many observers was drawn to the very obvious oscillations in brightness. The chief reason for these oscillations is the rotation of the rocket around its transverse axis. The amplitude of this change, according to calculations of Japanese observers, is 5 to 6 stellar magnitudes. Even more considerable was the amplitude of the change in brightness of the Soviet satellite (6 to 8 stellar magnitudes). An analysis of the large number of observations permitted V. P. Tsesevich (Odessa) to determine the average period of rotation of the satellite around its axis. This was found to equal 208.5 seconds. He was also able to show that during the lifetime of the satellite, this period changed from 180 to 230 seconds,

An interesting feature of the rocket of the third satellite was the periodic, comparatively short-term, oscillations in brightness caused by tumbling around the transverse axis. Photoelectric measurements made by J. Moore (California) showed that the period of the oscillations in brightness changed from 15 seconds in the beginning of June 1958 to 18.4 seconds in the middle of October 1958. Analagous results on the basis of a large number of visual observations were obtained by M. S. Zverev and M. I. Yesipova (Pulkovo). The third satellite itself, as a result of its shape and high altitude of the Earth, was rarely visible to the naked eye. Outside of individual instances when a rather smooth rise and fall in its brightness could be observed for the course of 50-60 seconds, there was more characteristically an instantaneous flash with a very rapid and sharp drop-off. Evidently we have here simply a flash from some narrow reflecting portion of the surface. By 1 January 1959, 48 stations had obtained about 200 estimates of the brightness of the third satellite, which is clearly inadequate for drawing any conclusions concerning its rotation.

The study of the motion of artificial Earth satellites is a large and important international task. The results of the observations on the motion of satellites convincingly shows how great is the striving of scientists for business-like cooperation and what a great advantage it can bring to science. ("Astronomical Observations on Artificial Earth Satellites," by A. G. Masevich, Doctor of Physicomathematical Sciences; Moscow, Vestnik Akademii Nauk, No 5, May 59, pp 85-94)

Special Telescope Devised for Satellite Observations

The following article appeared in a recent Soviet journal:

A station for photographic observations on artificial Earth satellites, No 67 in the network of similar stations in the Soviet Union, was set up in October 1957 by the Astrophysical Institute of the Academy of Sciences Kazakh SSR on the Kamenskoye Plateau near Alma-Ata. The station's equipment consists of a wide angle "Sofir" Boyye Camera, (100-millimeter objective and 450-millimeter focal length) and a small camera with a "Zonnar" objective. A stop mounted in front of the objectives produces breaks in the image of the satellite track at times indicated by an ordinary chronograph and makes it possible to synchronize the motion of the satellite with the chronometer readings. Equipment which makes it possible to determine the coordinates with an accuracy of one minute of arc and to record time with an accuracy of up to 0.05 second was successfully applied on 23 October 1957, when the rocket carrier with the first Soviet artificial Earth satellite rose from behind the mountains of Zailiyskiy Ala-Tau for the first time below our latitudes.

This equipment, of course, cannot be called first class, either with regard to the accuracy of the photographic determinations or with regard to the penetrating power, i.e., the ability to photograph satellites with low illumination. The efforts of the scientific workers were therefore directed toward improving methods of photographing, primarily by raising the sensitivity of the small cameras to the tracks of weak satellites.

As it moves through the sky, the star-like satellite leaves a more or less distinct track on the photograph. In the first approximation, the effect of its action on a photographic emulsion increases with an increase in the value

$$H = D^2/F\ \delta v.$$

In the above equation, D is the diameter of camera objective, F is the focal length of the objective, v is the linear velocity of the moving image on the surface of the emulsion, and δ is the diameter of the scattering circle, i.e., the image formed by the objective of a stationary point of light at an infinite distance. Without going into detail, it may be said that a photographic camera intended for observing artificial Earth satellites must combine properties which are high and yet very difficult to coordinate with one another from the viewpoint of optical abberations. These are a large objective diameter, a sufficiently large focal length (since the accuracy of determining the coordinates increases almost proportionally to the value of F), as small a scattering surface as possible, and a large angular visual field. In ordinary observation practice, we can speak only of choosing the photographic equipment which more or less successfully combines these properties. However, there is a real possibility for increasing the sensitivity of a photographic installation by decreasing the velocity (v) of the moving image on the surface of the photographic emulsion. This, in fact, means increasing the effective exposure. This is defined in the first approximation as the time required for the passage of the scattering circle through its own cross-section. (The formula for H was written on this assumption.)

Reducing the velocity of the moving scattering circle at a certain place on the Photographic emulsion presents the possibility for increasing the time for light to act on a given place. Of course, this method is not particularly effective, since the photochemical action is primarily determined by the intensity of the light and not the duration of its action. In addition, a limit is approached too fast in the increase in sensitivity of the equipment operating according to this method; slowing down the moving image lowers the accuracy of the time indications and considerably decreases the number of stars visible on the picture. The stars are necessary in measuring the coordinates of the artificial satellite. The problem is solved in practice by adding to the velocity of the forward motion of the satellite image the same forward velocity, but in the opposite direction.

If the velocity V is added to the corresponding rotational or oscillating motion, it is possible to obtain a periodic slowing down, which effects the image of the stars only slightly. In this way, the sensitivity of the photographic equipment is increased many times.

An experimental model of a small photographic camera based on this principal was prepared at the institute in early 1958. The camera has an objective which rotates relative to an axis parallel to its main optical axis. Tracks of stars in the form of small circles and the cycloidal track of the satellite were obtained on the resulting photographs. A reduction in the velocity of the scattering circle of the satellite occurs at the cusps of the cycloid. Calculations and experiments show that the effective exposure time can be increased four to five times with the use of this instrument. Flashes were visible on the photographs thus obtained of the tracks of the second satellite at the times that its image was sharply slowed down. The value of the method consists in the fact that the degree of slowing down is completely independent of the direction of the flight of the satellite.

Similar operations were effected as an experiment. Particular attention was devoted to observations of artificial satellites using more powerful and precise instruments which were available at the observatory of the institute. Ranking first among these is the Maksutov Telescope with a 50-centimeter meniscus. Images of stars of the 6th magnitude can be obtained with this telescope using an exposure of the order of 0.0015 seconds. The excellent quality of the images, comparatively large focal length (120 centimeters), and other optical and design features provided a good answer to the problem of making exact photographic observations on satellites.

At the end of 1957, the telescope was fitted out with the necessary accessories and equipment. Since this time, in addition to its chief purpose of studying weak heavenly objects, it has been used for satellite observations. Various improvements have been made on it since it has been operative. Oscillations of the glass plane-parallel plate which cause the breaks in the track of the satellite on the photographic plate are produced by a system of electromagnets and a circuit breaker. Any extreme position of the plate is indicated, on the one hand, by a break in the track on the photographic plate, and, on the other hand, by a pulse current which is synchronized with an accuracy up to 0.001 seconds and sent to an oscillograph or printing chronograph. The chronograph is controlled by radio signals and the velocity of the film on the oscillograph, by a tonal generator. A contact chronometer is connected to one of the oscillograph loops in case it is needed. Experience has shown the advantages of applying the oscillating plate as a synchronizing device. The accuracy of determining the coordinates of the satellite on the pictures obtained on the telescope is in the neighborhood of one second of arc. Times can be determined with an accuracy of up to 0.001 second.

It should be noted that at present, all the operations during the observations with the telescope can be completed by one man. Previously, at least three observers were required for this purpose.

In addition to this installation, the station has the standard equipment for observing artificial satellites, namely, a NAFA-3C/25 camera, a printing chronograph, and other devices. As a result, photographic observations are made independently on two instruments which somewhat complement one another in their optical properties.

It should be noted that 1958 was an extremely unfortunate year with regard to meteorological conditions and almost half of the artificial satellite passings could not be observed. About 10 percent of the ephemeris positions on the satellite sent by the computing center "Kosmos" referred to daylight hours. Nevertheless, the station gathered no small amount of observational material. From the time of its organizations to the end of 1958, 31 observations were made with theodolites and binoculars, and 96 photographs were made with various other instruments. Of these, 87 were suitable for precision analysis. This analysis is being made systematically and the results published in Soviet astronomical publications. ("At the Photographic Observation Station," by D. A. Rozhkovskiy, Candidate of Physicomathematical Sciences; Moscow, Vestnik Akademii Nauk SSSR, No 5, May 59, pp 95-98)

Barabashov on Artificial Earth Satellites and Problems of Space Flights

Man's entry into the age of space flight has made direct study of the planetary world especially necessary today, says Nikolay P. Barabashov, director of the Astronomical Observatory of the Khar'kov State University imeni A. M. Gor'kiy. The first astronauts setting out for the Moon and the planets must have a sufficiently clear knowledge of what they may find on these bodies. They must know the nature of the surface of the planet on which the rocket craft will land, whether it has an atmosphere, what the temperature conditions are, whether living organisms exist there, and so on. Approximate answers to certain of these problems have already been obtained by astronomers using terrestrial means of observation and investigation. But only since the launching of artificial earth satellites and automatic cosmic rockets has the actual possibility of solving the principal problems of cosmic flights by man, and his travel to other planets, made its appearance.

The first Soviet artificial Earth satellites made it possible to develop scientific works connected with the problems of practical cosmonautics and to acquire exceptionally valuable information concerning the phenomena originating in interplanetary space. Thus, were studied primary cosmic rays, the intensity of ultraviolet and X-radiation, the corpuscular radiation of the Sun, and the quantity and dimensions of meteorites and cosmic dust striking the shells of the artificial Earth satellites. Man will encounter all of these with his entry into the cosmos, and to create suitable safeguards in advance, it is necessary to be well acquainted with the phenomena mentioned. A still more valuable contribution in these investigations was made by the Soviet cosmic rocket which passed near the Moon and thereafter began revolving around the Sun becoming the first artificial planet of our solar system.

The material of the observations obtained because of this rocket make it possible to take still another great step forward in the development of the design of interplanetary craft and the means of establishing reliable communication at considerable distances from the Earth during space flights. In particular, the creation of the artificial comet [sodium cloud] with the aid of the cosmic rocket reveals a particularly important possibility of tracking interplanetary craft of the future. Such craft may be thus optically observed from very great distances, a fact which is of great value for cosmonautics. In addition, new important information concerning the properties of cosmic space, temperature conditions in it, cosmic radiation, the Moon's radioactivity, etc., was obtained. All of these data will be used in the realization of interplanetary flights with people.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1

New, more perfected artificial Earth satellites and interplanetary craft will be launched for future investigations of cosmic space, the Sun, Moon, planets, stars, and for the successful solution of the problems of cosmonautics.

First of all, says Barabashov, the so-called stationary satellites must be considered. These will remain over one and the same spot on the Earth's surface at an altitude of 35,810 kilometers, moving from west to east around the world once every 24 hours. Communication with the stationary satellites, the switching on and off of the instruments and mechanisms located in them can be easily accomplished by light signals and directed radio waves. Flights to such satellites can be made at any necessary moment from one and the same take-off area. It is true that the Moon's attraction "shakes" the stationary satellite and it becomes nonstationary. However, the orbit can be corrected. Stationary satellites make it possible to study the meteorological conditions of the Earth as a whole, changes in the Sun's radiation, in the intensity of cosmic rays, and in the magnetic and electrical fields. It will be possible to establish permanent observations of meteor bodies and the cosmic dust in interplanetary space, which present the chief danger for cosmonauts.

Next, Barabashov considers enormous extraterrestrial flying laboratories. Such cosmic laboratories can be organized with the aim of studying cosmic space, the Sun, planets, stars, nebulae, and interstellar matter. Investigations in the fields of astronomy, physics, geophysics, biology, and other branches of science will be made from them.

Such astronomical observations, which, up to now, have been inaccessable to scientists will be realizable from flying laboratories and artificial earth satellites.

One of the immediate problems in the development of cosmonautics is the launching of an interplanetary craft which will fly around the Moon at a very close distance to it and will report detailed information concerning the structure of the separate parts of the lunar surface and the physical conditions on it. Television cameras and other complex equipment which will permit obtaining interesting data concerning certain peculiarities of the lunar world must be established in these craft. The creation of an artificial satellite of the Moon (which is also scheduled) will considerably simplify its detailed study. If such a satellite were to fly at an altitude of 30 kilometers from the lunar surface, then even details with an average size of 6.3 meters can be seen from it. It is true that the satellite must move with a speed of more than 1,600 meters per second and therefore the objects being observed will be quickly (not later than 6.4 minutes) out from the field of view of the instruments carried in the satellite. At an altitude of 150 kilometers, the maximum time any object will be visible increases up to 15.7 minutes, while the size of the object must be (for the naked eye) no less than 31.5 meters.

The launching of an artificial satellite of the Moon would also provide very great returns on the score of investigations of the physical parameters in the neighborhood of the Moon: the magnetic field, the intensity of the cosmic radiation, etc.

The next stage will be to launch an interplanetary rocket, with the aim not only of flying around the Moon, but also of landing on its surface. Then, scientists will obtain such information as is impossible to report from flying cosmic craft. Apparatus landing on the moon can measure the temperature of the lunar soil at various depths directly, give more accurate information on the structure of small portions of its surface, on the properties of matter forming its surface layers, on the density and composition of the rarefied lunar atmosphere, etc. All of this is a very important link in the preparation for cosmic flights, with the participation of people themselves.

Flights by man in interplanetary craft will lead to new, extremely interesting, discoveries. The launching of artificial Earth satellites and the first cosmic rocket showed that man's escape into the cosmos is fully possible. It is not impossible that the first lunar travelers will find rock possessing new properties which may be used on Earth. With time, lunar astronomical observatories will rise.

"It is possible to propose," says Barabashov, "that the next stage in the development of cosmonautics will be dispatching, at first, large automatic cosmic rockets, and then, obviously, also rockets with people to the nearest planets, Venus and Mars, which will reveal all their secrets to us. Thereafter will follow flights to the most distant planetary bodies and finally beyond the limits of the solar system to other stars and planetary systems." ("Artificial Earth Satellites and Problems of Cosmic Flights," by N. P. Barabashov, Kharkov; Moscow, Nauka i Zhizn', No 5, May 59, pp 17- 19)

Soviet Scientist Discusses New Model of Upper Atmosphere

The structure of a modern model of the upper atmosphere based on results of recent studies is the subject of an article by B. S. Danilin, Candidate of Technical Sciences, a summary of which is presented below.

The launching of artificial earth satellites made it possible for the first time to determine the density of the atmosphere at great altitudes. Despite the fact that the motion of satellites occurs in the extremely rarefied layers of the Earth's atmosphere, where the density does not exceed a billionth part of the density of the air at ground level and the force of the resistance even in the lowest part of the orbit does not exceed two grams per square centimeter of cross section, the collisions of the satellite with the molecules and atoms of the gas cause its braking, leading to the shrinking of its orbit and a change in its orbital period.

The perigees of the Soviet artificial earth satellites were at altitudes of 226-228 kilometers. An analysis of their braking and the direct measurement of the density, using manometers in Sputnik III, indicate that the value of density at this altitude is $3 \cdot 10^{-13}$ grams per cubic centimeter. Analysis of the braking of the American satellites, Explorer and Vanguard, showed that the density at altitudes of 368, 405, and 720 kilometers consists, correspondingly, of $1.5 \cdot 10^{-14}$, $9 \cdot 10^{-15}$, and $1.2 \cdot 10^{-16}$ grams per cubic centimeter.

Knowing the change in the density with altitude, it is possible to determine the so-called "altitude of a homogeneous atmosphere." The larger the molecular weight of the air and the lower its temperature, the lower the altitude of the homogeneous atmosphere. Knowing this value, it is possible to calculate the temperature of the upper atmosphere and also the atmospheric pressure and to construct a modern model of the atmosphere based on the results of experimental investigations.

The observed brakings of satellites and manometric measurements indicate a high temperature of the upper atmosphere and its considerably denser structure at high altitudes and fully disproves earlier existing opinions concerning cold and strongly rarefied upper layers of the air.

Numerous observations of aurorae, of the change in the Earth's magnetic field, of twilight phenomena, of night airglow, of meteors, and of the ionosphere suggested to scientists that the atmosphere expands under heating by day and contracts under cooling at night and that in it occur solar and lunar tides.

However, the experimental investigations by artificial earth satellites and the launching of high altitude rockets (including in the polar regions) during the IGY period alone made it possible to establish the regularity of these phenomena. It was discovered that the diurnal summer density of the atmosphere is almost 20 times greater than the night winter density and that the density of the atmosphere in the polar regions is approximately five times greater than that near the equator. It was established that the Sun and those numerous processes which arise up on it have an exceptionally great effect on the Earth's atmosphere. Solar radiation and the particles ejected by the Sun are the reasons for magnetic storms, causing aurorae and ionization of the upper layers of the atmosphere. Strong magnetic storms are simultaneously accompanied by an increase in the braking of a satellite which obviously is connected with an increase in the density and temperature of the atmosphere. ("Model of the Upper Atmosphere," by B. S. Danilin, Candidate of Technical Sciences; Moscow, Nauka i Zhizn', No 5, May 59, p 20)

Unusual Finding of a Meteorite

The finding of a meteorite at the imeni M. V. Frunz placer mine in November 1957 is reported by A. I. Shul'zhenko. The mine is located in the Susuman Rayon, Magadan Oblast.

The meteorite, which weighed 15 kilograms, was discovered by a worker at the 34-meter level. When broken into two parts the exposed surfaces showed a clearly expressed crystallic structure, the crystals of which were triangular in shape and were strictly oriented. Inclusions of mineral matter occurred between the crystals.

The meteorite's outer surface was fused in appearance and bore the marks of weathering. The elongated shape of the body was reminiscent of a cobblestone. The object possessed magnetic properties.

A chemical analysis showed the following composition: 0.4-0.5 percent carbon, 5-6 percent nickel, and the remainder iron. Other ingredients were not detected in the fusion. The composition of the mineral interlayer between the crystals has not been subjected to an analysis. The matter's specific weight is 7.82.

The chemical composition and the location of the discovered body make it possible to tentatively propose that it is crystallite of meteorite origin. ("Finding of a Meteorite," by A. I. Shul'zhenko; Moscow, Priroda, No 5, May 59, p 115)

IV. METEOROLOGY

Soviet Hydrometeorological Instruments Described

A description and photographs of some Soviet telemetric and automatic hydrometeorological instruments appear in Priborostroyeniye, official monthly scientific-technical and industrial journal of the State Scientific-Technical Committee of the Council of Ministers USSR. At present, says the source, specialized plants manufacture up to 160 different hydrometeorological instruments and stations. Some of the most interesting have been selected for presentation.

Figure one shows the remote meteorological station DMS-N-53, which is used for quick determinations of remote air temperatures and humidities and of the speed and direction of the wind at the level of the devices of the respective transmitters. The station is portable and is easy to operate.

Its operation is based on the conversion of the measured meteorological values into electrical values, which are read visually from needle gauges on measuring instruments located at the receiving station. With the aid of such instruments, it is possible to measure the speed of the wind within the limits from 2 to 30 meters per second, the direction of the wind from 0 to 360 degrees, and the temperature of the air from +45 to -45 degrees centigrade.

For complex ship conditions, the ship remote station SDS, permitting the measurement of the mean value of the speed and direction of the wind, the temperature and humidity of the air, and the temperature of the surrounding water, has been created and placed in series production. The station consists of a control panel and transmitter units (Figure 2 and 3). Such stations are successfully used on ships.

For operations without human intervention, under the conditions in the Antarctic and in barely accessible, uninhabited regions, the automatic rain gauge M-4 and the automatic radiometeorological station ARMS were created and placed in production.

The radio rain gauge makes it possible to measure atmospheric precipitations falling in liquid form and to report their quantity by radio.

Each such transmission consists of the identification signals assigned to the given station and signals denoting the amount of precipitation. The transmission range of the automatic rain gauge is 50 kilometers.

The ARMS automatic meteorological station makes it possible to transmit by radio, at distances up to 600 kilometers, the atmospheric pressures, air temperature, wind direction, and the solar radiation at the moment the station is in operation, as well as the amount of precipitation between the periods of radio transmission.

An instrument for measuring the humidity of the soil under field station conditions without taking soil samples for drying has been created (Figure 4).

The instrument's operation is based on the measurement of the degree of reduction in the gamma rays penetrating the soil layers. The instrument consists of a gamma-quanta counter, a power source, and a rod which has a radioactive source on its lower end.

The error in the measurement of humidity by gamma ray examination of the soil layers at 20, 50, and 100 centimeters and at a gamma level of 10,000-12,000 pulses per minute consists of $\pm$ 1.5 to $\pm$ 2.0 percent.

A portable snow gauge was created for measuring the water content of snow based on the attenuation of gamma rays radiated by the radioactive isotope Co^{60}.

The portable gamma snow gauge is a snow gauge having on its lower end a steel tip with a container for isotopes, and at its upper end, a gamma-quanta counter. The determination of the water content in snow cover is based on the measurement of the degree of attenuation of gamma rays radiated by a radioactive isotope during their passage through the snow.

The instrument makes it possible to measure the water content in snow with an error of 3-5 percent with a snow depth of 3 meters.

The automatic radio-wind gauge ARIV is a meteorological instrument for the automatic radio transmission of information concerning the mean velocity and direction of the wind from open parts of water reservoirs.

A ship hydrosonde was developed for continuous, automatic registration of the vertical distribution of the temperature and salinity of sea water in a layer of a depth of 2 to 220 meters. The bridge zero method of measuring the resistance by direct current for pressure and temperature and by alternating current for salinity is used in this instrument. Recording is produced on uniformly-moved recording tape by various colored inks.

For measuring and recording the speed and direction of water currents during stationary and expeditionary investigations of current systems, an independent, photographic current recorder with a tape-feeding mechanism was developed. The instrument is based on the principle of automatic registration of the speed and direction of sea currents by means of photographing the readings of the tachometer of the bladed wheel and the compass.

Airplane dropsondes intended for measurement of the pressure, temperature, and humidity of the air from an altitude of 15,000 meters down to the earth's surface parachute descent from the weather are being built. The results of the measurement of the meteorological elements are transmitted by the sonde's radio transmitter in the form of telegraphic signals and are received by the plane's radio-operator or recorded by magnetic recorder.

For measuring the relative humidity of the air under ground conditions, a hygrograph using animal membrane as a transducer was developed and is manufactured (Figure 5).

For measuring the humidity of the soil under field conditions, with a temperature over zero degrees centigrade, the AM-11 soil humidity gauge was developed and manufactured (Figure 6).

Automatic recordings of the temperature distribution in the layer of water of a depth down to 200 meters is ensured by a thermobathygraph being manufactured at the present time (Figure 7 and 8).

Photoelectric cloud meters, parachute-dropped from a weather plane from 15,000 meters, are proposed for determining the upper and lower limits of cloudiness for middle and lower strata. Upon the entry of the instrument into the cloud, a scattering (by the cloud) of the light being radiated by a pulsed source occurs, as a result of which the light pulses fall on the photoelectric cell and are converted into electrical pulses. The mangnified electrical pulses enter a manipulator controlling the radio transmitter.

The registration of icing is of great value to scientific investigations and to maintenance operations for railroad transportation and for telegraph and power transmission lines. For determining the weight, intensity, type, form, and dimensions of icing on wiring, the M-28 icing meter was developed. At present, the Scientific Research Institute of Hydrometeorological Instrument Building was developed a remote icing meter.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1

This, says the author of the article, is not a complete list of all of the products of the new technology created by the scientific research institutions of the Hydrometeorological Service and the products already being developed and produced by specialized plants.

At present, major work is being conducted on lowering the cost of instruments being produced by the introduction of an efficient production technology in machine and bench operations, the introduction of conveyor lines for the assembly of instruments, and the mechanization and automation of laborious check operations. The role of plant laboratories in the solution of production and research problem is continually increasing. The work of the central plant laboratory of the Rizhskiy Hydrometeorological Instrument Plant is a good example in this regard. Direct contact with production is extremely important for plant laboratories.

Along with the successes achieved in the field of hydrometeorological instrument building and in the work of creating new and perfecting existing hydrometeorological instruments, there are shortcomings. The most substantial of these still is the significant lag in the development of mass-produced instruments which are necessary for increasing the accuracy of observations, lightening the work load of the observer and, in many instances, replacing him. Another, is the absence of automation in the processing of observations.

It is necessary to more intensively design and introduce mass-produced hydrometeorological instruments utilizing the means of telemechanics, radio electronics, and other modern achievements of science and engineering. ("Hydrometeorological Instrument Building," by A. B. Reyfer; Moscow, Priborostroyeniye, No 4, Apr 59, pp 26-28)

Re-evaluation of Book on Long-Range Weather Forecasting Urged

Although B. P. Mul'tanovskiy's book, Osnovnyye Polozheniya Sinopticheskogo Metoda Dolgosrochnykh Prognozov Pogody (Fundamentals of the Synoptic Method of Long-Range Weather Forecasting), Moscow, 1933, is generally considered difficult to read -- apparently because it presents no statistical data, but rather a procedure for the analysis of data for the purpose of extracting information on the laws of the circulation of the atmosphere -- this article describes the book as a valuable work guide which should be re-evaluated in the light of most recent developments in meteoro[illegible].

The article also further develops the two principal hypotheses advanced by Mul'tanovskiy, namely, the hypothesis regarding the "dominator," i.e., that the general transfer of air masses in a moving baric formation is made up of its closed circulation and the general transport of it by atmospheric currents, which can be estimated on the basis of the trajectory of the cyclone; and the hypothesis that all baric formations on synoptic charts reflect the activity of larger formations of synoptical or (as Mul'tanovskiy called it) dynamic centers of activity of the atmosphere (not climatic).

It is recommended that the book by Mul'tanovskiy be reissued and used by synopticists. ("The Principles of the Synoptical Method of B. P. Mul'tanovskiy for Preparing Long-Range Weather Forecasts," by N. A. Bulinskaya; Trudy Morskogo Gidrofizicheskogo Instituta, Vol 12, 1958, pp 3-21)

Study on the Formation of Advective Condensation Mists Over Snow Cover

As part of a program of 1956 observations of the physical processes in the lower atmosphere, this article describes the conditions under which the formation of advective condensation mists over snow is possible. Such mists have been observed in winter on the shores of the northern seas, where snow covers have been considerably earlier than the freezing of the water, and in the Central Arctic, where such occurrences have been observed during the entire 6 months of cold weather.

To predict a mist according to the nomogram of a day on which advection is assumed or probable, the following data are required:

1. The temperature of the water during the period of advection; since the temperature of the water surface changes relatively little from day to day, it is possible to use the mean daily temperature of the water during the 24-hour period preceding the advection.

2. The relative humidity of the air mass; if the prognosis of of the relative humidity is not possible, it should be assumed to be 90 percent.

3. The minimum temperature at the surface of the snow in the period of advection.

No verification of nomograms on the basis of experimental data was attempted because of the difficulty of selecting material (infrequent occurrence of mists of this type). ("Advective Condensation Mists Over the Surface of a Snow Cover," by L. A. Klyuchnikova; Leningrad, Trudy Glavnoy Geofizicheskoy Observatorii, No 77, 1958, pp 3-6)

Devices for Measuring Temperature and Humidity Gradients Developed at Pulkovo Observatory

To increase the accuracy and convenience of operation of instruments in use at the Main Geophysical Observatory, two simple, compact devices were developed, with which it is possible, by remote means, to measure temperature and humidity and to conduct all of the other operations connected with these measurements. One of these psychrometric devices was designed for use close above the surface of water, and the other was mounted on a television tower. Laboratory tests and practical tests at Koltushakh and on Lake Sevan showed that the accuracy of the temperature measurements of the remote psychrometers is on a par with that of larger models. ("Device for Measuring Temperature and Humidity Gradients," by N. V. Kucherov: Leningrad, Trudy Glavnoy Geofizicheskoy Observatorii, No 77, 1958, pp 57-64)

Wind Velocity Computations For Nonsteady Pressure Fields

At the present time, according to this author, there is no method of computing the velocity of the wind in a boundary layer when the pressure field is changing; consequently, even with a series of synoptical surface charts at hand, the velocity of the wind at the height of a weather vane or wind sock when the pressure field is not steady, cannot be computed.

The problem was treated earlier by Dyubyuk (Trudy TsIP, No 15, 1949), who presented a solution in principle, but not an acceptable practical method of calculation. This article, represents an attempt to derive formulas, suitable for practical use, which will provide a correction for the velocity of the wind in the case of a nonsteady pressure field. ("The Influence of an Unstable Pressure Field on the Distribution of Wind in a Boundary Layer," by V. Shnaydman; Leningrad, Trudy Glavnoy Geofizicheskoy Observatorii, No 77, 1958, pp 65-71)

V. ARCTIC AND ANTARCTIC

Academy of Sciences USSR Publishes Reports on Antarctic

The Trudy Kompleksnoy Antarkticheskoy Ekspeditsii Akademii Nauk SSSR (Reports of the Complex Antarctic Expedition of the Academy of Sciences USSR) are being published by the Council for Antarctic Research, Academy of Sciences USSR, in the form of several series. Scientific reports on various types of antarctic research will be included in the series Scientific Articles on Geophysics, Scientific Articles on Oceanology, and others.

The series Research Reports and Materials includes a volume containing results of meteorological and aerological observations made on the Ob' during its first voyage to the Antarctic. An appendix to this volume also gives the results of meteorological observations conducted on the Lena and at the station Mirnyy.

During the period from 10 December 1955 to 26 April 1956, the aerometeorological detachment of the First Antarctic Expedition conducted a total of 1,219 meteorological observations, 182 radiosonde observations, and 244 pilot-balloon observations. The book contains detailed tables, listing the coordinates for each point at which observations were conducted and the hydrometeorological data thus obtained.

Another volume in the series Research Reports and Materials contains the results of hydrological, hydrochemical, geological, and biological studies conducted during the first voyage of the Ob' in 1955-1956. The book lists the names of all scientific associates who participated in preparing the material for publication.

The volume entitled Description of Expedition on the Diesel-Electric Ship Ob' 1955-1956 contains an account of the work of the marine expedition, describing the aims and problems of the expedition. A special chapter of this volume describes the conditions under which the Ob' sailed from Kaliningrad to the Antarctic, the search for a site for setting up the Mirnyy observatory, and the weather conditions during the voyage and the period of anchorage in Farr Bay and near Mirnyy.

Other chapters in this volume contain the materials of scientific observations of the marine expedition. During the period from 30 November 1955 to 8 July 1956, the Ob' traveled 33,325 miles. Scientific observations were conducted almost continuously.

The volume contains the materials of scientific research on aerology, meteorology and actinometry, hydrology and hydrochemistry (physical and chemical characteristics of water masses and currents, color and transparency of water, wave characteristics, quantity and drift of ice), marine geology (bottom relief, accumulation of deposits, seismo-acoustic research, etc.), geophysics (measurements of gravity and electricity in the ocean), hydrography (geodetic and astronomic observations), and hydrobiology (plankton, benthos, fishes, marine mammals, and birds).

The conclusions drawn from the scientific research work are of a preliminary nature, as they are based on the first processing of materials obtained during the period of the voyage. (Trudy Kompleksnoy Antarkticheskoy Ekspeditsii Akademii Nauk SSSR, Leningrad, 1958)

Activities at Station Vostok

The new group of scientific workers at station Vostok is spending their fifth month at that location. The middle of the polar night is approaching. The sun has not been seen for over 5 weeks. More and more frequently the air temperature drops below minus 70 degrees. Heavy snowstorms occur from time to time. Even when the wind reaches a velocity of only 8-10 meters per second, the air is so saturated with snow dust that visibility is reduced to a few meters. The atmospheric pressure, which is normally low at this station (3,420 meters above sea level), is subject to even greater drops.

As a result of efficient preparations for the polar night, outdoors work is now reduced to a minimum. Remote-control and automatic instruments make it possible to work without leaving the building. The time spent outdoors by the scientists is reduced to 20-30 minutes per day. Only the launching of radiosondes, meteorological observations, processing of snow or ice for obtaining water, and some emergency operations require the men to spend longer periods of time outdoors.

The station is conducting an extensive series of scientific observations in aerology, meteorology, actinometry, terrestrial magnetism, ionosphere, and auroras. The data obtained are transmitted regularly by radio to the Mirnyy observatory. ("Altitude Above Sea Level 3,420 Meters"; Moscow, Vodnyy Transport, 6 Jun 59)

Results of Third Antarctic Expedition Discussed

The results of scientific work conducted in Antarctica under the IGY program were discussed on 12 Jun by the Presidium of the Academy of Sciences USSR. A report was made by Ye. I. Tolstikov, chief of the Third Continental Expedition.

Valuable data have been obtained, which contribute a great deal to the available information on geophysical phenomena and the nature of the Antarctic. On the basis of seismic and gravimetric measurements, an interesting theory was suggested concerning the gradual lowering of the eastern portion of Antarctica under the pressure of the huge mass of ice.

The exploration of the Antarctic ice cap on a cross-section between the Mirnyy observatory and the pole of relative inaccessibility, covering over 2,100 kilometers, was of special significance in the work of the Third Continental Expedition.

The Presidium of the Academy of Sciences USSR approved the work of Soviet antarctic expeditions, as well as the general direction of future activities pertaining to the study of the Sixth Continent, as outlined in the plan for 1959-1965. ("Soviet Scientists Explore Antarctica"; Moscow, Pravda, 13 Jun 59)

* * *

USCOMM-DC-61143

Approved For Release 1999/09/08 : CIA-RDP82-00141R000200740001-1