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(3) RED-STAR PATROL INVESTIGATES THE COSMOS.

A NEW AND OUTSTANDING EXPERIMENT

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RED-STAR PATROL INVESTIGATES THE COSMOS. - A NEW AND OUTSTANDING EXPERIMENT.

Highlights of the Press-Conference, held on 6 February in Moscow, under the joint sponsorship of the USSR Foreign Ministry and the USSR Academy of Sciences, and published in extenso in both, PRAVDA and KOMSOMOL'SKAYA PRAVDA of 7 February 1964.

The Press-Conference was opened up by the Chairman of the USSR Academy of Sciences, Academician M. V. KELDYSH, who outlined the progress of Soviet science and technology since Sputnik 1 was launched on 4 October 1957. After the introduction, Chairman Keldysh introduced the principal speakers, Prof. S. N. VERNOV, Dr. K. I. GRINGAUZ and Dr. Yu. D. Kalinin.

SPEECH BY S. N. VERNOV
Member-Correspondent of the
USSR Academy of Sc.

The first flights of satellites resulted in the discovery of a new, heretofore unknown natural phenomenon — the Earth's radiation belts. It became possible to ascertain that the near-terrestrial space has a complex structure. It includes two zones, filled with intensive fluxes of charged particles, called "Earth's radiation belts". At distances from the Earth exceeding by ten times the dimensions of our planet, there is an outer radiation belt, discovered during the flight of the third Soviet satellite. Even now, thus five years after its discovery, this belt still a quiz.

Besides the outer radiation belt, there still is an inner belt, discovered during the flights of American satellites.

Immediately after the discovery of the inner radiation belt, a hypothesis was brought forth in the USSR, and then in the U.S.A. on the mechanism of the inner radiation belt occurrence.

This hypothesis provides a good explanation for the experimental facts about the nature and the energy spectrum of particles in the inner belt.

Quite different a picture is observed when studying the outer radiation belt. It may be considered as established that the mechanism of inner belt occurrence cannot provide the explanation of the existence of the outer radiation belt. This was shown in 1960 during the flights of Soviet spaceships. Apparently, a peculiar " cosmic accelerator" operates at distances from the Earth of thousands and tens of thousand kilometers.

A simultaneous investigation of numerous physical phenomena is necessary for the explanation of the nature of the "cosmic accelerator". This requires the creation of a cosmic system, consisting of a series of satellites conducting simultaneous measurements at various points of the space adjacent to the Earth.

The launching of scientific stations-satellites " Electron-1" and "Electron-2" is the beginning of the creation of such a system. The investigations conducted to-date have already shown that corpuscular streams, originating from the Sun, induce strong variations in the outer radiation belt at times when the Earth hits these streams. This coincides with periods of geomagnetic storms and polar aurorae. This implies that the "cosmic accelerator" begins to operate precisely at that time.

The main problem to be solved during flights of "Electron-1" and "Electron-2" is the study of these radiation belts and of the physical phenomena associated with them.

Aboard both satellites identical instrumentation is installed for the purpose of measuring electrons and protons of various energies. These measurements must allow to determine simultaneously the composition of emission in the radiation belts at two different points of the near-terrestiral space. The inner belt and the nearest to Earth ramifications of the outer radiation belt are to be studied by "Electron-1", while "Electron-2" cuts through the outer belt and drifts in interplanetary space beyond its boundaries, where particles from radiation belts

no longer exist and where the main form of radiation consists of cosmic rays.

The presence on both satellites of identical instrumentation will allow to draw the pattern of the spatial disposition of radiation belts and correlate the measurements obtained by various satellites at different distances from the Earth.

A broad assortment of various devices allows a detailed study of the composition of the various emissions, defining the nature and the energy spectrum of particles entering into the composition of the radiation belts.

A rich and diversified information arrives from Electron-1 and -2. Data obtained to-date indicate that the aparatus operates normally.

The Moscow agreement on the ban of nuclear experiments in space assures the possibility of studving radiation belts without interferences from nuclear explosions in space.

COMMENTS BY Dr. K. I. GRINGAUZ

I should like to call your attention to the region immediately beyond the radiation belts, having an unquestionably great geophysical sig-nificance, but considerably less studied than the radiation belts. Reference is made to the zone where intense fluxes of electrons of comratively low energies are recognized, constituting the so-called outermost radiation belt of charged particles.

The results of measurements of currents, measured in charged particles traps on the first Soviet Moon probes in 1959, have shown that upon leaving the outer radiation belts, rockets began to register by means of the traps electron fluxes with energies from 200 ev to 10 ÷ 20 kev., exceeding by no less than ten times the electron fluxes in the outer belt.

In the subsequent investigations of the zone to which it is referred, studies were extended with the aid of rockets and satellites in the USSR as well as in the USA. Magnetic measurements have shown that the magnetic field in the region of the outermost radiation belt

varies continuously in magnitude as well as in direction. This is evidence of the fact that the electrons in this zone are not trapped by the Earth's magnetic field, since the magnetic trap of charged particles cannot exist there. Apparently, electron fluxes of the outermost belt are capable of a strong effect on the upper atmosphere, hitting it at high latitudes.

Is the outermost belt of charged particles fully closed, i. e. does it exists in a direction opposite to that Earth-Sun? Such a question arises naturally, if one starts from the assumption of the origin of the outermost belt from solar plasma fluxes.

Although the combination of the heretofore conducted experiments does not allow a definite answer to that question, it nevertheless provides the basis to assume that the belt is totally closed. The results of measurements, provided by the measurements aboard the "Mars-1" - probe speak, in particular, in favor of such an assumption.

Measurements carried out on "Electron-2" must substantially complete the currently available informations on the outer belt of charged particles.

COMMENTS BY Dr. YU. D. KALININ

Among the scientific apparatus installed aboard "Electron-2" are two magnetometers, with the help of which investigations of the Earth's magnetic field and outer radiation belt are conducted. By their installation and their technical capabilities these magnetometers are analogus to those used earlier on the first and second Soviet cosmic rockets, but they allow magnetic field measurements with much higher precision than could be done formerly.

The "Electron-2" probe is especially designed for the study of the outer radiation belt and it has been calculated for a prolonged operation.

We hope to obtain material for the clarification of the question

as what happens with the outer radiation zone during the time of geomagnetic storms. Scientists estimated to-date that a geomagnetic storm is a period, when the Earth with its magnetic field is hit by a flux of solar corpuscles — electrons and ions.

Electron-2 will allow the clarification of the behavior of the magnetosphere boundary in time, and in particular, whether or not this boundary comes closer to Earth during the storms, as is assumed, and what is the range of its oscillations in space.

We must still pause at one question. According to the agreement concluded between the USSR Academy of Sciences and the National Aeronautics and Space Administration of the USA on the peaceful use of cosmic space, a world magnetic survey is scheduled for 1965 with the aid of Earth's artificial satellites. Observations aboard "Electron-2" constitute the first such experiment, designed to study the variation of the magnetic field of the outer radiation zone with the view of accounting for the regularity of such variations during the future world magnetic survey.

Data obtained now are being processed and the results will be expounded in scientific papers.

* * *

Answering questions from correspondents, M. V. Keldydh stated that more than two satellites can be put in orbit with the aid of a single rocket. Obviously, said he, the greater the number of satellites with different orbits, the more it is technically complicated. But it is attainable, and can be materialized, should the need arise.

In connection with the fact, that on February 5th "Electron-2" will be during several days outside the field of observations of Soviet stations, the question arose as to whether it would be possible to organize cooperation with foreign stations. M. V. Keldysh pointed out that there is no such requirement insofar as Soviet scientists are concerned, as memory devices are installed aboard Electron-2, allowing to memorize the information, and yield it when the satellite returns within the range of Soviet scientific stations.

If any foreign stations, pursued the President, express the desire to pick up information, we may consider these questions.

Academician Keldysh pointed out, that one of the objects of launching of that system consists in studying radiation at great height and in determining what has to be done to protect men in future flights. He noted, that after American explosions, carried out at great heights, there was an increase in radiation in space which caused a serious worry to Soviet scientists. The President emphasized that at such heights, the radiation is particularly solidly retained.

Answering the question of the duration of the current flight of "Electron" probes, the scientists stated that ballistically, these stations will fly numerous years. But we are not now in the position to say how long the communications will last, for it is not known what effect will be exerted upon the apparatus within the radiation belts. The Academician reminded the audience, that after American explosions in space, solar batteries of several satellites, and "Telstar" in particular went dead.

M. V. Keldysh noted in one of his answers, that "we are in a position to launch a living being to any height, in principle,, but such an experiment requires a high degree of reliability".

One of the questions touched upon the state of perspectives of collaboration between Soviet and American scientists in the field of space mastering.

Academician A. A. Blagonravov, present at the press-conference, said :

As is well known, American satellite "Echo-2", currently in orbit, is observed with the help of optical instruments in the Soviet Union, and all the data on the results of these observations are immediately forwarded to the United States.

On 21 February we shall begin the reception of radiosignals with the aid of the English station "Jodrell Bank", which are transmitted by way of reflection from that satellite.

I think, said the scientist, that the more there is mutual understanding, the better will all the obstacles to the broad development of cooperation be removed, and it will develop more and more. Unfortunately, there still currently are certain difficulties, for example, the lack of a full accord concerning legal questions in space. Let us hope, that these obstacles will be removed step-by-step.

****** THE END ******

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