SECRET [redacted]

DECLASSIFIED UNDER AUTHORITY OF THE INTERAGENCY SECURITY CLASSIFICATION APPEALS PANEL, E.O. 13526, SECTION 5.3(b)(3)

ISCAP APPEAL NO. 2009-068, document no. 90
DECLASSIFICATION DATE: December 5, 2014

[redacted]

K410.607-235

NORTH AMERICAN AIR DEFENSE COMMAND

W I R

WEEKLY INTELLIGENCE REVIEW (U)

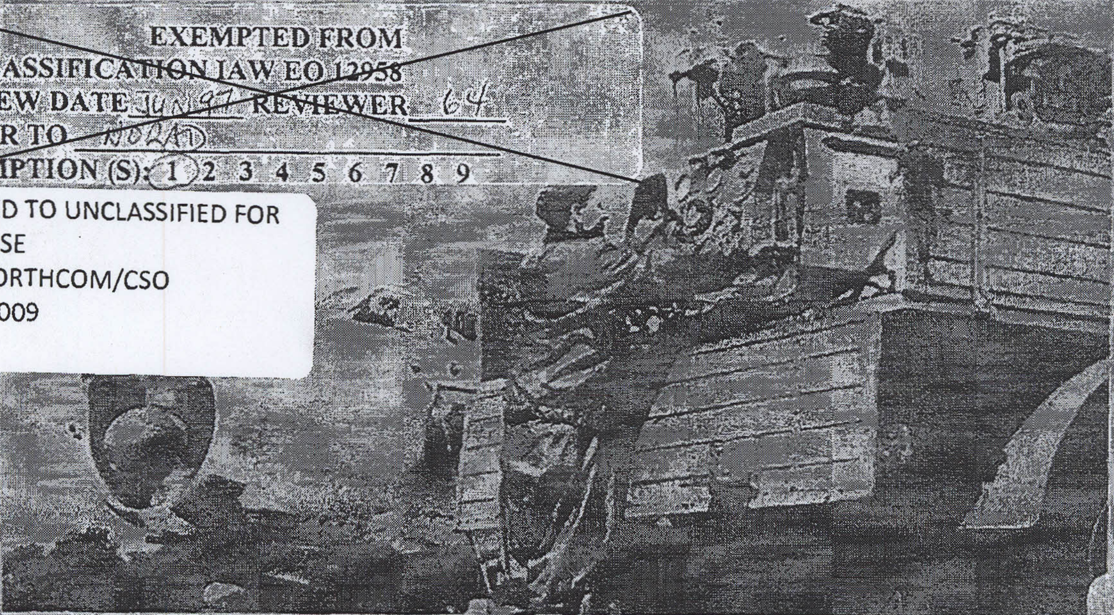
PRIVILEGED INFORMATION

SEE INSIDE COVER FOR SAFEGUARDING GUIDE

SCANNED BY ACD 2008

~~EXEMPTED FROM DECLASSIFICATION IAW EO 12958~~
~~REVIEW DATE JUN 97 REVIEWER 64~~
~~REFER TO NORAD~~
~~EXEMPTION (S): 1 2 3 4 5 6 7 8 9~~

DOWNGRADED TO UNCLASSIFIED FOR PUBLIC RELEASE
BY NORAD/NORTHCOM/CSO
SEPTEMBER 2009



00880700

FOR OFFICIAL USE ONLY

34-65
20 Aug 1965
copy 1

SECRET [redacted]

SPECIAL HANDLING REQUIRED
This document is releasable only to U.S. and Canadian Nationals

~~EXCLUDED FROM AUTOMATIC REGRADING, DOD DIRECTIVE 5200.10 DOES NOT APPLY~~ Group 1

SECRET

WIR 34/65
20 Aug 1965

AUG 23 1965
Postal Registry No.

SECRET

[redacted]

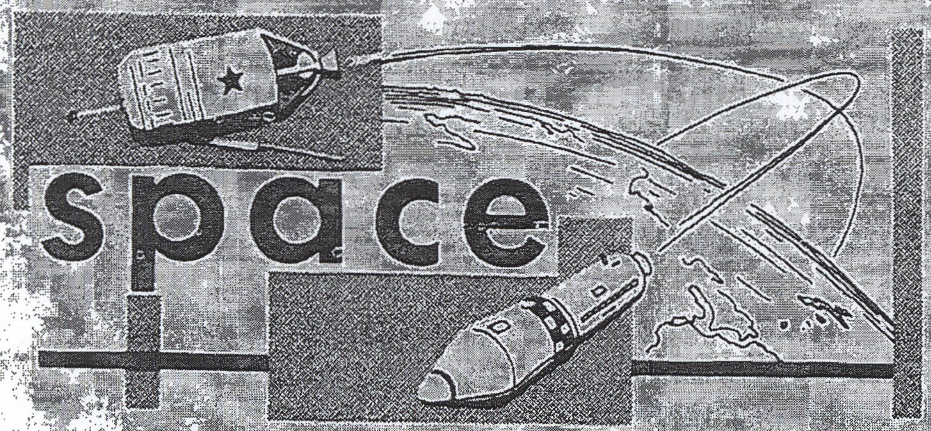
NORAD Weekly Intelligence Review

Issue No. 34/65, 20 August 1965

The WIR in Brief

COVER: FRESCO D of East German Air Force (from book "Unsere Volksarmee") (OFFICIAL USE ONLY)

[redacted]TE: Pages 28, 30, 31, 34, 35, 38, 39, 42, 43, and 44 of this issue are blank.



significant
intelligence
on space
developments
and trends

Proton 1 and Its Gear Described by Izvestia

The 7 August issue of Izvestia carried an illustrated article describing Proton 1, the purpose of its flight, and the type of equipment it carried. The main purpose of the flight reportedly was to study cosmic radiation and the interaction of particles of superhigh energies -- phenomena which are difficult to study on the Earth.

Following are summaries of portions of a NORAD translation of this article and quotes from other portions of it.

THE SCIENTIFIC SPACE STATION "PROTON 1"

An Account of the 12-ton orbital laboratory

Space flight has opened up new possibilities for the study of space phenomena, but bigger carrier rockets are needed to carry the equipment necessary for space experiments of the future. The launch on 16 July 1965 of Proton 1, which weighed 12.2 tons, including "the scientific space station and the complex of control and measurement apparatus," succeeded only because the Soviets had developed a new and heavier carrier rocket, which had new features and developed more than 60 million horsepower.

The purpose of the flight was to study "a series of fundamental problems of the physics of superhigh-energy cosmic rays," including:

- Study of solar cosmic rays and their radiation hazard.
- Study of the energy spectrum and chemical composition of of primary cosmic ray particles with energies up to 10^{14} (100 trillion) electronvolts.
- Study of the nuclear interaction of cosmic particles with superhigh energies of up to 10^{12} (1 trillion) electronvolts.

- Determination of the absolute intensity and energy spectrum of electrons of galactic origin.
- Determination of the intensity and energy spectrum of galactic gamma rays with energies greater than 50 million electron-volts.

The world's scientists have been studying cosmic rays for more than 30 years, as a result of which the "enormous diversity of the nature of elementary particles out of which the material world is built" has been revealed. A new science, the physics of elementary particles, which studies the characteristics of these particles, their interrelationships, and their transmutations, has been born. It is now at the stage where an even deeper penetration must be made into the hearts of elementary particles. For this purpose, physicists need a source of particles of energies much higher than can be created in particle accelerators on the Earth. The stream of cosmic rays which arrives from the depths of the Galaxy can furnish particles -- protons and atomic nuclei -- with energies of up to billions of billions of electronvolts, much greater by many orders of magnitude than the energies of particles from accelerators. However, these particles must be studied out in space, out beyond the Earth's atmosphere, which absorbs most of their energy. They can best be studied by means of Earth satellites.

In this connection, it will become possible to solve some of the most fundamental problems, such as the search for elementary particles, in particular for "kwarks," particles with charges of 1/3 to 2/3 the charge of an electron, which have been predicted by theory.

To conduct this research, the apparatus must be able to sort out particles automatically according to their energy, to measure their energy, and to determine the nature of the primary particles (to distinguish protons from higher atomic nuclei and, for heavy nuclei, to determine the elements they represent), and to study their interactions with atomic nuclei.

"The basic obstacle has been the lack of carrier rockets which could orbit satellites of the necessary weight. "For the study of particles with energies on the order of 10^{11} to 10^{15} (10 billion to 1 quadrillion) electron-volts, a satellite of more than 10 tons is needed." This obstacle has been overcome with the launch of scientific space station Proton 1.

"Figure 1 shows the complex of scientific apparatus installed on Proton 1." (Photo on page 37.)

"This complex consists of an ionization calorimeter with a variety of devices (3-8) for measuring energy, determining the nature of high- and superhigh-energy cosmic-ray particles, and studying their interactions with matter; an instrument for studying high-energy electrons (9); a gamma telescope for investigating gamma quanta of high energy (2); and an instrument for studying the chemical composition and energy spectrum of cosmic rays of moderate energy (1)."

Soviet scientists developed an original method, incorporated in an instrument called the ionization calorimeter, for distinguishing high- and superhigh-energy particles from the variety of particles falling on the instrument and for measuring the energy of each separate particle.

"Figure 2 shows a schematic of the ionization calorimeter and the devices which measure the energies of high- and superhigh-energy particles. (Photo on page 37.)

"The ionization calorimeter consists of a large number of steel slabs, between which are placed scintillators of a special plastic. When high-energy particles fall on the device, they interact with the atomic nuclei of the iron atoms. The collisions create secondary particles which, in turn, collide with iron nuclei, creating particles of still another generation, etc. As a result, all the energy of the primary particles passes to a great number of secondary particles which also are absorbed in the thick block of the ionization calorimeter (Figure 2 shows the development of the avalanche of secondary particles). The absorption of energy is accompanied by flashes of light in the plastic scintillators, the intensity of which is proportional to the energy absorbed..., that is, proportional to the energy of the primary particle. (The light flashes are registered by photoelectric multipliers.)

"For studying the nature of cosmic-ray particles -- for measurement of their electrical energy, two special counters are installed on the ionization calorimeter (3), each of which measures the charge independently. The use of two counters increases the precision of measurement and permits reliable separation of high-energy protons from heavier particles.

"Below the counters are a block of carbon (4) on one half of the device, and a block of polyethylene on the other (4). The substances of these blocks interact with the high-energy particles being studied. Under the blocks of carbon and polyethylene are interaction detectors (I).

"Polyethylene consists of atoms of carbon and hydrogen. Thus one half of the apparatus studies the interaction of high-energy particles with the atomic nuclei of carbon, the other half studies the interaction of these particles with the atomic nuclei of carbon and hydrogen. A comparison of the measurements of the two halves makes it possible to distinguish in pure form the interactions on atomic nuclei of hydrogen -- that is, on protons.

"Below the ionization calorimeter are scintillation counters (II) which, jointly with interaction detectors (I), distinguish particles going in specific directions.

"Also installed on Proton 1 is a device for studying the electron component of high-energy cosmic rays. The principle of the ionization calorimeter is used also in measuring the energy of electrons.

"Among other problems solved by the scientific apparatus on Proton 1 are these important ones:

- "Registration of gamma quanta of primary cosmic radiation.
- "Determination of the energy spectrum of gamma quanta in the energy region 10^8 to 10^9 electronvolts.
- "Measurement of the energy spectrum and chemical composition of primary cosmic rays of galactic origin exposed to the geomagnetic field.
- "Study of the variation in intensity of cosmic rays.
- "Study of the energy spectrum and chemical composition of cosmic rays of solar origin.

"The scientific apparatus created by Soviet scientists is unique in both scale and characteristics. . . It had to be developed methodically under actual conditions of space flight.

"The launch of Proton 1 will test not only the construction of the space station itself but also the whole complex of scientific equipment and the on-board systems. At present the apparatus is working normally and is carrying out the planned program."

In addition to its scientific instrumentation, Proton 1 carries telemetry, a radio beacon, attitude sensors and control devices, programing apparatus, apparatus for radio-command control, sources of electrical power, and a system of heat regulation. Telemetry is a special high-data-rate system. Control of the scientific instrumentation and of on-board systems is accomplished both by programming and by radio-command from the Earth. (Photos on page 40.)

The station turns with a slight angular speed so that the solar batteries can be charged, temperature of the space station is distributed more evenly, and the instrumentation aboard the space station gets the necessary "field of view." Angular speed is measured several times each day with the help of gyroscopic instruments. Sensors determine the attitude of the ship in space at every moment, fixing the direction of the cosmic rays being studied.

An electropneumatic system, in which gas is discharged through nozzles, damped the movement of the ship after injection into orbit.

Solar batteries provide electrical power while the station is in sunlight and they recharge the chemical batteries, which provide power when Proton 1 is not illuminated by the Sun. "The solar batteries are arranged on special panels which, prior to injection of the station into orbit, are folded in the form of truncated pyramids. In orbit, the panels are opened up and fixed by a special arrangement, forming a shape like a 4-bladed propeller."

Heavy satellites like Proton 1, equipped with ionization-calorimeter-type instrumentation, will promote the study of a great circle of problems which have long awaited solution. Among the first of these may be "precision measurement of the probability of the collision of protons with protons of energies of 10^{12} to 10^{13} (1 trillion to 10 trillion) electronvolts and of protons with complex nuclei with energies of 10^{12} to 10^{14} (1 trillion to 100 trillion) electronvolts, and study of collisions of particles of super-high -energy (the origin of secondary particles, their energy distribution, and a series of other parameters). These investigations are necessary for penetrating into the structure of elementary particles, for a study of the mysterious secrets of the microcosm."

Such researches, conducted on Earth, would require enormous, more expensive accelerators of greater power. But accelerator technology places a natural limit on the energies achieved, or about 1 trillion electron-volts; such accelerators apparently will not be built in the very near future. Thus, using space station Proton 1 for this purpose is, in principle, a new step in the study of cosmic rays.

"Using such apparatus for determining the chemical composition of primary cosmic rays and their distribution by energy will permit clarification of how the accelerators in the depths of the Universe operate, imparting enormous energies to particles. These investigations will bring closer to us an understanding of those processes, phenomenal in scale, which control the development of the Galaxy and, perhaps, the whole Universe."

(Izvestia; NORAD)
(UNCLASSIFIED)

Missile 'Approaches' Cosmos 77 Which May Have Carried Detection Sensor

A probable SS-4 MRBM launched from Kapustin Yar (KY) at about 1518Z, 5 August, passed within about 160 n. m. of the Soviet satellite Cosmos 77. It is not known whether this "approach" was deliberate or coincidental. At any rate, there are some similiarities between this event and one which occurred 26 May, when a missile of unidentified type "approached" Cosmos 67. (WIR 24/65)

- Both Cosmos 67 and Cosmos 77 were launched into orbits with inclinations of 51 degrees by heavy Venik upper stages. They are the only Soviet satellites to date which have both this orbital inclination and injection vehicle in common.

- Both missiles were fired from Kapustin Yar at about the same time of day -- 1530Z on 26 May, and 1518Z on 5 August.
- 50X1 and 3, E.O.13526

The missile of 26 May, however, came within 31.1 n.m. of the satellite, much closer than the 160 n.m. of the 5 August event. In either or both cases, the miss-distance could have been intentional.

If there is a relationship between the two events, the most likely possibility is that the satellites were carrying a sensor for detecting missile launches and, possibly, missiles in flight. While both Cosmoses 67 and 77 were photorecce satellites, they could easily have carried other equipment, such as missile-launch detection sensors.
(FTD, NORAD)
(~~SECRET~~ NO FOREIGN DISSEMINATION -- Releasable to US, UK & Canada)

Cosmos 78 First Soviet Photorecce Satellite Launched into 69° Orbit

The Soviets launched Cosmos 78, a photoreconnaissance satellite, from Tyuratam at about 1057Z, 14 August. It is the first Soviet space vehicle to be launched into an orbit with an Equatorial inclination of 69 degrees. Most satellites launched from Tyuratam have inclinations of 65 degrees, although some have had inclinations of 51, 56, and 59 degrees. All satellites launched from Kapustin Yar have had inclinations of 49 degrees.

The higher inclination would give only slightly wider coverage in Iceland, southern Greenland, the northern parts of Alaska, Canada, Norway, Sweden, Finland, and USSR, and the tip of Antarctica which stretches toward the southern end of South America.

Cosmos 78 was launched by the usual SS-6 ICBM booster-sustainer and apparently injected into orbit by a Lunik upper stage. Use of the Lunik would continue the sequence, previously noted (see last week's WIR) of alternating the use of Venik (heavy) and Lunik (light) upper stages. A camera system of high resolution (estimated at 5-8 feet) is believed to be used in Venik-launched payloads; one of lesser resolution (20-30 feet) is believed to be used in Lunik-launched payloads.

Orbital parameters have been reported as follows for Cosmos 78:

	SPADATS	TASS
Inclination	69 degrees	69 degrees
Period	89.8 minutes	89.8 minutes
Apogee	297 kilometers (161 n.m.)	329 kilometers (177 n.m.)
Perigee	208 kilometers (112 n.m.)	209 kilometers (113 n.m.)

50X1 and 3, E.O.13526

Cosmos 78 is the 10th Soviet photoreconnaissance vehicle launched this year, not counting the 13 July launch failure of an apparent member of this series.
(SPADATS; various ELINT sensors; NORAD)
(~~SECRET~~ NO FOREIGN DISSEMINATION -- Releasable to US, UK & Canada)

SECRET

-37-

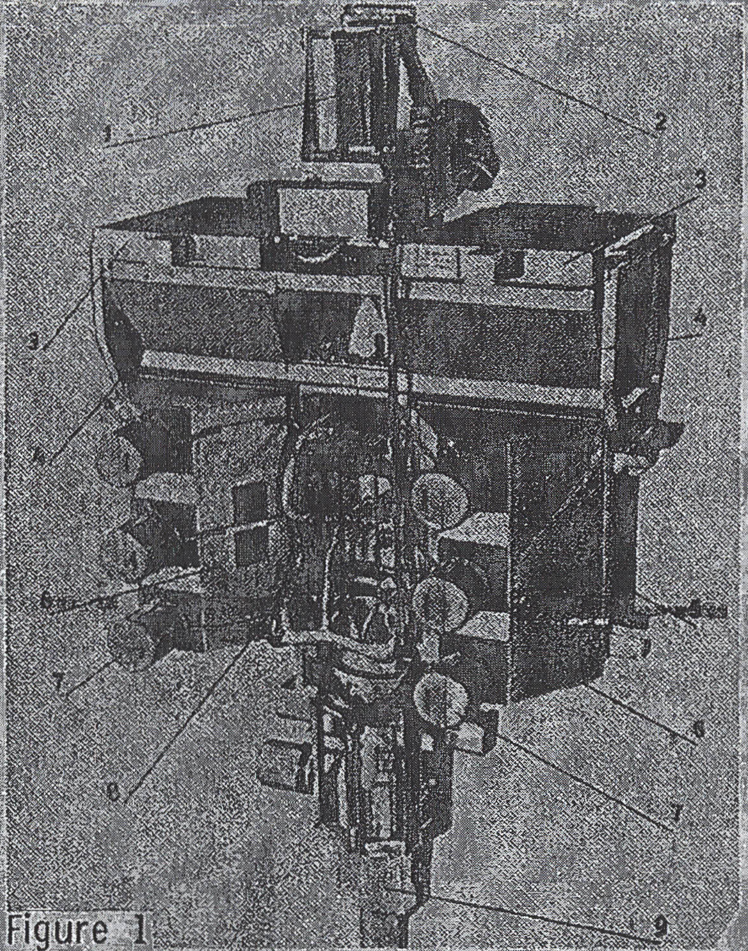


Figure 1

NORAD

WIR 34/65

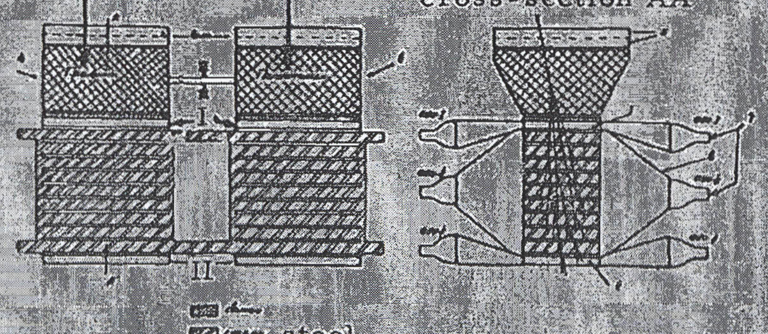
OFFICIAL USE ONLY

Proton 1 Scientific Apparatus

1. Spectrometer of cosmic-ray particles of moderate energy.
2. Gammatelescope.
   The ionization calorimeter
   3. Special counters.
   4. Block of carbon (left) and Block of polyethylene (right)
   5&6. Not described.
   7. Photoelectric multipliers
   8. Not described.
9. Instrument for registering high-energy electrons.

Ionization Calorimeter

Figure 2



I. Interaction detector

II. Scintillation counters

SECRET

Proton 1 -- Exterior & Interior Views

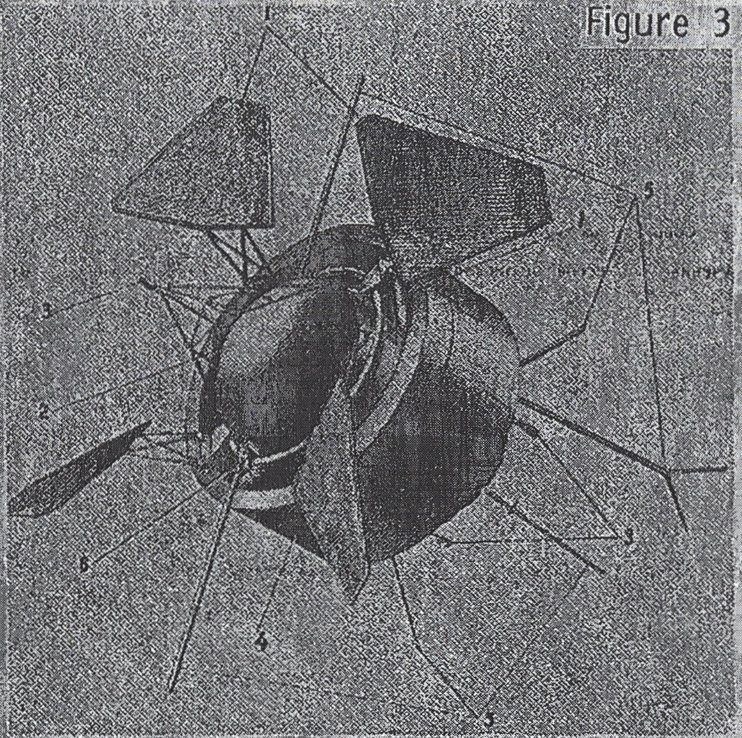


Figure 3

1. Solar energy panels.
2. Sealed body.
3. Attitude sensors.
4. Outer covering.
5. Antennas.
6. Chemical batteries.

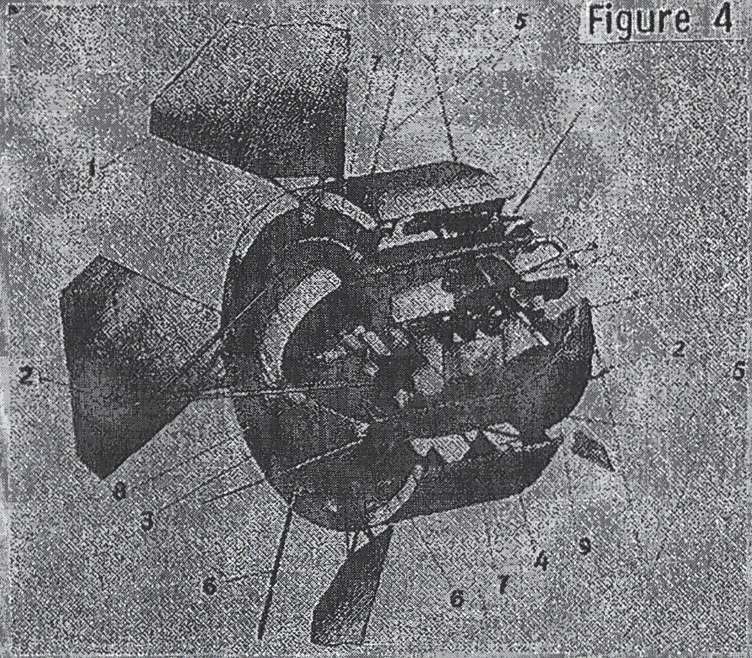


Figure 4

1. Solar energy panels.
2. Attitude sensors.
3. Sealed body.
4. Outer casing.
5. Antennas.
6. Chemical batteries.
7. Scientific apparatus.
8. Radio equipment.
9. Heat exchanger.

NORAD WIR 34/65

OFFICIAL USE ONLY