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Issue No. 30/65, 23 July 1965

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The WIR in Brief

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Space

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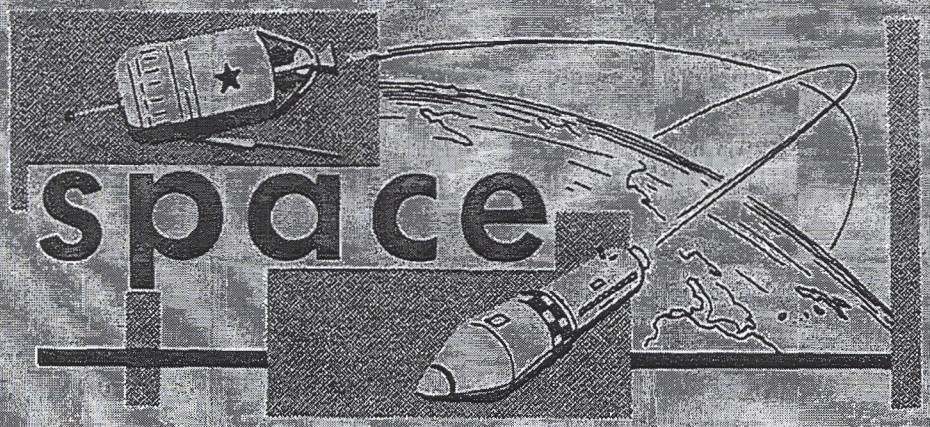

significant intelligence on space developments and trends

Need for Spaceborne Power Supplies May Explain Stress on Hot-Cathode MHD Generators

The Soviets appear to be deeply interested in developing hot-cathode MHD (magnetohydrodynamic) generators, possibly to supply electrical power to space payloads, judging by an FTD review of Soviet papers on the subject. (Cooled-cathode MHD generators do not appear to be practicable at power levels below several hundred megawatts.)

Much experimentation and study must be accomplished before a practicable hot-cathode system can be built, but the Soviets appear to be capable of rapid development in this research. Their work seems to be well advanced in some areas and progressing rapidly.

The principal problem may be that of devising thermal insulation between a region of high temperature and a region of very low temperature in close proximity. This problem must be solved before a superconducting magnet -- the heart of an MHD generator in a space application -- can be used. Superconductivity to date has been achieved only by lowering the temperature of certain materials to near absolute zero.

MHD generation is one of several potential systems being studied as sources of electrical power for large payloads of long life, such as manned space stations.

(FTD; NORAD)

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Missile Range Ship Sighted in Pacific

The imminence of a Soviet space event, probably manned, is suggested by the recent sighting at sea of a Soviet missile-range instrumentation ship (SMRIS), the Suchan, at 3224N-16541E on a course of 160 degrees.

SMRISs may be deployed to the Pacific for monitoring either the re-entry phase of extended-range ICBM tests or certain types of space events, possibly manned flights. When deploying for ICBM firings they deploy in a close, triangular or quadrangular formation, depending on the number of ships; for space events they take up positions hundreds of miles apart along the Earth trace of the first orbit of the satellite to be launched. The sighting of a single SMRIS suggests that a space event is planned and that other SMRISs may be deploying separately to space-monitoring positions. (The SMRISs could, of course, redeploy later for an ICBM test series.)

The Soviets probably plan to "top" in some way the US's forthcoming Gemini 5 flight, or to beat it to the punch. The Gemini 5 flight presently is planned to last an unprecedented 8 days and to include the world's first rendezvous attempt. The Soviets may orbit a Voskhod for an even longer flight -- perhaps 10-14 days -- and include a rendezvous with the giant, new Proton 1. It is entirely possible that a cosmonaut from the Voskhod will transfer to Proton 1, ride in it for a while and perform some task, such as inspection, and then return to the Voskhod. The transfer is more likely to be accomplished by EVA (extravehicular activity) than by docking. (PACFLT; NORAD)

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Proton 1 Probably Test of New Payload and Propulsion; Recovery or Rendezvous Possible

The Soviets launched a new space vehicle, Proton 1, from Tyuratam at about 1115Z, 16 July 1965. TASS announced 9 hours later that the new vehicle weighed 12.2 tons (presumably metric tons, or about 26,840 pounds) and was launched by a "new powerful booster rocket."

The event probably was the initial test of a new, large spacecraft and, possibly, testing and/or man-rating of the propulsion system used.

Orbital parameters of the new vehicle have been reported as follows:

	By SPADATS	By TASS
Inclination	63.4 degrees	63.5 degrees
Period	91.85 minutes	92.45 minutes
Apogee	585.71 kilometers (316 n.m.)	627 kilometers (338 n.m.)
Perigee	187.84 kilometers (110 n.m.)	190 kilometers (112 n.m.)

50X1 and 3, E.O.13526

50X1 and 3, E.O.13526

50X1 and 3, E.O.13526

Propulsion. The propulsion system has not been identified yet. [redacted] the SS-10 ICBM, a large, tandem, 2-stage liquid-propellant ICBM. [redacted]

FTD estimates that, if Proton 1 weighs 12.2 tons:

- Take-off gross weight would be about 1,375,000 pounds for a 2-stage system. Sea level thrust, assuming a thrust-to-weight ratio of 1.5, would be about 2,000,000 pounds.
- Take-off weight would be about 1,050,000 pounds for a 3-stage system. Assuming a thrust-to-weight ratio of 1.35, sea-level thrust would be about 1,420,000 pounds.

(Gross weights would be slightly higher if the booster used integral clustered tanks or strap-on units.) If a 2-stage vehicle was used, an optimized third stage might be added to orbit a payload of about 35,000 pounds.

Mission(s). TASS said that Proton 1 is carrying equipment for studying cosmic particles of superhigh energies. This may be the case, but data-collection surely is not the primary mission of this vehicle.

- Little data is being telemetered. Proton 1 could be recording data for recovery later, but the Soviets are unlikely to entrust a sophisticated data-handling system to an untried recovery system.
- Neither are the Soviets likely to entrust a multiton instrument load to an unproved propulsion system.

The announced size of Proton 1 suggests that an entirely new type of Soviet spacecraft -- entirely unrelated to the 1-man Vostoks or their successors, the 2- and 3-man Voskhods -- is in the final stages of development and the initial stages of testing. And if the new vehicle is to be manned when it becomes operational -- as will probably be the case -- the propulsion system is probably in the early stages of man-rating, that is, testing to determine whether it is reliable enough for manned flight.

A new, large manned vehicle the size of Proton 1 might be either a recoverable spacecraft or a nonrecoverable space station. If the former,

the Soviets may try to recover Proton 1. If the latter, a coming manned flight may involve rendezvous with Proton 1 and, possibly, transfer of a cosmonaut from a Voskhod to the big vehicle, and return. If the two vehicles do not dock -- the Soviets have not yet demonstrated either rendezvous or docking -- the cosmonaut might make the transfer by EVA (extravehicular activity).

Proton 1's orbital inclination of 63.4 degrees offers maximum stability of perigee, that is, perigee will continue to occur at or near the launch site in the USSR for the maximum period of time before precessing away. This characteristic would be desirable for either a prototype space station or for initial rendezvous attempts.

Launch windows providing minimum phase angle for coplanar intercept (or rendezvous) will occur once each 48 hours (approximately) or once every 31 orbits.

The number of crewmen on the operational version of Proton 1, if it is a prototype space station, is speculative at present. The Soviets have alluded to the existence of such a craft designed for a crew of 5. However, the Soviets themselves are responsible for FAI adoption of the standard of a 6-man crew for a vehicle for record certification in the "heavy" category. The Soviets, therefore, may initially man such a craft with a crew of 6. ("FAI" stands for Federation Aeronautique International, which gives official recognition to aeronautical and astronautical records.)

Outlook. Assuming that Proton 1's weight is more or less as announced, the Soviets have taken a substantial step toward the attainment of relatively advanced space missions, such as the establishment of space stations and the modular build-up of large propulsion packages for advanced lunar and interplanetery flights.

Other ingredients, however -- maneuver, rendezvous, and docking -- have not been demonstrated yet by the Soviets. These possibly could be in the offing, particularly in view of the Soviets' recent progress in correcting their deficiencies in starting and restarting engines in space.
(SPADATS; FTD; NORAD)
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Cosmos 71-75 Mission Possibly Related to 3 Previous Multiple Launches

The Soviets launched 5 payloads (Cosmoses 71, 72, 73, 74, and 75) into orbit from Tyuratam at about 0332Z, 16 July 1965, using a single launch vehicle.

The launch appears to be a continuation of a program in which 3 sets of triple payloads were orbited.

Cosmoses 38, 39, & 40 -- 18 August 1964
Cosmoses 54, 55, & 56 -- 21 February 1965
Cosmoses 61, 62, & 63 -- 15 March 1965

This continuity is suggested by indications that:

- All launches were made from Tyuratam, using the same type of launch vehicle, the "SE-8," which has been used to date for no other space launches.
- The second stage restarted and burned briefly after initial cut-off, as it did in the preceding triplet launches.
- All payloads were injected into orbits having inclinations of a nominal 56 degrees -- the only Soviet vehicles to have this inclination.
- The same nominal 20- and 90-mc/s transmissions have been intercepted from vehicles of all four series.

One difference is that the newest payloads are in nearly circular orbits (TASS says implicitly that circularity is perfect), in contrast with the highly eccentric orbits of the triplet payloads.

Orbital parameters of the 5 payloads have been reported as follows:

	By SPADATS	By TASS
Inclination	56.06 degrees	56.1 degrees
Period	95.23 minutes	99.5 minutes
Apogee	558 kilometers (300 n.m.)	550 kilometers (296 n.m.)
Perigee	518 kilometers (278 n.m.)	550 kilometers (296 n.m.)

50X1 and 3, E.O.13526

[redacted] probably payload associated, are close to the 4 frequencies announced for Cosmoses 71-75 by TASS: 19.8-, 20.084-,

50X1 and 3, E.O.13526

50X1 and 3, E.O.13526

89.1-, and 90.378-mc/s.

Propulsion. The 5 payloads of this launch were orbited by the "SE-8," according to a [redacted] The SE-8 is a 2-stage tandem vehicle, in which the SS-5 IRBM -- or a vehicle closely resembling it -- is used as the first stage, and a new, restartable vehicle serves as the second stage. The system, smaller than the SS-6 used for most Tyuratam launches but bigger than the space-launch vehicle used at Kapustin Yar, is believed capable of orbiting a useful payload of about 3500 pounds.

Mission(s). The missions of Cosmoses 71-75 are not known. TASS announced 8 hours after launch, that the multiple payloads were accomplishing unspecified portions of the over-all Cosmos mission of studying the near-Earth space environment. That announcement is of little significance, however, for the same blurb is issued for all Cosmoses, though some of these have been photorecce satellites, test vehicles, and certain types of launch failures which have, nevertheless, achieved Earth orbit.

Three of the new Cosmoses may be repeating the mission(s) of the 3 preceding Tyuratam triplets, which might have included one or more of the following:

- Mapping of the electron-density profile of the Earth's ionosphere, a project useful in studies of HF radiowave propagation. The transmitting frequencies of the triplet payloads and of at least some of the new payloads have the required mathematical relationship, that is, they are rational fractions of each other.
- Testing of undefined communications satellite systems.

One or more of the new payloads might be a geodetic satellite -- used to improve man's knowledge of the size and shape of the Earth. The perigee of the new Cosmoses (300 n.m.), though not optimum for the purpose (375 n.m.), would probably be adequate. Such a vehicle, probably spherical in shape to minimize drag, would emit beaconry; telemetry would not be necessary.

The orbital parameters of Cosmoses 71-75 would also be suitable for a delayed-repeater communications satellite system.
(SPADATS; FTD; NORAD)
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Zond 3 May Have Test and Scientific Mission, as Announced

Zond 3 was launched from Tyuratam at about 1432Z, 18 July, and injected into heliocentric orbit from an Earth-parking orbit about 90 minutes later. The propulsion configuration was the same as that used for interplanetary probes and, more recently, also for lunar probes. The orbital parameters of the new space probe have not been computed yet.

Zond 3's mission is not known with certainty, but it could very well be the two announced by TASS four hours after launch: "to check the station's systems in conditions of prolonged space flight and to conduct scientific studies in interplanetary space." Similar missions were announced for Zond 1 and Zond 2, which actually were attempted probes, respectively, of Venus and Mars. But the most recent TASS announcement may have been stating the truth for Zond 3:

- The launch window is not presently open for probes of Venus, Mars, Mercury, or Jupiter.
- The Soviets have a valid need for testing onboard systems of their deep-space probes. Each of the 4 probes successfully sent out toward Venus or Mars failed when onboard communications systems ceased functioning. With the launch window for Venus opening again late this year, the Soviets could profitably launch a targetless probe at this time to determine whether they have corrected the defects of earlier probes. This would seem to be preferable to the older practice of launching 2 or 3 probes during a launch-window opening without any assurance that any of them would succeed.

Zond 3 may also be conducting scientific studies of interplanetary space, as the Soviets claimed. Among other things, the Soviets may plan to collect data on the Sun from a distance of about 37 million miles. G. Skuridin, leader of a Soviet delegation that attended a meeting of the American Astronautical Society in Chicago in May 1965 stated that the Soviets plan to send a probe to the vicinity of the Sun, "possibly to a distance of 0.4 astronomical units," or about 37 million statute miles from the Sun.

An interesting aspect of this operation is that the Soviets caused Zond 3 to swing by the Moon, the gravitational attraction of which perturbed Zond 3's heliocentric orbit to make it more elliptical. The Soviets apparently had no intention of hitting the Moon with this probe. Preliminary analysis indicates that it may have passed by it at a distance of about 1142 n.m. at about 0205Z, 20 July.

(SPADATS; FTD; NORAD)

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