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NORTH AMERICAN AIR DEFENSE COMMAND

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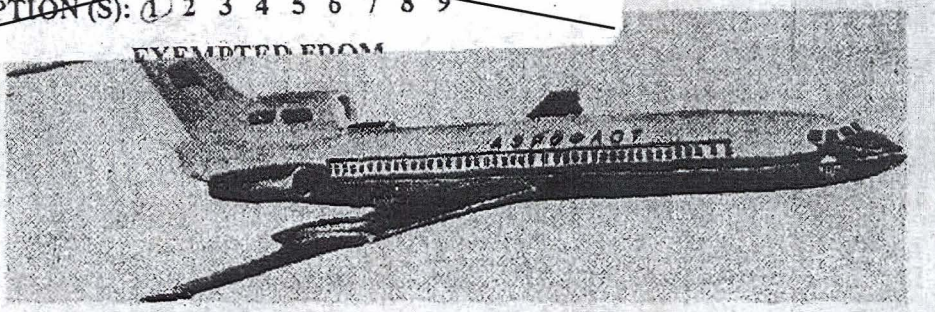
WEEKLY INTELLIGENCE REVIEW (U)



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The WIR in Brief

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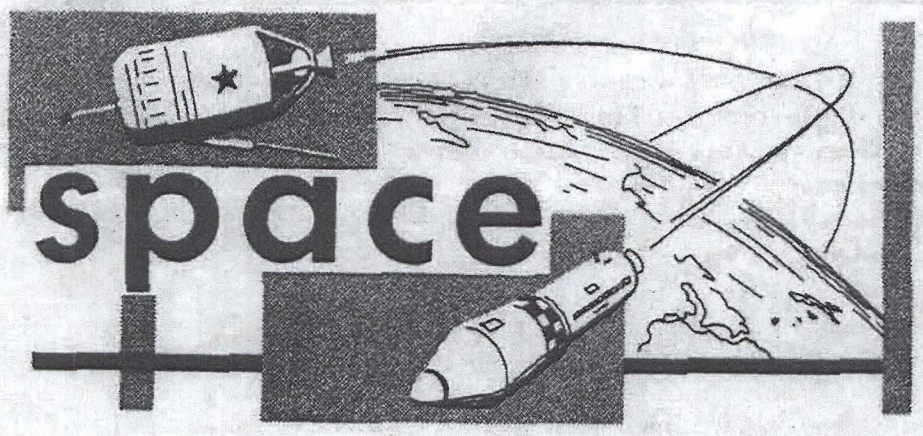

significant intelligence on space developments and trends

Cosmoses 125, 102 Tested Restartable Thrust Unit and Attitude-Control System

The missions of Cosmoses 125 and 102, which puzzled the intelligence community at first, are now believed to be:

- Test of a propulsion unit restartable in flight.
- Test of an attitude-control system more sophisticated than any previously identified aboard Soviet spacecraft.

Cosmos 125 was launched at about 0859Z, 20 July, Cosmos 102 at about 2225Z, 27 December 1965 -- both from Tyuratam.

Test of the Restartable Propulsion Unit. The main mission of Cosmos 125 apparently was to test a vehicle which could be used to inject payloads into orbit and could be restarted at suitable times thereafter in order to change orbital parameters of the payload. The propulsion unit was, therefore, an integral part of the payload.

Cosmos 125 was launched by the SS-6 ICBM booster/sustainer usually used for Tyuratam launches but, contrary to custom, it was not injected into orbit by a Lunik- or Venik-type upper stage. The SS-6 sustainer, burning for a shorter time than usual, injected the payload only into suborbital trajectory; orbital injection was executed by a payload-associated propulsion unit which burned for 45 seconds.

The initial orbit was nearly circular, with an altitude of about 250 kilometers. During Revolution 5, however, the propulsion unit was reignited 3 times, apparently in a test of its capability to restart in the weightlessness of orbital flight. The 3 thrust periods occurred over a time span of about 3 minutes (176 seconds) -- twice in a pulsed mode of 32-seconds duration (each consisting of 16 seconds of thrust and 16 seconds of no thrust and full pressurization) and once at reduced thrust, which decayed until the propellant was depleted.

At the end of these orbital maneuvers, Cosmos 125 had an apogee of 257 kilometers and a perigee of 193 kilometers.

Cosmos 102 appears to have been virtually identical in orbital parameters, mission, and design to Cosmos 125. [redacted] indications are that this vehicle tested the same type of payload/propulsion unit that Cosmos 125 did:

- Radar tracking confirms that there was no separate injection unit.
- Cosmos 102 performed an orbital altitude maneuver identical to that of Cosmos 125 and on the same revolution.

Test of a New Attitude-Control System. Two types of systems for stabilizing the payload in flight were installed on both Cosmos 125 and Cosmos 102 -- the usual cold-gas jets, and a more sophisticated system using momentum flywheels.

The gas jets were used only when the main propulsion unit of the payload was in use. The flywheel system was used during the injection maneuver, the orbital-altitude maneuver, and the major portion of the early orbital flight. On both vehicles, all on-board attitude-control and propulsion systems were shut down by ground command on Revolution 7. Both vehicles began to tumble some time after shutdown. No attempt was made to de-orbit either vehicle. Thus, the tests apparently having been completed, the Soviets lost interest in these payloads. Both vehicles suffered natural decay, Cosmos 102 re-entering 17 days after launch, Cosmos 125 re-entering 15 days after launch.

Retrospect and Prospect. The Soviets announced that Cosmoses 125 and 102 were performing the usual Cosmos mission of collecting data on near-Earth space, but all indications are that they were flight-testing spacecraft systems. These two spacecraft resembled the maneuverable Polyots 1 and 2 which the Soviets launched, respectively, in late 1963 and early 1964, the main differences being that:

- The Polyots lacked the momentum-flywheel attitude-control system of Cosmoses 102 and 125.
- The Polyots may have had a more powerful propulsion unit, since at least one of them -- Polyot 2 -- changed orbital inclination, a maneuver which requires more energy than changing altitude.

The Soviets did not assign the name "Polyot" to the two most recent maneuverable vehicles, probably because their doing so would have called

attention to orbital maneuvers far less sophisticated than those accomplished by the US's Syncom and Gemini spacecraft and the Titan 3 transstage. Instead, they announced that the two were Cosmos research satellites -- a strategem of concealment previously used for flight-test spacecraft, satellites with classified missions (such as reconnaissance satellites), and vehicles which fail to accomplish any mission other than achievement of orbit.

The Soviets need restartable propulsion units and sophisticated attitude-control systems for increased operational flexibility and mission versatility of their military, research, and utilitarian satellites.

Stabilization, maneuver, and size and shape (about 23 feet long, 6 feet in diameter) indicate that Cosmos 125 was an Agena-type vehicle. (DIA; NORAD)
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Recce Cosmos 126 a Day Late in Being De-orbited

Cosmos 126, a reconnaissance satellite which the Soviets launched from Tyuratam at about 1050Z, 28 July, was de-orbited 6 August, probably impacting in the USSR at about 0927Z, during Revolution 143 after spending nearly 9 days in orbit.

Most Soviet recce Cosmoses launched in 1964, 1965, and 1966 have been de-orbited on Revolutions 126, 127, or 128, after spending nearly 8 days in orbit.

The Soviets have failed in only one de-orbit attempt of a Cosmos reconnaissance satellite -- Cosmos 50, which exploded when de-orbit was attempted.

(NORAD)

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For Manned Lunar Landing, Soviets May Launch 2 Manned Craft Separately

The Soviets, in their coming attempt to land men on the Moon, may plan to launch 2 manned spacecraft separately. This possibility was suggested last October by an article in Moscow News which described a possible lunar manned-landing attempt as follows:

> "Two spaceships, A and B, fly to the Moon. Spaceship A becomes a Moon satellite and B makes a landing. After completing their research program, the cosmonauts take off in spaceship B but do not try to reach the Earth; they only reach spaceship A, which takes them aboard and then brings them back to Earth."

In this mode, too briefly described above, the two spacecraft probably will first be launched separately into Earth parking orbit with an upper rocket stage attached to each. The upper stage will, at the proper time, launch the spacecraft toward the Moon. On approaching the Moon, spacecraft A will enter lunar parking orbit while B will softland on the Moon. The crew of B will exit their spacecraft, accomplish certain tasks on the lunar surface, and reboard their spacecraft and launch it into lunar orbit, where it will rendezvous with A. It is not believed, however, that B will dock with A; instead, the crew of B will "walk in space" to A and enter it. Spacecraft A will then return both crews to the Earth.

Both spacecraft will probably weigh the same, but A will be larger in volume, to accommodate both crews for the return trip to the Earth.

The Apollo Mode -- a Comparison. The US's Apollo spacecraft, consisting of 3 modules (service, command, and lunar-excursion), will be injected into Earth parking orbit by the Saturn V. The Saturn IV-B third stage will inject the 3 modules into transfer trajectory toward the Moon. Sometime after third-stage burnout, the command and service modules will separate, rotate 180 degrees, and mate with the LEM (Lunar-excursion module), to put the modules into proper alignment. The spent Saturn IV-B will then be jettisoned. The service module will provide inflight guidance for the trip toward the Moon. Also, its retrothrust will be used to place the 3-module assembly into parking orbit 90 miles above the Moon.

While the Apollo assembly is in lunar orbit, two members of the 3-man crew will transfer to the LEM and separate it from the other modules. If all checks out, the LEM will make its soft landing on the Moon.

The astronauts, staying on the Moon for up to 2 days, will collect samples of lunar-surface material, transmit pictures and data to the Earth, and place on the Moon an experiment package which will transmit data to the Earth for 6-12 months.

On completing their tasks, the astronauts will return to the LEM, (leaving its legs and descent engines on the Moon), launch it into lunar orbit, rendezvous and dock with the orbiting command-and-service-module assembly, and transfer to the command module. The LEM will then be jettisoned. The assembly will then eject from lunar orbit for return to the Earth. The service module, after furnishing inflight guidance will be jettisoned before re-entry.

The Orbital-Launch Mode -- an Alternate Possibility. A third possibility, and one which it was at first believed the Soviets would use, is the orbital-launch facility. In this mode, the spacecraft or module assembly would be injected into Earth parking orbit, where it would hook up with a previously launched propulsion unit. This unit would be used to inject the craft or assembly into transfer trajectory toward the Moon. This mode would probably also involve 2 or 3 modules, one to make the softlanding, another to remain in orbit and return the cosmonauts to Earth.

Prospects for the 2-Launch Mode. The Moscow News article is the first indication that the Soviets have considered, or are considering, the 2-launch type of operation. While such Soviet press articles are not necessarily firm indications of official intentions, they cannot be ignored since they often have been confirmed by later developments.

In this case, the described mode has certain advantages which the Soviets might want to exploit.

- Much less weight would have to be injected into Earth parking orbit in a single launch than would be required for an Apollo-type mission. The latter would require that the Soviets put about 300,000 pounds into Earth parking orbit in a single launch. For the mission described in Moscow News, the maximum weight required for a single launch would be about 214,000 pounds, assuming that spacecraft A and spacecraft B would each weigh about 10,000 pounds. The Apollo-type mission thus would require design, development, and construction of a much larger and completely new propulsion system. The only new propulsion unit to be developed for the 2-launch mode would be a large first stage to be placed under the existing 2-stage Proton launcher. The 2-launch mode would also involve less extensive EVA (extravehicular activity) than the Apollo mission.
- It would not require development and test of as many operations as would be involved in the orbital-launch-facility mode. The latter, while it would also require less weight than the Apollo-type mission, would involve rendezvous, docking, and in-orbit fuel-transfer, checkout, and launch operations, as well as man-rating of the systems involved. The time required to develop and test these operations and the related equipment could delay launch of the actual manned lunar mission considerably. In this connection, it may be significant that the Soviets have already accomplished their first simple EVA, a prelude to the EVA which would be required of crewmen transferring from spacecraft B to spacecraft A in the 2-launch mode, but they have not yet tried the docking and other sophisticated operations that would be required for the orbital-launch facility mode.

The 2-launch mode is entirely feasible and, since less development time would probably be involved, might permit an earlier Soviet attempt at a manned lunar landing. This factor could be very tempting to the Soviets. However, the 2-launch mode is more complex in profile, and mission reliability would be reduced.

(FTD; NORAD)

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