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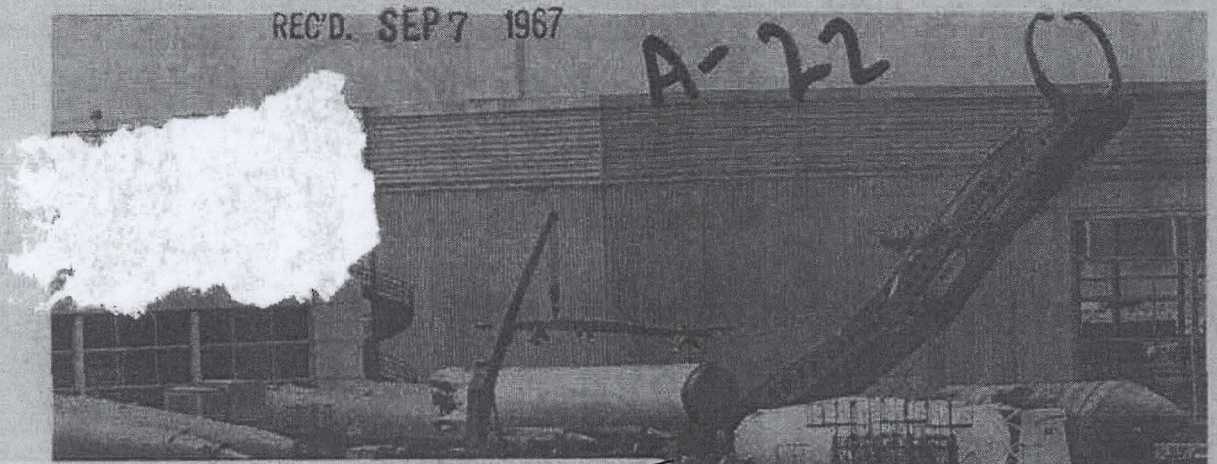

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SECRET [redacted] NORAD

Weekly Intelligence Review

Issue No. 35/67, 1 September 1967

The WIR in Brief

COVER: Assembling the Vostok space launcher for Paris Air Show

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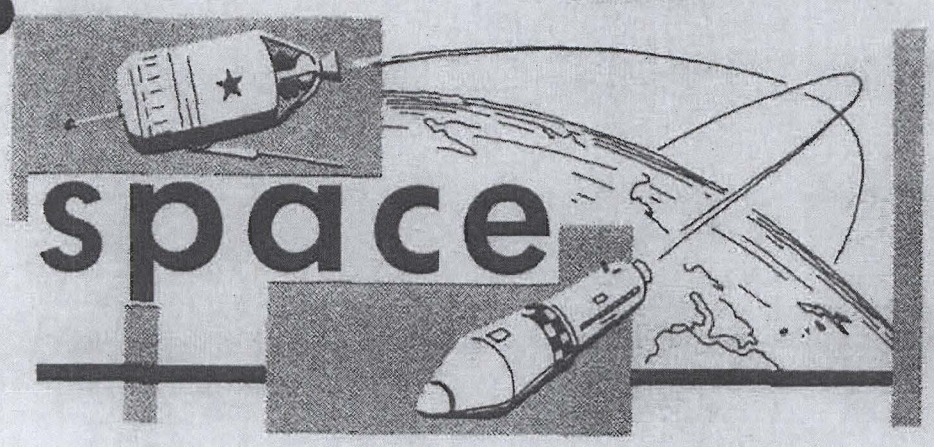

significant intelligence on space developments and trends

Cosmos 173 Possibly a Research Satellite to Replace Cosmos 152, Which is Now Silent

50X1 and 3, E.O.13526

Cosmos 173, which the Soviets launched from the Plesetsk Space & Missile Complex at about 0502Z, 24 August, may be a research satellite as claimed by the Soviets.

The new satellite is probably a replacement for Cosmos 152, which was launched 25 March and has not been heard from since 25 March, [redacted] Cosmos 152's mission has been assessed as high-altitude research. Both Cosmos 152 and Cosmos 173 were launched from Plesetsk, apparently by the SL-7 launch system. Cosmos 152 was launched at about 0700Z, Cosmos 173 at about 0502Z. A comparison of orbital parameters, derived by NORAD Space Defense Center, follows:

	SDC Cosmos 173	Cosmos 152
Inclination to Equator	71.04 degrees	70.9 degrees
Period	92 minutes	92 minutes
Apogee	482 km (259 n.m.)	494 km (266 n.m.)
Perigee	270 km (146 n.m.)	253 km (136 n.m.)

(NORAD)
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USSR Pushing Studies of Fuel Cells to Generate Power for Spacecraft, Submarines, Other Systems

Background. The fuel cell can be an extremely efficient means of generating electrical power, since it transforms chemical energy directly into electricity without the losses involved in mechanical intermediaries.

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But they have other advantages as well. In land-based military systems and submarines, for instance, they can provide power silently. One type is particularly suitable for spacecraft and submarines because it uses nontoxic fuel and yields potentially useful water as a waste product. In spacecraft, moreover, the fuel cell is superior to the storage battery because of its higher ratio of power output to weight.

The Soviet Program. A Soviet lag in the development of fuel cells is seen in the fact that the Soviets have not used them in space, despite their eminent suitability for manned spaceflights of moderate duration (up to about two weeks); the US, in contrast, used them successfully in the manned Gemini flights of late 1965 and 1966. The Soviets used storage batteries on their Vostok- and Voskhod-series manned spacecraft, but on their newest manned vehicle (Soyuz 1, launched 23 April 1967) they used solar cells, despite their design complexity and operational constraints. This transition from storage batteries to solar cells for manned flights does not mean that the Soviets are not interested in using fuel cells for such flights. On the contrary, the fuel cell most suitable for manned missions of moderate duration -- the hydrogen-oxygen cell -- apparently has been given top priority in the Soviets' fuel-cell development program, for it is in the most advanced state of development of all their fuel cells.

At any rate, the USSR now has a large and diversified program of fuel-cell development. This is deducible from the fact that significant work on fuel cells has been conducted at 17 Soviet installations and over 100 Soviet scientists have published on the subject in generally available scientific literature. Soviet publications on this and related subjects, some of which date back to the early 1940s, indicate that most of the major aspects of fuel-cell development are being covered. Clearly, the program is a broad one. It encompasses studies not only of a variety of potential fuels but also of such fuel-cell components as electrolytes, electrodes, and ion-exchange membranes. Although no approaches to novel systems can be discerned from the available information, the work is of high quality and is providing a solid foundation for the development of different types of fuel cells, including:

- The hydrogen-oxygen cell, which apparently is best for manned operations in an enclosed environment.
- Cells which use higher-energy inorganic or organic compounds such as hydrazine or methanol; unlike the components of the hydrogen-oxygen cell, hydrazine and methanol do not have to be transported and stored in heavy pressurized containers.
- The hydrocarbon-air fuel cell which uses very low-cost fuels.

Successful completion of Soviet investigations known to be under way is certain to result in more than one type of practical fuel cell in the next few years.
(CIA; NORAD)
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