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NORTH AMERICAN AIR DEFENSE COMMAND

WIR

WEEKLY INTELLIGENCE REVIEW (U)

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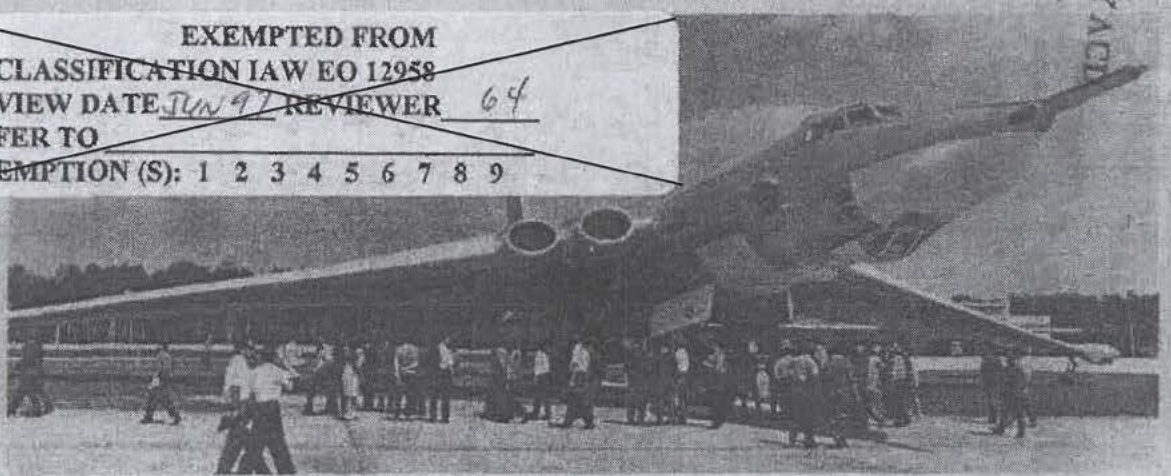

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WIR 31/67
4 Aug-67
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WIR 31/67
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Issue No. 31/67, 4 August 1967

The WIR in Brief

COVER: BISON C (from Aviation Week & Space Technology (OFFICIAL USE ONLY)

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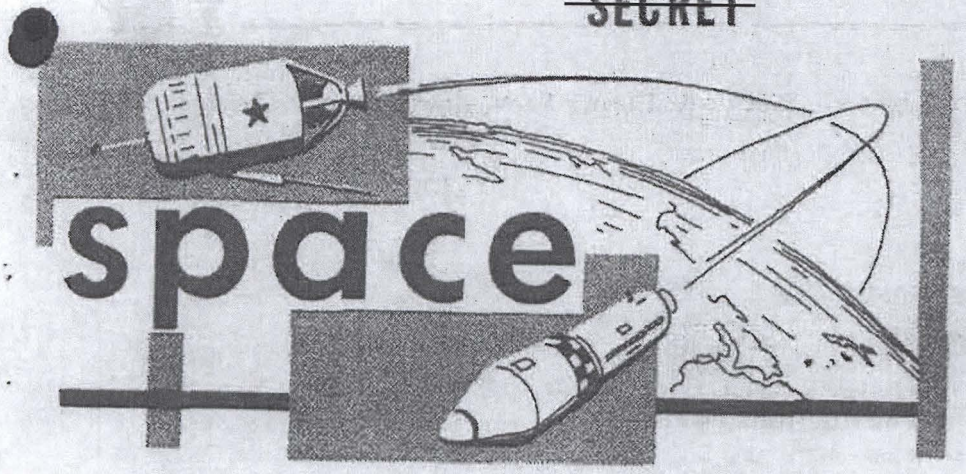

significant intelligence on space developments and trends

10th Test of Soviet Orbital Bombardment System Conducted; Threat to NORAD Grows

The Soviets conducted their 10th test of an orbital bombardment system on 31 July with the launch of an OB-1 from Tyuratam at about 1641Z. (The OB-1 is a 3-stage vehicle, comprising the large SS-9 ICBM as the first two stages and a re-entry vehicle as the third stage.)

This latest test is significant because:

- It is the second straight successful test, indicating that early difficulties, apparently with deboost of the re-entry vehicle, are being successfully overcome.
- It was launched two weeks (almost to the minute) after the 9th test, in contrast with the launch rate of one every two months between September 1966 and July 1967. This fact indicates that the Soviets are confident enough of the system's feasibility to begin volume production of the vehicle and that they earnestly intend to bring this vehicle into their operational weapons inventory as quickly as possible.

Thus, the OB-1, though still in the testing stage, is emerging ever more clearly as a threat to NORAD.

The OB-1 of 31 July was launched into an orbit of 49 degrees inclination, as has been the case of all 7 tests of this system in the orbital mode (the first 3 tests were suborbital in mode). The orbital period was about 89 minutes. The retropackage was ignited at about 1816Z and impact is believed to have occurred at about 1841.8Z at 49.2° N. in the USSR.

The Soviets are pretending that this was a scientific vehicle. Naming it Cosmos 170, they announced that it was performing the usual Cosmos mission of study of the near-Earth space environment.

This was the third successful test of this vehicle in the orbital mode; the first two successes were Cosmos 139 (25 January 1967) and Cosmos 169 (17 July 1967). (For details on these launches, see WIRs 5/67 (p. 7) and 29/67 (p. 6).)

An orbital bombardment weapon could be more difficult to detect, intercept, and destroy than an ICBM because of the wide choice of approach routes to target that it can follow and the relatively low altitude of the orbit, which would substantially reduce the detection range of the line-of-sight radars. These advantages are gained, however, at some sacrifice in warhead weight and accuracy.
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Spacetracking Stations in Cuba May be Picking Up Geodetic Data, for Soviet ICBM Targeting

Soviet satellite tracking stations in Cuba could be collecting geodetic data which would aid the Soviets in targeting ICBMs against the Western Hemisphere.

The Stations and Their Equipment. The Soviets have been operating two optical satellite-tracking stations in Cuba as follows:

- One in Havana's southern suburb of Santa Susana which has been operating since 1964.
- One in an abandoned Roman Catholic Church in Santiago de Cuba which became operational about the end of March 1967 -- almost a month ahead of schedule.

Each station is equipped with:

- Two TZK telescopes -- binocular telescopes on theodolite mountings which are generally used for visual observations. However, a modified version has associated photographic equipment.
- Twelve AT-1 telescopes -- small, 6-power telescopes with an 11-degree field of view. It is used exclusively for visual observations, a technique long abandoned by the US.
- One Zeiss-Jena camera, probably a 40-centimeter astrograph with a 10-degree field of view -- almost the same size as the US's Baker-Nunn tracking camera. This instrument, probably used for photographing geodetic satellites, is adequate for obtaining geodetic data in the Western Hemisphere.

Operations. High-security operations at the tracking stations are suggested by the fact that Cuban astronomers are allowed to operate the visual equipment but apparently are not given access to any of the photographic observation equipment. Cubans are not allowed in the area where the cameras are operated, where films are developed, or where undeveloped film is kept. Cuban officials were allowed to see the camera at the Havana station in operation as recently as February 1967, but not since the commencement of camera observations.

Photographic operations are an essential element in gathering geodetic data from satellite tracking.

Tracking of satellites by the stations in Cuba is coordinated and scheduled in Moscow. The observation ephemeris is sent encoded to the Academy of Science in Havana via teletype, each one giving instructions on which satellite to track and the date and time for tracking.

Certain facts strongly suggest that the collection of geodetic data is the primary mission of the Soviet stations in Cuba:

- The first program scheduled for the new station was the systematic tracking of the US's Pageos (a 100-foot-diameter geodetic satellite).
- Both stations are so located that they are suitable only for observing brighter satellites, such as those of the Echo type, which can be tracked for geodetic purposes. Both stations are close to or within urban areas where the scattering of city lights is severe enough to interfere with the tracking of faint satellites. Actually, the accuracy of the observations could be reduced by the bright sky and turbulent air over the city.

The Soviet Interest in Geodetic Data. There is no evidence that the Soviets have geodetic satellites of their own. They have, however, reported to COSPAR (the International Committee of Space Research) that their European-Asian stations have been actively tracking US satellites, primarily geodetic. This tracking data is not released.

The Soviets can obtain valuable data by optical tracking of US satellites. Accurate geodetic data of North America and its tie to Cuba have been published by the US and an accurate datum established. The problem for the Soviets is to connect the European datum with the North American datum of 1927. This can be done by a well-planned program of tracking geodetic satellites by the network of stations in the USSR and by the stations in Cuba. When ample data for a statistical study has been collected, the Soviets can tie together the datum of Europe and that of North America, with a consequent improvement in geodetic positioning of potential targets in North America.

Establishment of the two stations in Cuba could be justified alone by the fact that they can acquire information on satellite drag and the characteristics of the upper atmosphere and obtain better positioning data on both Soviet and US satellites. On the other hand, Cuba's closeness to the US makes it a highly desirable place from which to collect geodetic data, for which the stations appear to be adequately equipped.

The Soviets could improve their geodetic data still more by establishing stations in other parts of the world; however, they are not likely to need more stations in Cuba in the near future.

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Portion identified as non-responsive to the appeal

Soviets Behind in Psychology of Man-Machine Relationships, at Least in Known Achievements

Portion identified as non-responsive to the appeal

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Aviation-Space Engineering Psychology. The great Soviet effort has been in aviation-space engineering psychology. They are developing a broad study program of the three phases of man's reflex sequence (sensory mechanisms, central nervous-system association, and human motor capabilities -- the latter expressed as behavior) when man is part of a flight-control system. This involves research on the characteristics of signals (stimuli) and their acceptance, the training of recognition, memory, and decision-making by man in combination with control systems, and the efficiency of motor behavior for changing the control of automatic flight devices.

Two examples of Soviet research:

- The time required for a pilot to react to a signal has been shown to vary with the number of signals received per unit of time and their spacing in time. As the number of signals increases per unit of time, the reaction time of the pilot increases (reaction is slower). If several signals must be applied in succession, the pilot's reaction time is relatively shorter if they are spaced at short intervals.
- The nature of the "living quarters" of a space capsule may require the pilot to work while his body is in unusual positions. It was found that prolonged stays in an inconvenient body position alter the positioning sense. Coordination for performing tasks became less efficient, it was observed, and the ability to calculate time lapse was disturbed.

Future studies, the Soviets say, will include proposals for changes in flight training and work organization as well as in cabin design, control levers, and instrument panels (both individual instruments and aggregates of instruments) in order to exploit the findings of aviation-space engineering psychology.

The Soviets are improving their biocontrolled prosthetic devices (artificial limbs controlled by muscle currents), an area in which they have pioneered (p. 13, WIR 26/67), as practical means for incorporating man into automatic flight-control systems.

Over-all, however, the US leads the USSR in aviation-space engineering psychology because of its over-all lead in research results in advanced engineering psychology.

Future Plans for Soviet Space Engineering Psychology Research. Uppermost is the unanswered question of how best to fit man into new and complicated control systems. His capacity to perceive, remember, conceive, decide, and to be motivated during extended space journeys is quite unknown. Man is the most uncontrollable variable in the man-machine-control linkage; it would be useful

if his actions can be experimentally modified so as to be more predictable.

The environmental factors which modify man's ability to perceive and react are next in importance in future research plans. Information has been gained for only short time spans on the effects of vibration, temperature, artificial atmospheres, nutritional factors, weightlessness, vestibular stimulation, decreased mobility, isolation, boredom, and sleep-rest rhythms as they affect man's psychological capabilities. Information must be provided for improving reaction time, and making proper choices among alternate plans for action, for overcoming problems of health, and for maintaining interest and the desire to complete the requirements of the space mission.

Evaluation. Soviet investigators have progressed in all areas of engineering psychology but they apparently suffer from a lack of adequately trained specialists as well as a shortage of suitable experimental facilities and equipment.

Western achievements in applied psychology are far in the lead, compared to Soviet psycho-engineering accomplishments. The Soviets are well aware of Western production engineering research but have chosen not to use much of it in their own bio-engineering efforts.

The Soviets claim that their past achievements are better and their future attainments will be superior to Western experimental results. However, no one can say authoritatively that the Soviet or the Western approach is the correct one because no one understands adequately the actual brain mechanisms which explain the cognitive functions. The West, however, generally considers Soviet psychological research and the philosophy of brain function 20 years behind the modern Western approach.

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