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NORTH AMERICAN AIR DEFENSE COMMAND

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WEEKLY INTELLIGENCE REVIEW (U)

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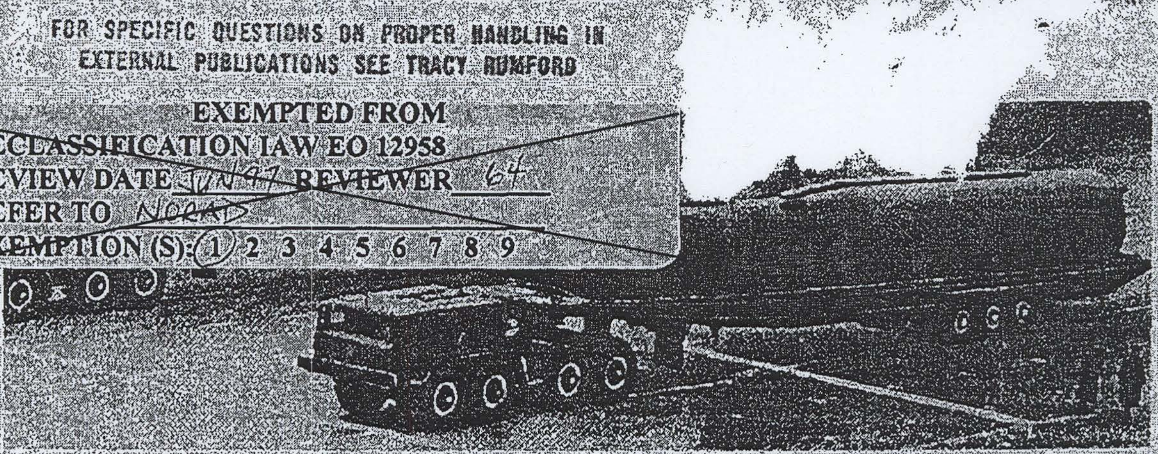

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NORAD Weekly Intelligence Review

Issue No. 47/64, 20 November 1964

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COVER: Soviet missile in 7 November 1964 parade (from Red Star) (OFFICIAL USE ONLY).
NOTE: Pages 26, 27, 30, 31, 34, 35, 38, and 39 of this issue are blank.

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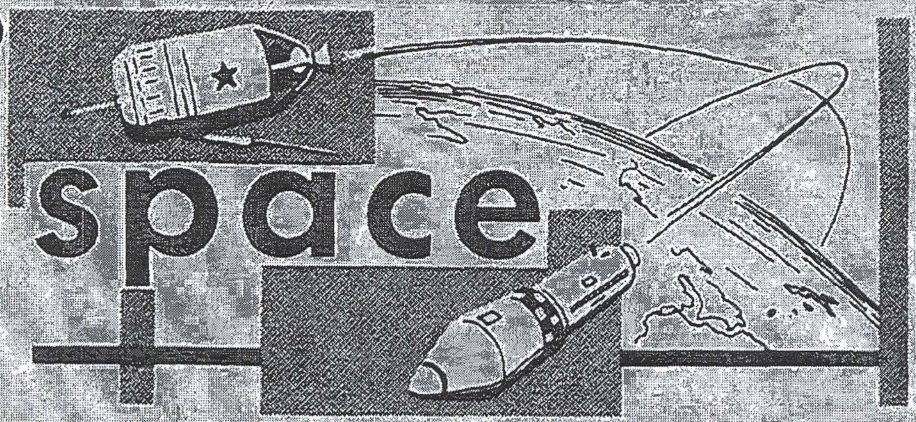

significant intelligence on space developments and trends

Rubber Spacecraft Proposed for Manned Interplanetary Flights

A Soviet radio broadcast for the domestic audience stated that a proposal had been made to build manned interplanetary stations out of rubber. The broadcast also stated, "A rubber 'space ark' about 30 meters (100 feet) in diameter could accommodate 2 men. Packed in a container for launch, the station would be filled with a gas which would inflate it after injection into orbit. Special partitions would insure rigidity. Two of these stations have already been made for carrying out scientific research in space."

NORAD Comment: The broadcast did not state which nation had built the two existing rubber space stations or whether they had been launched already.

A space station such as the one described could provide a relatively large amount of working space for crewmen at no increase, or a relatively small one, in launch weight. Added work space could contribute significantly to man's ability to endure flights of extended duration, such as those of manned Earth-orbiting laboratories or interplanetary probes.

A rubber space station itself would not reflect radar waves, although metal protrusions and metal contents of the vehicle would give off echoes. Thus, while the rubber station itself would be "invisible" to tracking radars, the dispersion of protrusions and of payload items over a wider area could result in a better radar return than would be obtained from the surface of the usual high-density-payload space vehicle. Finally, the rubber skin could be coated with radar reflective material. Radar tracking would be of significance in manned interplanetary flights only in the initial and return phases, but could be of continuous significance for orbiting laboratories.

One serious drawback to a rubber space station would be the increased danger of puncture by meteorites.
(Soviet broadcast; NORAD)
(UNCLASSIFIED)

Interceptor Satellite Might Use Infrared for Homing on Target Spacecraft

Passive infrared equipment is one possible Soviet choice, as an alternate to active radar, for installation on antisatellite spacecraft as a means for detecting, tracking, and homing on other spacecraft.

Passive infrared would have a few advantages over active radar:

- It s use would not warn the target that it was under surveillance.
- It would be relatively immune to countermeasures.
- Power requirements would be low.
- The equipment would be small in volume and light in weight.

Its main disadvantage is that it would not be able to determine the range of the target satellite -- only its relative direction.

A 24-inch optical aperture system probably would be required for infrared homing guidance against a satellite at a range of 50 n.m., once the interceptor satellite had acquired the target from ground stations. Such a device might operate in the 6-8 micron region; the target satellite would emit enough radiation on this wavelength to be detectable, yet Earth radiation in this region of the infrared spectrum would be largely screened out by the Earth's atmosphere. This operating wavelength could be attained by using a gold-doped germanium detector, cooled by a 1,000-hour (42-day) supply of liquid nitrogen.

The Soviets might be able to develop the complete system in about one year, assuming ideal conditions and an all-out effort.
(FTD)
(~~SECRET~~ NO FOREIGN DISSEMINATION Except NATO, Aus & NZ)

Space-Tracking Role for TALL KING EW Radar No Longer Deemed Likely

TALL KING, the Soviets' highest performance AC&W radar, has been credited in the past with some capability for detecting and tracking Earth satellite vehicles. A recent FTD analysis indicates that, while TALL KING should be able to "paint" satellites under certain conditions, the use of an unmodified TALL KING as a space tracker is highly impracticable. Further, although certain modifications could significantly improve TALL KING as a space tracker, the radar's accuracy might not be adequate, even as a space-target acquisition radar.

(TALL KING is a Soviet early warning radar with a parabolic antenna 115 feet wide by 41 feet high. Deployed at more than 200 of the USSR's 1400 ground radar sites, mainly about the periphery of the Soviet Bloc, TALL KING has a primary mission of detecting and tracking high-altitude aircraft and cruise-type missiles. It can detect a 1-square-meter target out to its unambiguous range limit of 400 n.m. at altitudes of 150,000-200,000 feet. (Coverage diagram on page 37.) Its range against a medium bomber at 60,000 feet would be somewhat less (owing to line-of-sight limitations and atmospheric degradation of the lower altitude) -- perhaps 260-280 n.m. at a 50-percent blip-scan ratio.)

Normal TALL KING Capabilities. An unmodified TALL KING would be able to detect a satellite with an echo area of 10 square meters or less only when the satellite is at a range of 760-800 n.m. and at an altitude of 110 n.m. or less. Inability to tilt TALL KING's large antenna would prevent detection at other ranges and altitudes. On most passes, a satellite would be "visible" a maximum of only two times. A satellite passing directly over the radar, for example, would be "visible" to the radar for about 8 seconds on its approach and for a similar period of its withdrawal or recession, that is, when 760-800 n.m. from the TALL KING. With the antenna completing one rotation each 15 seconds, the radar beam would hit the target only once -- if at all -- during each of the two 8-second intervals. Further, assuming a blip-scan ratio of 50 percent, there would be only a 50-50 chance of detecting the satellite each time it came within the radar's coverage. And then, if the radar did detect it on each of the two "possible" occasions, which would be about 6 minutes apart, there would not be enough data to establish a track. Finally, the radars' PRF would cause the satellite to be displayed on the scope at the confusing range of 360-400 n.m. instead of its actual range of 760-800 n.m.

Similar limitations (except for the time between scans) would apply to all passes, except those in which the satellite's path was tangential to the radar site at a distance of 760 n.m. and at an orbital altitude of less than 115 n.m. In the rare instances when these exceptional conditions existed, the radar would scan the target a maximum of 8 times; yet, with a blip-scan ratio of 50 percent, there would be, on the average, only 4 "paints" of the target. (See diagram on page 40.)

Modified TALL KING Capabilities. TALL KING's space-tracking capabilities could be improved considerably with the following modifications:

- Change the RF to 250 mc/s.
- Reduce noise figure from 6db to 3 db and loss factors from 12 db to 9 db.
- Increase the pulse width to 20 microseconds.
- Provide for adjustable antenna tilt of up to 40 degrees.

Assuming that the radar location is optimum with respect to the trajectory of the satellite concerned, TALL KING could detect a satellite with a 1-square-meter echo area at orbital altitudes of 480 n.m., while a 16-square-meter target could be detected out to a maximum orbital altitude of 960 n.m. The satellite's location could then be fixed within a space 1 n.m. deep in range, 12 n.m. wide in azimuth, and 30 n.m. high in elevation. This might not be accurate enough, however, to enable TALL KING to turn the target over to a more precise tracking radar. Triangulation, using several TALL KINGS, would probably be required -- a dubious course, in view of the elaborate data links and signal processing equipment which would be required and the limited results which would be attained.

There are no indications from ELINT or visual sightings that any of these modifications to TALL KING have been undertaken.

Outlook. Unmodified TALL KINGS are most unlikely to be used for satellite tracking, and it is doubtful that the Soviets will modify them to suit them to this purpose.

Soviet resources for active radar tracking of satellites, the principal means of determining the orbital parameters of those which do not transmit, appears to be limited to the few available ABM radars, most of which are test or developmental models.

The Soviets apparently must continue to rely primarily on passive beacon tracking and, to a lesser extent, on optical tracking.
(FTD; NORAD)
(~~SECRET~~ NO FOREIGN DISSEMINATION Except NATO, Aus & NZ)

Refusal to Supply Orbital Data Suggests Low Performance for Soviet Optical Tracking

Soviet delegates to a 1964 meeting of COSPAR (the international Committee on Space and Astronautical Research) objected to a resolution which called on them to provide precise orbital data on the Soviet satellite Electron 2 (launched 30 January 1964) so that its beacon, which was still transmitting, could be used for studies of the ionosphere.

The Soviets insisted that they had not planned to use this vehicle as an ionospheric-beacon satellite. They suggested also that they were not in a position to supply good orbital data at all.

The Soviets are believed to possess adequate electronic tracking data on Electron 2. Their reluctance to supply this data indicates an unwillingness to declassify it.

The refusal to provide optical tracking data suggests that the Soviet system has rather low performance and cannot routinely provide position data for distant satellites such as Electron 2, which has an apogee of about 42,000 statute miles (36,000 n.m.). This agrees with current estimates of Soviet optical tracking capabilities. Electron 2 spends most of its time at distances too far from the Earth to be observed with the standard Soviet NAFA 3s/25 satellite-tracking camera. The Soviets apparently have not yet replaced this camera with an instrument equivalent in performance to the US's Baker-Nunn camera, which could probably photograph Electron 2 at apogee.
(CIA)
(~~SECRET~~ NO FOREIGN DISSEMINATION Except US, UK, Can, Aus & NZ)

Private Italian Tracking Station Makes False Claim for Lunik 4 Photo Intercept

Achille and Gian Battista Judio-Cordiglia, directors of the privately owned Radio Tracking Spatial Center, Torre Bert, Turin, Italy, recently presented US intelligence with photographs they claimed to have intercepted from the Soviet space probe Lunik 4.

A study of the photographs revealed that they could have been reproductions of published pictures of the Moon and that, based on astronomical and other considerations, none of them could have been taken by Lunik 4. Launched on 2 April 1963, Lunik 4 was considered a failure by the US intelligence community, although it did pass near the Moon. The Moon pictures and other reports of Soviet astronaut fatalities from this center thus have been judged false.

(CIA)

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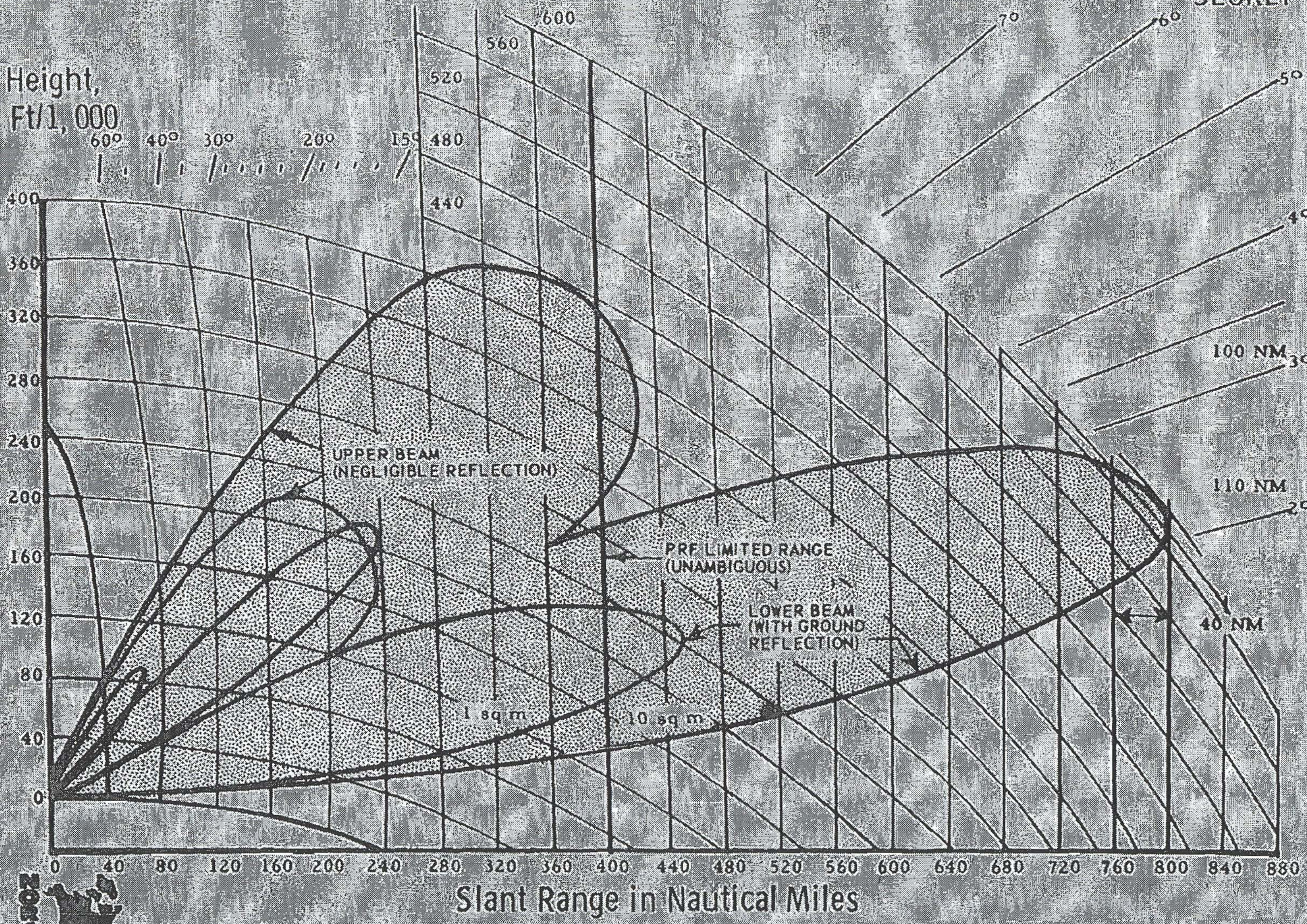
TALL KING Radar Coverage Diagram



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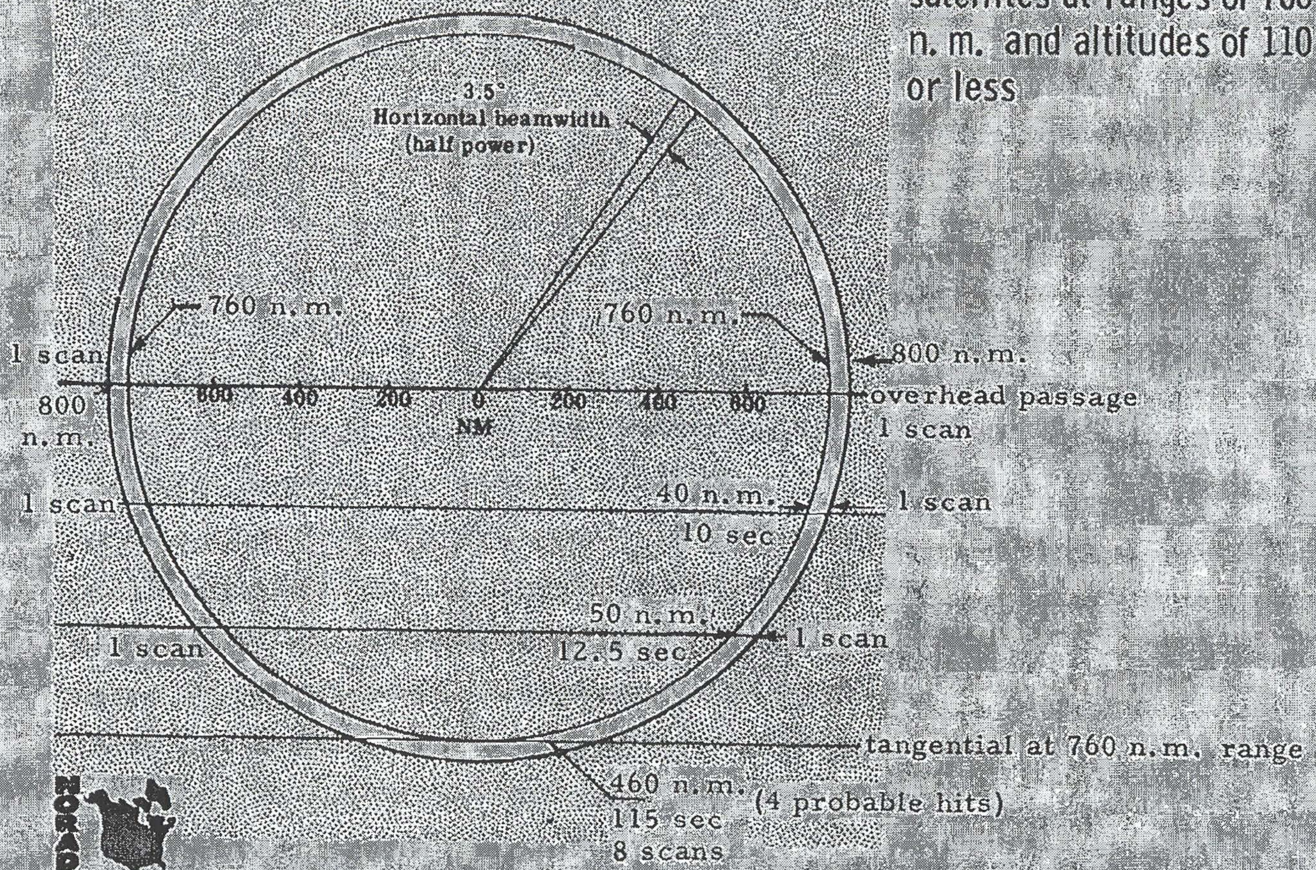
TALL KING (Soviet EW Radar) Capabilities for Detection of Satellites on Various Paths

(TALL KING located at 0 n. m.)
Coverage (clear area) limited to satellites at ranges of 760-800 n. m. and altitudes of 110 n. m. or less or less



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