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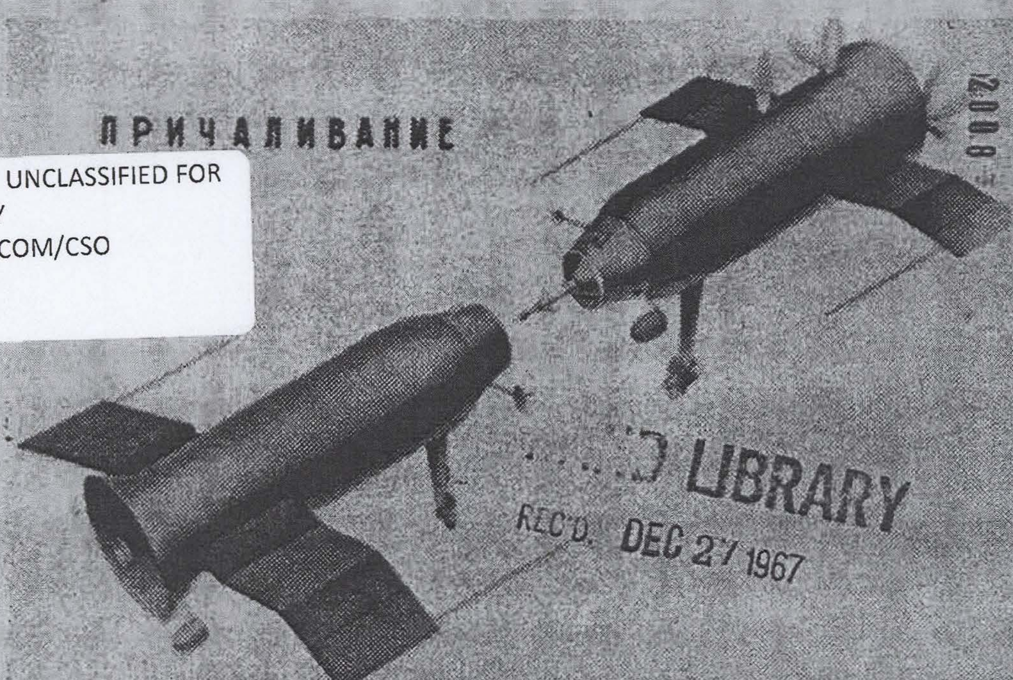

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The WIR in Brief

50X1 and 3, E.O.13526

00880822

COVER: Soviet conception of unmanned rendezvous of Cosmoses 186 and 188

NOTE: Pages 2, 24, 26, 27, 31, and 34 of this issue are blank.

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significant intelligence on space developments and trends

Soviets Derive Family of Reliable Space Launchers from SS-6 ICBM

The display of the Vostok launch vehicle, designated SL-3 in the West, at the 1967 Paris Airshow and the new permanent exhibit in Moscow have provided many insights into an important family of Soviet space launch systems.

The SL-3 launch vehicle has been designed around the SS-6 booster/sustainer combination, the first Soviet ICBM. Since 1957, this basic SS-6 booster/sustainer combination has been used in more than 160 space launches with a reliability figure, based on launch success, of better than 90%.

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Booster/Sustainer Propulsion System. The booster/sustainer propulsion system consists of five four-chamber main engines. In addition, each booster has two control/vernier chambers while the sustainer has four. The multi-chamber main engine configuration was unexpected, as previous history had suggested a single chamber unit. [redacted] The display substantiated previous estimates of the thrust capability of each propulsion unit as about 220,000 pounds of vacuum thrust.

The propellant combination used by this launch vehicle is not clear from the display. The oxidizer is certainly LOX, but the fuel, quoted as "hydrocarbon" on the display placards, is not necessarily kerosene. The quoted vacuum specific impulse of 314 seconds, which agrees closely with previous estimates, could be obtained only with difficulty using kerosene, even at the high chamber pressure claimed. An amine-type fuel (possibly a mixture of methylated hydrazines, which could be considered as "hydrocarbon") would readily provide the performance, however, and is considered to be the most likely.

The general impression left by close study of the displayed engines is that they are of native Soviet design, quite sophisticated by mid-Fifties standards, and owing less to V-2 derived technology than than had been generally expected.

Various Configurations. The SS-6 booster/sustainer has been used in various configurations -- depending on the upper stages employed. These configurations have been designated as:

- SL-2 -- an early space launcher which used only the booster/ sustainer with an assessed low orbit payload capability of about 2500 pounds.
- SL-3 (as displayed) -- used the Lunik upper stage with an assessed low orbit payload capability of approximately 11,000 pounds. The SL-3 has been used to launch recoverable earth satellite vehicles, including the manned Vostoks.
- SL-4 -- uses the Venik as the third stage with a near earth recoverable payload capability in the 14,000 pound class. The SL-4 was used for the manned Voskhods.
- SL-5 -- used the Lunik third stage and a new fourth stage in a flight test program which placed Cosmoses 102 and 125 into orbit.
- SL-6 -- consists of the third stage Venik plus a fourth stage for injections into interplanetary and lunar orbits.
- SL-10 -- used a maneuverable third stage Polyot capable of placing about 3600 pounds into orbit.

The chart on page 28 shows the various configurations, while technical characteristics are listed for comparison on page 29.

Flight Profile. All SS-6 booster ESV's are thought to follow a similar flight path to orbit. A postulated flight profile for the booster is shown on page 32. In this profile a zero pitch rate occurs at booster burnout which would tend to aid in staging. The apparent reason for incorporating a long zero lift during booster burn is to allow more time for the reduction of dynamic pressure before introducing a large angle of attack.

Control for the vehicle during the very critical early boost phase is provided by the eight booster control chambers assisted by the small aerodynamic fins located on each booster segment. [redacted] This was not mentioned in Soviet statements about the display. During sustainer burn, the four hinged vernier chambers provide pitch, yaw and roll control, as well as final velocity trim.

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Launch Facilities. Until March 1966, all SS-6 booster space payloads were launched from Tyuratam. In that month the launch of Cosmos 112 by an SL-3 introduced the Plesetsk Missile and Space Complex (PMSC) as a space launch facility. This site had been previously used only for the ICBM flight tests. Since then the SL-4 has also been launched from PMSC. The use of Plesetsk considerably widens the range of orbital inclinations available to the Soviets, and inclinations up to 81° have been demonstrated from the facility. Page 33 shows the range of inclinations for SS-6 boosted space payloads from Tyuratam (TTMTR) and Plesetsk. On pad times are very short. Unmanned SL-3 payloads can be launched within 24 hours of erection, and manned payloads are not thought to take more than a few days.

The series of space launch vehicles based on the SS-6 ICBM booster/sustainer combination is an impressive achievement. The Soviet ability to create, in the mid-1950s a booster/sustainer combination in the million-pound thrust class, of refined aerodynamic design and powered by reliable and efficient multi-chamber rocket engines, illustrated vividly not only the priorities accorded in the Soviet system to the acquisition of missile and space power, but also the enormous advances in Soviet technology since World War II.

The vehicle is of native Soviet design, owing little to contemporary Western concepts and less to the German legacy from the World War II. The surprise occasioned by unique features of this design, in spite of the accuracy of previous intelligence assessments predicting both the parallel configuration and the vehicle performance within close limits, suggests that the main lessons to be learned from the displays are that technical innovation has long ceased to be a Western prerogative, and that simplicity and elegance in design are inseparable.

(FTD)

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Further Details of Soviet SL-12 Space Vehicle Failure on 22 November Available [redacted]

[redacted] the 22 November SL-12 launch has confirmed that the vehicle failed when one of the four second-stage engines did not ignite. [redacted] the presence of six engines in the first stage booster. [redacted] further indicated a close similarity of the 22 November vehicle to Cosmoses 146 and 154 -- launched on 10 March and 8 April, respectively from Tyuratam. The SL-12 is the largest Soviet space booster flown to date. It is probably capable of placing some 45,000 to 50,000 pounds in near earth orbit or about 10,000 to 15,000 pounds around the moon. (For details of SL-12 system, see WIR 50/67.)

(DIA)

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Soviets Launch Cosmos 195, a Photo Recce Satellite

The Soviets launched Cosmos 195 from the Plesetsk Missile and Space Complex at about 1202Z on 16 December 1967. The vehicle is a probable medium resolution photo reconnaissance vehicle with an electronic intelligence collection capability. Cosmos 195 was placed into orbit with an SL-4 (SS-6 booster/sustainer with a third stage Venik) launch system. Mission of the vehicle is assessed as search and target detection. It will probably be de-orbitted on 24 December after a normal 8 day mission. Orbital parameters are as follows:

	Space Defense Center	TASS
Apogee (Kms)	356	375
Perigee (Kms)	204	211
Period (Min)	90.1	90.1
Inclination (Degrees)	65.7	65.7

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Soviets Launch Space Vehicle from Kapustin Yar

The Soviets launched an earth satellite vehicle, Cosmos 196, from the Kapustin Yar Missile Test Range at about 0632Z on 19 December 1967. This new satellite is probably a small, non-recoverable geophysical vehicle. This is the first ESV launched from the KYMTR since 16 June 1967.

Indications are that Cosmos 196 is similar to Cosmos 108, an apparent scientific satellite launched from Kapustin Yar on 11 February 1966.

Orbital parameters are as follows:

	Space Defense Center	TASS
Apogee (Kms)	887	887
Perigee (Kms)	229	225
Period (Mins)	95.8	95.5
Inclination (Degrees)	48.8	49

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Soviet Measurements of Micrometeorite Impacts in Space Erroneous

A recent Soviet analysis of the Cosmos 135 micrometeorite experiment has concluded that the number of impacts recorded by the spacecraft were completely spurious, probably due to noise of thermal origin within the vehicle. Cosmos 135 was instrumented with four piezoelectric sensors to register micrometeorite impacts; two were mounted on the body of the spacecraft, and two were mounted on an extendible panel. It was found that the micrometeorite impacts recorded by the sensors on the panel were periodic with time and were directly correlated with the temperature of the panel. The impacts recorded by the sensors on the spacecraft were directly related to the passage of the satellite from sunlight into darkness. The analysis further concludes that all the past Soviet micrometeorite experiments in space have been subject to the same errors, and that it is almost impossible to isolate the true micrometeorite impacts from the noise in the system.

This is the first known Soviet analysis of the type of problems they have encountered with their satellite micrometeorite experiments, although their data have been suspect since the very early days of the space program. The analysis of the Cosmos 135 experiment was performed by a different group than the group which normally has instrumented and analyzed such data. It may be that this new group will be able to overcome the past problems and will design instrumentation which will produce accurate micrometeorite data in the future. However, if this analysis is correct, it would appear that all past Soviet data of this type have been in error, and they will be forced to rely on US data for information on the number and size distribution of micrometeorite particles in space. Such information is important for designing spacecraft, and becomes particularly important in the development of safety measures for the crew in a manned spacecraft or during extravehicular operations.
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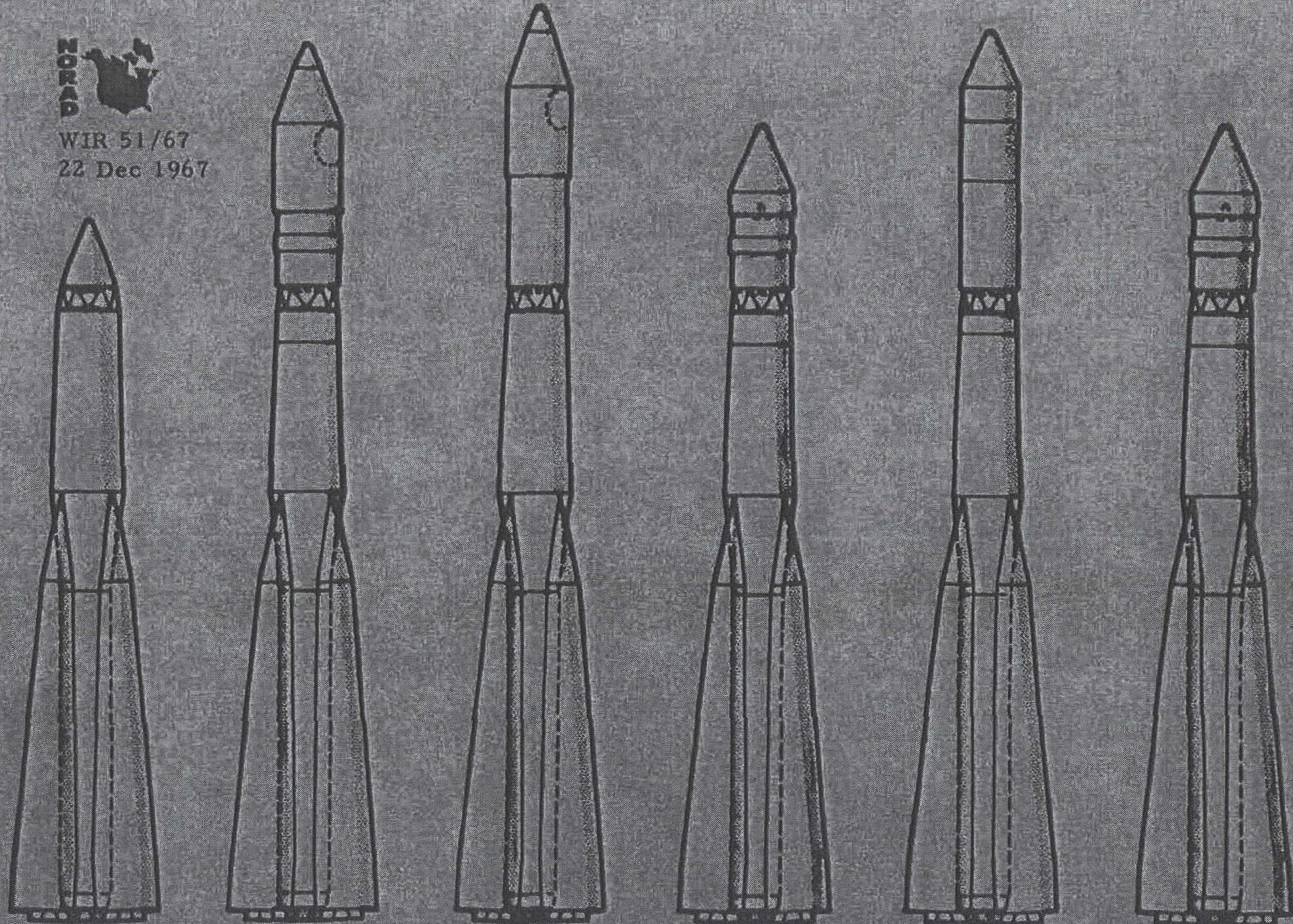

SL-3 Launch System Family

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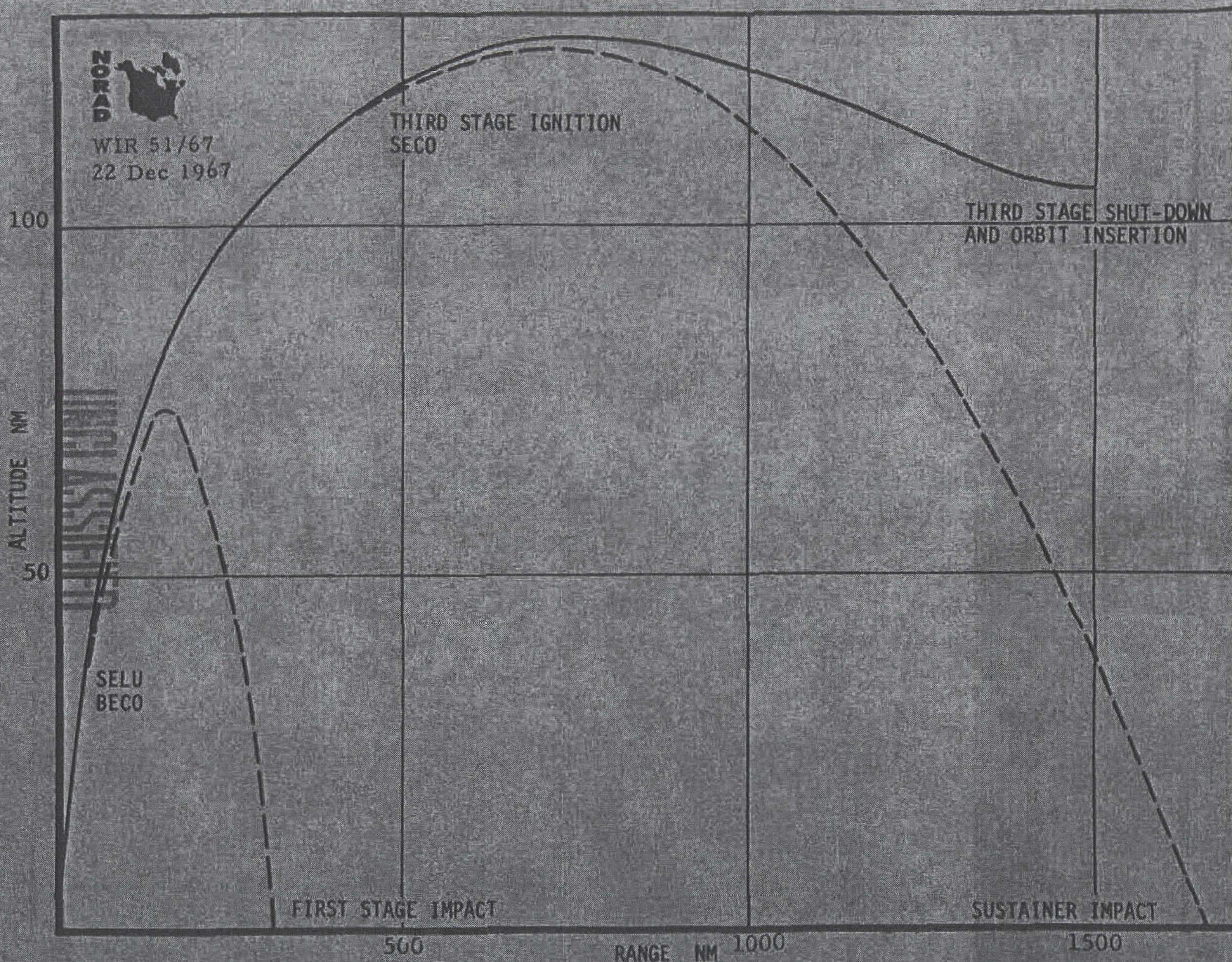
LAUNCH VEHICLE CHARACTERISTICS

LAUNCH VEHICLE	THRUST VACUUM (lb)	Isp VACUUM (sec)	PROPELLANT (type)	BURN TIME(s) (sec)	LIFTOFF WEIGHT (lb)	APPROXIMATE PAYLOAD (100 NM) (lb)
SL-2 (1)						
1st Stage	1,100,000	313	LOX/Hydrocarbon	118.5	604,000	
Sustainer	214,000	313	LOX/Hydrocarbon	188.5		2500
SL-3 (3)						
1st Stage	1,100,000	313	LOX/Hydrocarbon	118.5	629,000	
Sustainer	214,000	313	LOX/Hydrocarbon	188.5		
Lunik	11,500	320	LOX/TG-02	365		11,000
SL-4						
1st Stage	1,100,000	313	LOX/Hydrocarbon	118.5	673,000	
Sustainer	225,000	313	LOX/Hydrocarbon	172		
Venik	73,000	326	LOX/Amine	231		14,000
SL-5 (4)						
1st Stage	1,100,000	313	LOX/Hydrocarbon	118.5	626,000	
Sustainer	214,000	313	LOX/Hydrocarbon	188.5		
Lunik	11,500	320	LOX/TG-02	365		
4th Stage	2000	235	Storable	46		11,000
SL-6 (2)						
1st Stage	1,100,000	313	LOX/Hydrocarbon	118.5	676,000	
Sustainer	225,000	313	LOX/Hydrocarbon	172		
Venik	73,000	326	LOX/Amine	231		
4th Stage	15,000	336	LOX/Amine	211		15,000
SL-10						
1st Stage	1,100,000	313	LOX/Hydrocarbon	118.5	607,000	
Sustainer	225,000	313	LOX/Hydrocarbon	172		
Polyot Stage	Unknown	247-315	Storable	Unknown		3000

NOTES:
(1) Booster/sustainer combination
(2) Lunar version shown/interplanetary version quite similar
(3) TG-02 composition - 50% xylidine/50% triethylamine
(4) SL-3 orbital capability

[redacted]



SL-3 Typical Flight Profile

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[redacted]

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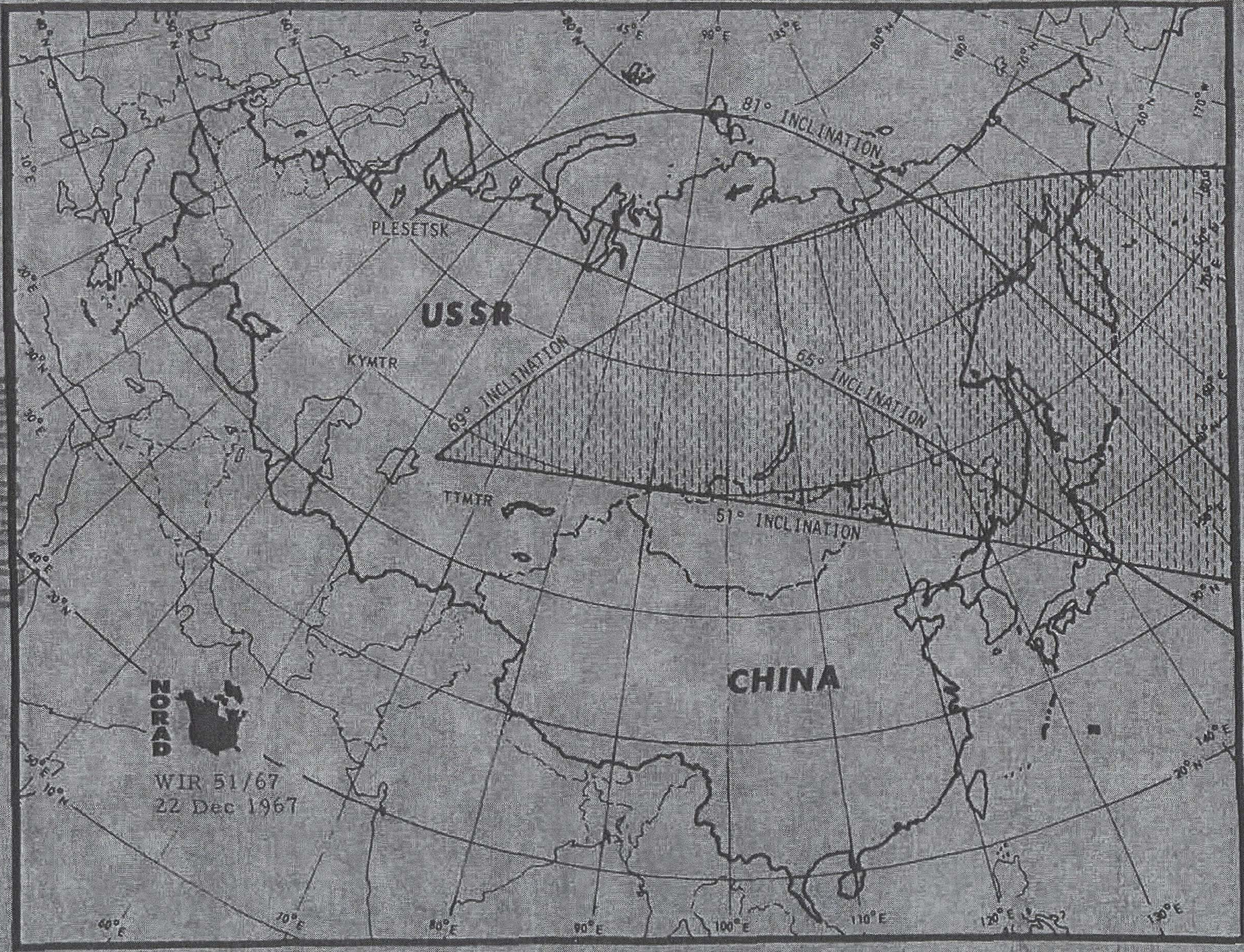

Soviet Launch Range Locations and Corridors

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