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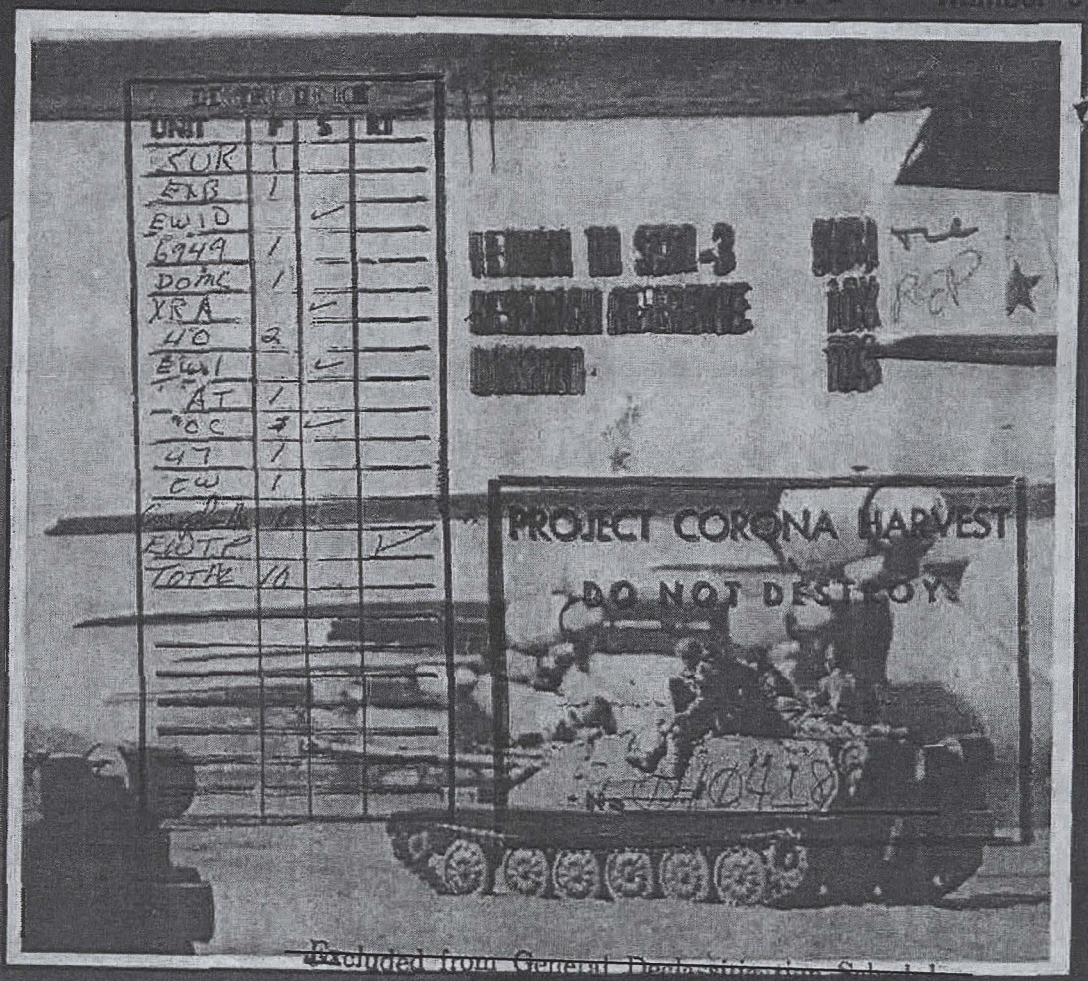
Defense Intelligence DIGEST

(U)

March 1970 • Volume 8 • Number 3



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DEFENSE INTELLIGENCE AGENCY

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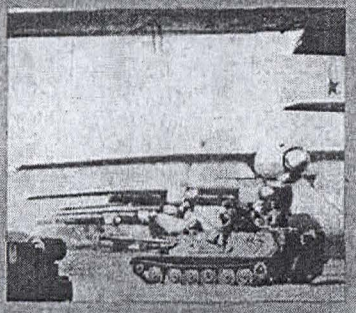

Air and ground units mass in preparation for Warsaw Pact Exercise Oder Neisse '69. For details see articles beginning on pages 4 and 7. [U]

FOREWORD

MISSION: The mission of the monthly *Defense Intelligence Digest* is to provide all components of the Department of Defense and other United States agencies with timely intelligence of wide professional interest on significant developments and trends in the military capabilities and vulnerabilities of foreign nations. Emphasis is placed primarily on nations and forces within the Communist World.

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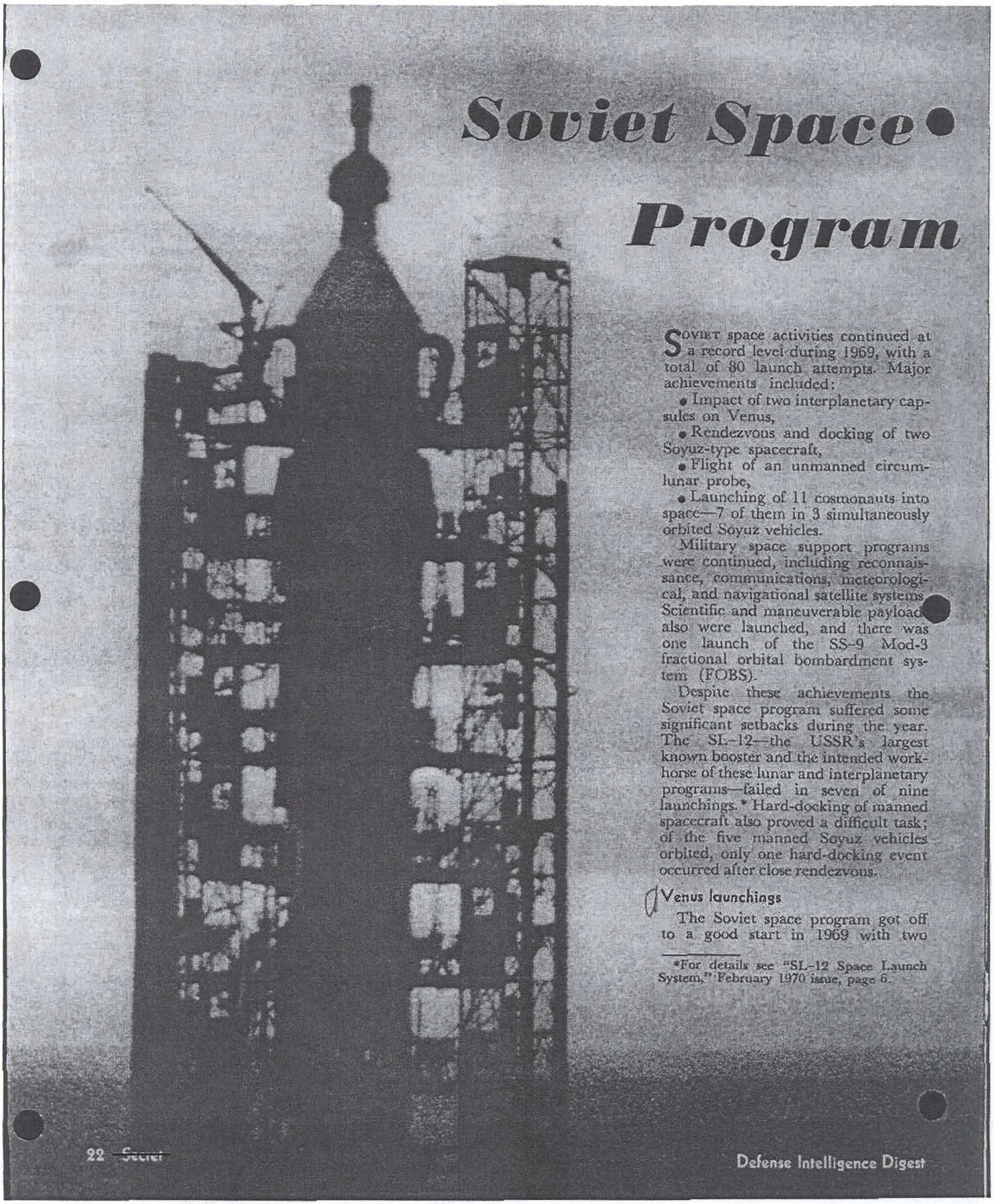
D. V. Bennett
D. V. BENNETT
Lieutenant General, USA
Director

Soviet Space Program



SOVIET space activities continued at a record level during 1969, with a total of 80 launch attempts. Major achievements included:

- Impact of two interplanetary capsules on Venus,
- Rendezvous and docking of two Soyuz-type spacecraft,
- Flight of an unmanned circumlunar probe,
- Launching of 11 cosmonauts into space—7 of them in 3 simultaneously orbited Soyuz vehicles.

Military space support programs were continued, including reconnaissance, communications, meteorological, and navigational satellite systems. Scientific and maneuverable payloads also were launched, and there was one launch of the SS-9 Mod-3 fractional orbital bombardment system (FOBS).

Despite these achievements the Soviet space program suffered some significant setbacks during the year. The SL-12—the USSR's largest known booster and the intended workhorse of these lunar and interplanetary programs—failed in seven of nine launchings.* Hard-docking of manned spacecraft also proved a difficult task; of the five manned Soyuz vehicles orbited, only one hard-docking event occurred after close rendezvous.

Venus launchings

The Soviet space program got off to a good start in 1969 with two

*For details see "SL-12 Space Launch System," February 1970 issue, page 6.

1969

Another active year in space exploration and research, replete with military support applications, was marred by partial failures in interplanetary and man-related probes.

interplanetary probes making parachute descents through the atmosphere of Venus. Both failed to function to the planet's surface, however. Venus 5, launched on 5 January, made a parachute descent through the atmosphere on 16 May. Venus 6, launched on 10 January, entered the dark side of the planet on 17 May, approximately 180 nautical miles from the Venus 5 encounter. It was the 14th Soviet attempt to launch spacecraft to Venus since 1961. Venus 5 and 6 weighed 2,492 pounds—54 pounds heavier than Venus 4, the only previous probe in the series to have met with any degree of success.

Some measurements obtained from Venus 4, launched in 1968, were erroneous because the probe's barometer and densitometer did not have adequate ranges. The Soviets falsely claimed that Venus 4 had soft-landed on the planet. No such claim was made for Venus 5 and 6, and the data obtained during these probes were probably more reliable.

Data obtained from Venus 5 and 6 included measurements of temperature and pressure and information on the chemical composition of the Venus atmosphere. The missions also provided data on interplanetary space and measurements of the magnetic fields and charged particles during the pre-encounter phase of the flights.

Destination—Mars

The Soviets launched one and possibly two unsuccessful payloads to Mars in 1969. The first attempt malfunctioned during launch on 27 March, and a second possible Mars probe was attempted on 2 April. Failure on the first attempt resulted from the initial employment of the SL-12 space launch system in the Soviet interplanetary program. The SL-12, a four-stage vehicle, is believed capable of placing about 5,000 pounds in Mars orbit. All previous interplanetary probes had used the SL-6 (SS-6 booster with a Venik third stage and a parking-orbit-ejection fourth stage).

Lunar probes

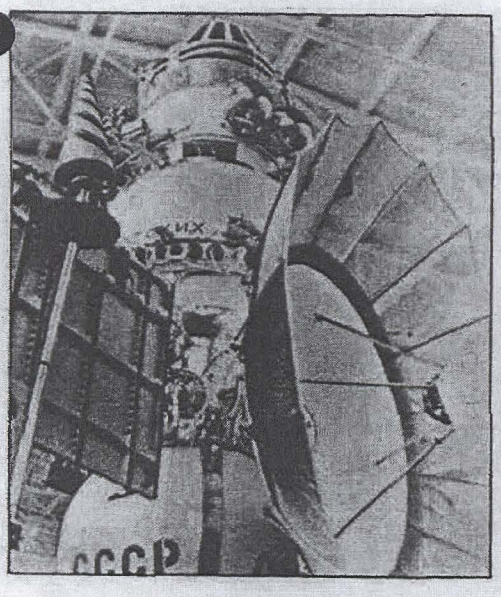
The lunar orbiter/lander program also was plagued with problems during 1969. Four launchings were attempted—all employing the SL-12 launch system. Of these, one did not achieve orbit and two failed to eject into translunar trajectories (Cosmos 300 and 305).

Luna 15, the only partially successful mission, lifted off from Tyuratam on 13 July. The first successful lunar orbiter launched by the SL-12, the vehicle orbited the moon from 17 to 21 July. However, a maneuver to guide the spacecraft to a soft lunar landing failed, and the vehicle crashed.

Man-related space activity

Soyuz 4 and 5—the Soviets claimed the first successful experimental space station with the rendezvous and docking of Soyuz 4 and 5. On 16 January, Soyuz 4, piloted by Col Vladimir A. Shatalov, was launched from Tyuratam. The following day, as Soyuz 4 was about to pass over Tyuratam, Soyuz 5, carrying a crew of three, was launched. On 16 January, while Soyuz 4 and 5 were on orbits 33 and 17, respectively, and about 100 meters apart, Shatalov made a manual approach and docked with Soyuz 5. The two spacecraft remained rigidly docked for about three orbits. During that time, two of the four Soyuz crewmen, Lt Col Yevgeny V. Khrunov and Aleksei S. Yeliseyev, a civilian, made a tethered "space walk" and transfer from Soyuz 5 to Soyuz 4. The tethers—connecting the cosmonauts to the spacecraft during the transfer operation—probably contained the hard wires for communications and biomedical monitoring of the cosmonauts during their extravehicular activity. Soyuz 4, with the three men aboard, was deorbited on 17 October within the USSR, and Soyuz 5, with Lt Col Boris V. Volynov aboard, was deorbited on 18 October.

Soyuz 6, 7, and 8—The successful launchings of Soyuz 6, 7, and 8 marked the first time more than four men had been in space at the same time. It also was the first time that three manned spacecraft made simultaneous orbits of the earth in group flight. On three successive days, beginning 11 October, the Soviets launched a Soyuz into rendezvous-compatible orbits. Launches were timed so that the three spacecraft remained relatively close together—only a few minutes apart (a minute represents about 250 nautical miles). Rendezvous and docking were at-



Venus spacecraft [U]

tempted several times, but no docking occurred. Thus the primary purpose of the mission was not achieved.

Soyuz 6 also had a welding-experiment mission. Three relatively unsophisticated remotely controlled welding experiments were conducted inside the forward compartment by the cosmonauts who remained in the aft compartment.

In addition, three SS-7 ICBMs were launched on three successive days while the Soyuz 6 spacecraft was over the missile launch facilities at Tyuratam. The cosmonauts probably observed the launch and powered flight trail of these missiles.

Col Vladimir A. Shatalov, pilot of Soyuz 8, was named commander of the entire seven-man team. The other cosmonauts included Lt Col Georgiy Shonin and Valeriy Kubasov in Soyuz 6; Lt Col Anatoly V. Filipchenko, Vladislav N. Volkov, and Lt Col Victor V. Gorbatko in Soyuz 7; and Aleksei S. Yeliseyev and Shatalov in Soyuz 8. The three spacecraft remained in orbit five days, each completing 80 orbits.

Zond 7—On 7 August, the Soviets launched the unmanned Zond 7 on a circumlunar mission. All four stages of the SL-12 performed flawlessly, and the mission appeared to be a complete success. This was the second attempt in 1969, a failure having occurred in January. Returning from its circumlunar flight, Zond 7 reentered the earth's atmosphere, slowed down, and skipped out of the atmosphere in a suborbital trajectory. The spacecraft again entered the atmosphere and landed in the Soviet Union, some 4,800 nautical miles down range from its atmospheric encounter. Zond 7 probably was a precursor of a manned circumlunar mission, since transmissions included voice, video, and biomedical data.

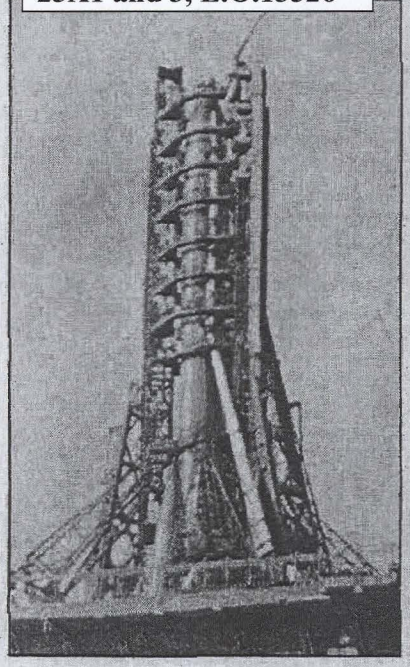
FOBS shot

On 15 September, the Soviets conducted one—apparently successful—orbital test of the FOBS. The mission was announced as a scientific research satellite, and the payload was designated Cosmos 298. While this launch may have been a troop-training firing, additional flights of this type would have to be observed to make a high confidence assessment of a troop training program. The launch came nearly a year after the last known FOBS launch on 2 October 1968.

Reconnaissance

The launch rate for reconnaissance satellites reached a new high in 1969—a total of 32 launches—compared to 29 in 1968 and 25 in 1967. Twenty high-resolution photographic payloads were launched, with a ground resolution of about [redacted] Twelve satellites carried low-resolution cameras

25X1 and 3, E.O.13526



Launcher for Venus probe [U]

Soyuz 6, 7, and 8 cosmonauts: seated are the mission, and Yeliseyev; standing are

[redacted] These also carried a secondary Elint package that apparently has remained essentially unchanged since April 1962. It was probably used to record radar scan rates, antenna lob widths, and probably electromagnetic emissions within preselected bands.

25X1 and 3, E.O.13526

Cosmos 264 and 280, and 317—three high-resolution satellites—performed several in-plane orbital adjustments. Their orbit adjustment engines were separated from the payload before de-orbit occurred. This orbital adjustment capability provides a change in the orbital period, thus altering the ground track. Each of the Cosmos vehicles were in orbit for 13 days, the longest period in the program's history.

Nineteen satellites, including 10 with high resolution, were launched from the Plesetsk Missile and Space Center. These used the nominal 65-degree or greater inclinations providing coverage of the higher latitudes. Thirteen, including 10 high-resolution satellites, were launched from Tyuratam and employed the 52- and 65-degree inclinations. The one exception was Cosmos 264 which employed the 70-degree inclination.

During the year, the Soviets launched two satellites from Plesetsk into nearly 300 nautical mile circular orbits. The launch vehicle was the SL-8 (SS-5 IRBM plus restartab upper stage). Analysis of these two satellites (Cosmos 269 and 315) shows

Kubasov, Shonkin, Shatalov, commander of Gerbatko, Filipchenko and Volkov. [U]

activity predominantly over areas of prime intelligence interest to the USSR. These vehicles have been identified as information-collection satellites. They may have an Elint-reconnaissance mission.

Communications

Molniya-I/11, launched from Tyuratam on 11 April, and Molniya-I/12, launched on 22 July, provided the Soviets with five active communications satellites, three of which are probably still functioning. The launch vehicle in both cases was the SL-6, which had been used in all Molniya-I operations.

Molniya-type satellites have an orbital period of 12 hours, and are so spaced that they can be used for daily limited-access communications. Since the orbits are highly elliptical, with apogees in the northern hemisphere, they provide excellent coverage for ground terminals at high latitudes such as Moscow and Vladivostok. Television programs originating from these cities are relayed by satellite to receiving stations (Orbita) in remote regions of the USSR. Orbita stations relay the program by radio-relay transmission or cable to local TV stations.

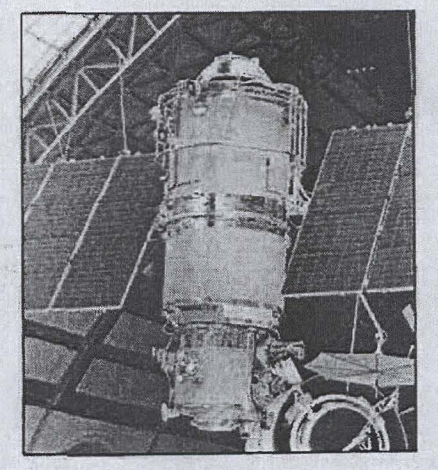
Within the Soviet Union only Moscow and Vladivostok terminals reportedly receive telephone and telegraph traffic or have a ground-to-satellite transmission capability. The space support ship, *Komarov*, provides the only Comsat terminal outside the USSR. This terminal probably can communicate with the USSR via Molniya-I from almost any point at sea in the northern hemisphere.

Meteorological

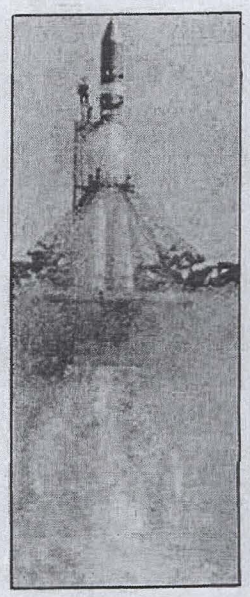
During 1969 the Soviets attempted to launch three meteorological satellites from Plesetsk on a nominal 81-degree inclination. The first, on 1 February, failed during launch. Two subsequent launches—on 26 March and 6 October—were successful and were designated Meteor by the Soviets. Prior to these launches, the name Meteor was applied to the overall weather satellite system—the satellites, ground stations, and processing/distribution installations.

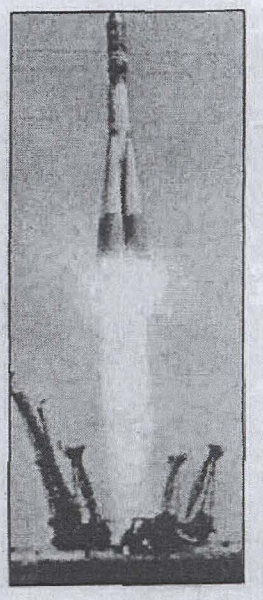
25X1 and 3, E.O.13526

The Soviets have endeavored to keep two active weather satellites in orbit continuously. Meteor 2, probably replacing Cosmos 226, was launched approximately 120-degrees out-of-phase of Meteor. This occasion enabled TASS to stress the scientific and peaceful uses of the Meteor system; not mentioned was the military value inherent in a network which provides meteorological observations.



Meteorological satellite [C]





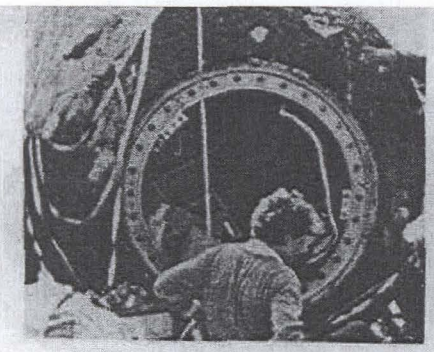
Vostok launching [U]

Navigation

Four navigation satellites (NAVSATS) were placed into a 74-degree orbital inclination during 1969 from Plesetsk by the SL-8 launch system. Cosmos 272 (launched on 17 March) and Cosmos 312 (launched on 24 November) were placed into a near-circular earth orbit of about 650 nautical miles. Cosmos 292 and 304, launched on 13 August and 21 October, respectively, had near-circular orbits of about 400 nautical miles.

The Soviets have used two different orbital altitudes in their navigational satellite program. The vehicle on the lower orbit (about 400 nautical miles) may be civilian-oriented; the one at the higher orbit (650 nautical miles) may have a military application. The higher altitude satellite provides a greater line-of-sight radius that is helpful over ocean areas.

The navigation satellite program was phased with the development of recent nuclear-powered ballistic missile submarines. Such satellites would provide a reliable aid for refining the location of launch points for sea-launched ballistic missiles in time of war. The extent to which they are used is not known. Currently, the Soviets have five active NAVSATs in orbit; three at the higher and two at the lower orbit.



Early Soyuz [U]

Scientific

Fifteen scientific research satellites were launched during 1969, two less than in 1968. Four were launched from Kapustin Yar; 11 were launched from Plesetsk—one of which failed to achieve orbit and one failed to transmit data. These small satellites, weighing from 400 to 800 pounds, were placed into orbit by the SL-7 (consisting of the SS-4 and an upper stage). A number of these satellites conduct research on space environment, emphasizing radiation measurements.

On 14 October, the Soviets launched Intercosmos-1 from Kapustin Yar. TASS announced that Intercosmos-1 was a cooperative program of socialist countries, and that the payload carried scientific instruments developed/produced in East Germany, the Soviet Union, and Czechoslovakia. The flight was directed by an operational group consisting of specialists from the three contributing countries.

The announced purpose of Intercosmos-1 was to study the sun's ultraviolet and X-ray radiation and the effects on the structure of the earth's upper atmosphere. Facilities in Bulgaria, Hungary, East Germany, Romania, Czechoslovakia, and the Soviet Union observed the satellite's operations.

On 25 December, Intercosmos-2 was launched from Kapustin Yar. TASS announced that parts of the scientific instruments were made in Bulgaria, in addition to the three nations which were involved in Intercosmos-1.

Maneuverable

Four launches during 1969 were made with an SL-11 that may have included a maneuvering payload. Two failed to achieve orbit, with a malfunction occurring on the maneuvering stage. Cosmos 291 and 316, launched on 6 August and 23 December respectively, had initial apogees of 300 and 900 nautical miles respectively. The space launch system used has been both versions of the SL-11.

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No orbital maneuvers were detected on Cosmos 291. [redacted]

SOVIET LAUNCHES

LAUNCH DATE	VEHICLE	LAUNCH AREA	RESOLUTION
	Photoreconnaissance		
12 Jan	Cosmos 263	Plesetsk	Low
23 Jan	Cosmos 264	Tyuratam	High
25 Feb	Cosmos 266	Plesetsk	Low
26 Feb	Cosmos 267	Tyuratam	High
6 Mar	Cosmos 270	Plesetsk	High
15 Mar	Cosmos 271	Plesetsk	High
22 Mar	Cosmos 273	Plesetsk	Low
24 Mar	Cosmos 274	Tyuratam	High
4 Apr	Cosmos 276	Plesetsk	High
9 Apr	Cosmos 278	Plesetsk	Low
15 Apr	Cosmos 279	Tyuratam	High
23 Apr	Cosmos 280	Tyuratam	High
13 May	Cosmos 281	Plesetsk	Low
20 May	Cosmos 282	Plesetsk	High
29 May	Cosmos 284	Tyuratam	High
15 Jun	Cosmos 286	Plesetsk	High
24 Jun	Cosmos 287	Tyuratam	Low
27 Jun	Cosmos 288	Tyuratam	High
10 Jul	Cosmos 289	Plesetsk	High
22 Jul	Cosmos 290	Plesetsk	Low
16 Aug	Cosmos 293	Tyuratam	Low
19 Aug	Cosmos 294	Plesetsk	High
29 Aug	Cosmos 296	Tyuratam	High
2 Sep	Cosmos 297	Plesetsk	High
18 Sep	Cosmos 299	Tyuratam	High
24 Sep	Cosmos 301	Plesetsk	Low
17 Oct	Cosmos 302	Plesetsk	High
24 Oct	Cosmos 306	Tyuratam	Low
12 Nov	Cosmos 309	Plesetsk	Low
15 Nov	Cosmos 310	Tyuratam	High
3 Dec	Cosmos 313	Plesetsk	Low
23 Dec	Cosmos 317	Plesetsk	High
	Scientific		
7 Feb	Cosmos 265	Plesetsk	
5 Mar	Cosmos 268	Kapustin Yar	
28 Mar	Cosmos 275	Plesetsk	
4 Apr	Cosmos 277	Plesetsk	
27 May	Cosmos 283	Plesetsk	
3 Jun	Cosmos 285	Plesetsk	
23 Jul	Failure	Plesetsk	
22 Aug	Cosmos 295	Plesetsk	
14 Oct	Intercosmos-1	Kapustin Yar	
18 Oct	Cosmos 303	Plesetsk	
24 Oct	Cosmos 307	Kapustin Yar	
4 Nov	Cosmos 308	Plesetsk	
24 Nov	Cosmos 311	Plesetsk	
11 Dec	Cosmos 314	Plesetsk	
25 Dec	Intercosmos-2	Kapustin Yar	
	SS9 Mod-3		
15 Sep	Cosmos 298	Tyuratam	
	Elint		
5 Mar	Cosmos 269	Tyuratam	
20 Dec	Cosmos 315	Plesetsk	

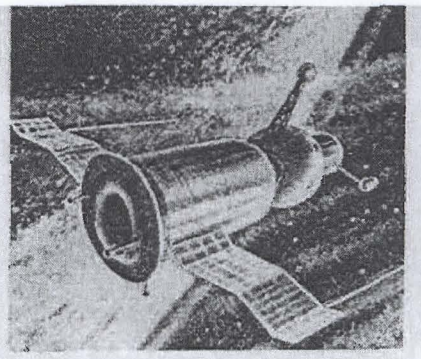
25X1 and 3, E.O.13526

that the satellite suffered a mission failure. The vehicle subsequently decayed in the earth's atmosphere on 8 September.

Cosmos 316 [redacted] Initially it was injected into a 90-nautical-mile perigee, 900-nautical-mile apogee orbit by the SL-11. It was the first maneuverable satellite to be launched into a 49-degree orbit from Tyuratam. Previous maneuverable satellites have been launched from Tyuratam on 62- and 65-degree inclinations.

DURING 1969

LAUNCH DATE	VEHICLE	LAUNCH AREA
	Interplanetary	
5 Jan	Venus-5	Tyuratam
10 Jan	Venus-6	Tyuratam
27 Mar	Failure (Mars Probe)	Tyuratam
2 Apr	Possible Failure (Mars Probe)	Tyuratam
	Lunar	
14 Jun	Failure	Tyuratam
13 Jul	Luna-15	Tyuratam
23 Sep	Cosmos 300	Tyuratam
22 Oct	Cosmos 305	Tyuratam
	Man-Related	
14 Jan	Soyuz-4	Tyuratam
15 Jan	Soyuz-5	Tyuratam
20 Jan	Failure	Tyuratam
7 Aug	Zond-7	Tyuratam
11 Oct	Soyuz-6	Tyuratam
12 Oct	Soyuz-7	Tyuratam
13 Oct	Soyuz-8	Tyuratam
	Communications	
11 Apr	Molniya I/11	Tyuratam
22 Jul	Molniya I/12	Tyuratam
	Navigation	
17 Mar	Cosmos 272	Plesetsk
13 Aug	Cosmos 292	Plesetsk
21 Oct	Cosmos 304	Plesetsk
24 Oct	Cosmos 312	Plesetsk
	Meteorological	
1 Feb	Failure	Plesetsk
26 Mar	Meteor	Plesetsk
6 Oct	Meteor-2	Plesetsk
	Maneuverable	
25 Jan	Failure	Tyuratam
6 Aug	Cosmos 291	Tyuratam
1 Nov	Failure	Tyuratam
23 Dec	Cosmos 316	Tyuratam
	Propulsion Systems Test	
28 Nov	SL-12 Failure	Tyuratam
	Vertical Launches	
Year's total 42	Research	Kapustin Yar
	Undetermined	
27 Dec	SL-8 Failure	Plesetsk

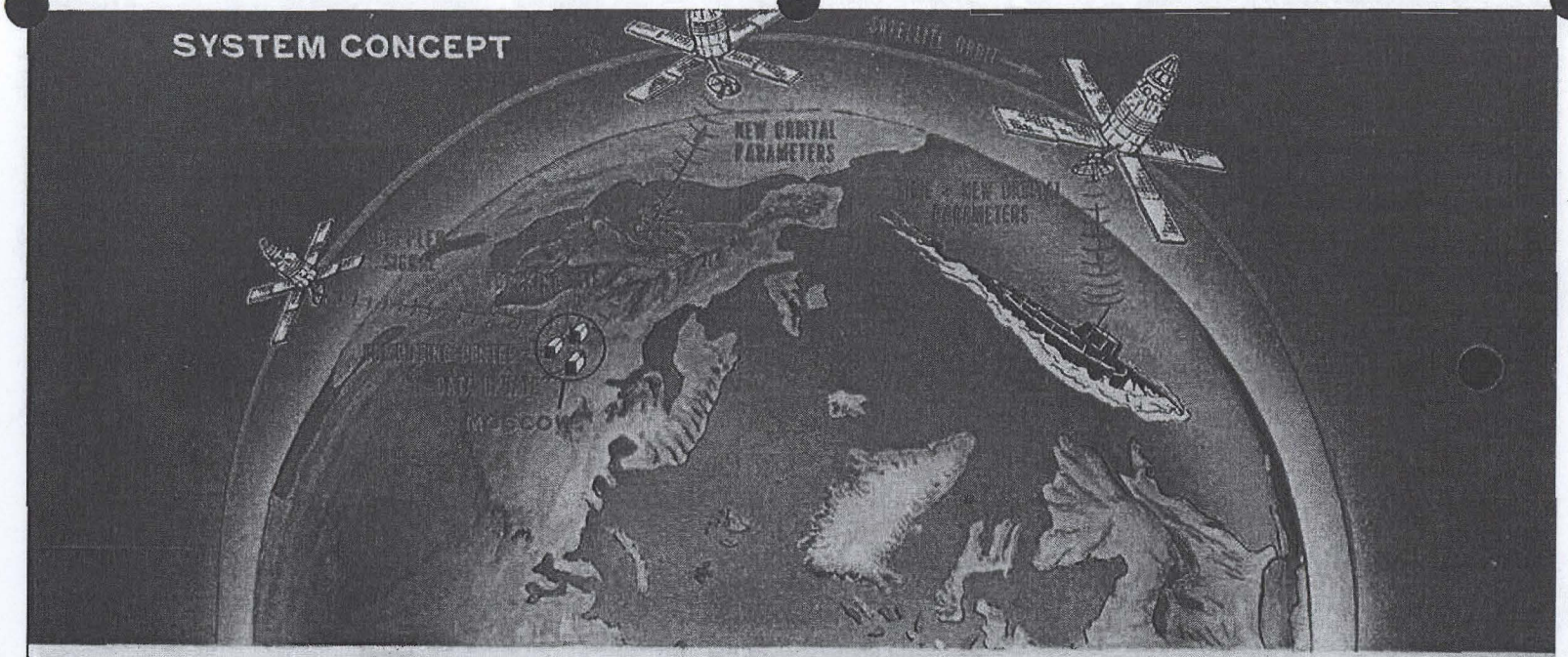


Soviet drawing of Soyuz in orbit [U]

Maneuverable satellites flown in 1968 demonstrated the capability of making significant in-plane orbital changes; about 2,500 ft/sec velocity change has been demonstrated. The data on the maneuverable satellites flown in 1968 were not entirely clear, but the evidence points to development of a satellite negation capability for some of these operations. The flights in 1969, with the different inclinations and trajectories used, cannot be clearly related to the specific testing seen with Cosmos 248, 249, and 252 in the fall of 1968. Thus, the development phase for several programs using the SL-11 and maneuvering stage as a base may be emerging. In any event the circumstances surrounding these tests tend to indicate an involvement with military missions.

Vertical launches

The Soviets launched 42 vertical research vehicles from Kapustin Yar during 1969—ten more than last year's record total of 32 launches. Several of this year's launches occurred during early morning hours, coinciding with known increased solar-flare activity, and at a time of day when unusual propagation conditions often prevail. This high launch rate is undoubtedly related to the fact that the 11-year cycle of solar activity will approach a peak in June-July of 1970. The Soviets are probably conducting this research to better predict major flares, which are of prime importance during the periods of manned launch because of the possible danger of the cosmonaut's exposure to proton/cosmic ray fluxes. [END]



OPERATIONAL NAVSAT

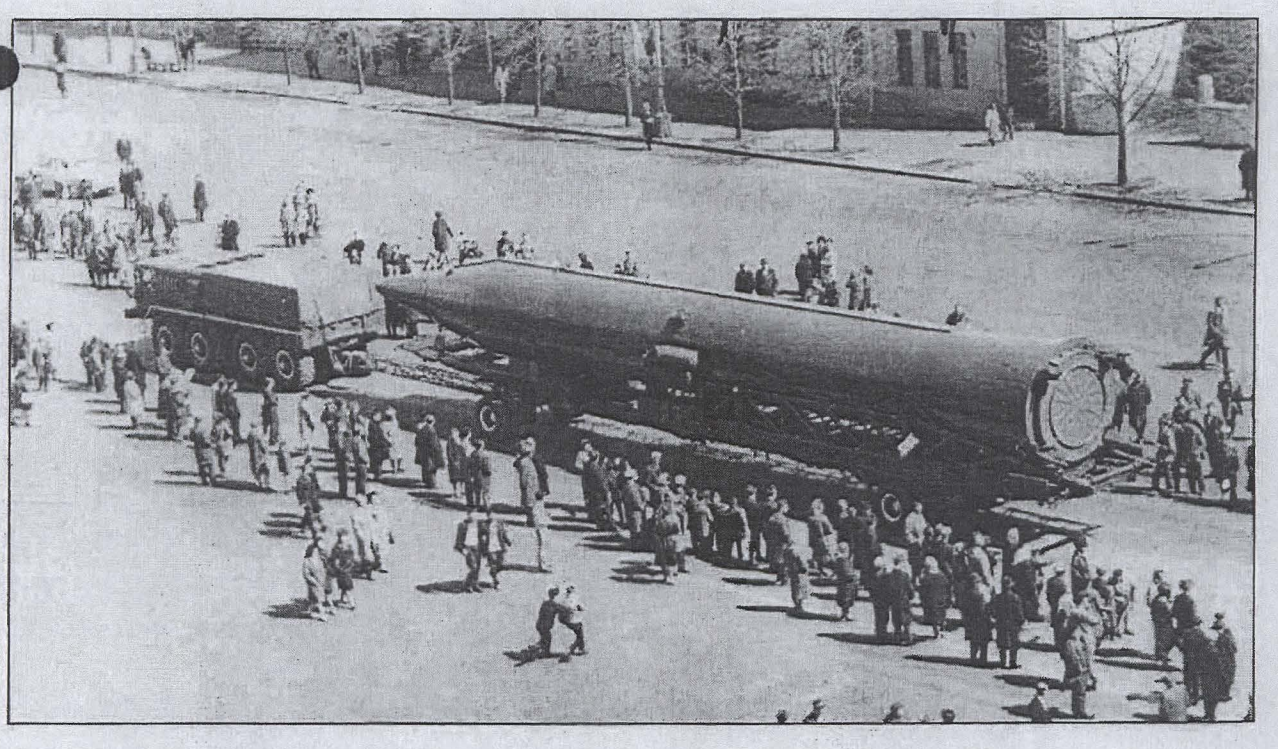
A navigation satellite (NAVSAT) program now underway in the USSR apparently is a success, and deployment of an operational global NAVSAT is expected shortly.

Since 1967, eight satellites have been launched and identified as having a navigation mission. The primary purpose of such vehicles is to provide the user with data for determining his specific location. This is accomplished by the satellite transmitting its location and velocity in a coordinate system. Navigators are thereby provided with a stable time reference and radio frequency for doppler tracking purposes.

The launcher

The SL-8 launch system—used for all navigation satellites—consists of a two-stage tandem vehicle with a second stage restart capability. The initial stage is a modified SS-5 intermediate range ballistic missile; the second stage is designed for space operations.

Estimated payload capability of the system is 3,000 pounds in a 100-nautical-mile (nm) circular orbit. The SL-8 has been used primarily for launching single payloads during the



SS-5 Intermediate Range Ballistic Missile (above). SL-8 system used to launch all navigation satellites employs a modified SS-5 vehicle as the initial stage. [8]

last few years but has also launched triplet and quintuplet satellites.

The launching of Cosmos 192 from Plesetsk on 23 November 1967 was identified as the first successful Soviet NAVSAT launch. This satellite transmitted for almost two years—indicating a long life satellite design.

The navigation satellite is estimated to weigh 1,200 pounds. With a roughly cylindrical configuration, it is about 8 to 10 feet long and 4 feet in diameter. Satellite protrusions could be antennae. Currently, five of the eight satellites launched are active—Cosmos 220, 256, 272, 292, and 312. Cosmos 304 has been the only known payload-initial-operating failure of the eight launches; Cosmos 158 may have been a precursor NAVSAT, launched from Tyuratam, that also failed to operate.

The NAVSAT storage system capacity is ostensibly comparable to that of the US Transit—loaded twice daily with data for 16 hours. As each Transit passes within range of the control facility, orbital data and time corrections are sent to the Transit. Injection of this data at 12-hour intervals provides the required accuracy.

Command activities for this program are suspected to originate from the Moscow area.

EXPERIMENTAL NAVSATS

Cosmos	Launch Date	Apogee (nm)	Perigee (nm)	Period (min.)
192	23 Nov 1967	437	403	100
203	20 Feb 1968	652	630	109
220	7 May 1968	412	362	99
256	30 Nov 1968	666	630	109
272	17 Mar 1969	659	645	109
292	13 Aug 1969	410	400	100
304	31 Oct 1969	418	403	100
312	24 Nov 1969	644	611	108

Looking ahead

The progress and success of the NAVSAT program indicates that the system may be or will soon be operational. The NAVSAT program is probably intended to supply the USSR with a mechanism to refine the accuracy of a submarine-launched ballistic missile and to serve as an oceanic navigation aid. [END]