

Proton-K/D

Part of Proton Family

This four stage version of the Proton was originally designed to send manned circumlunar spacecraft into translunar trajectory. Guidance to the Block D stage must be supplied by spacecraft. The design was proposed on 8 September 1965 by Korolev as an alternate to Chelomei's LK-1 circumlunar mission. It combined the Proton 8K82K booster for the LK-1 with the N1 lunar Block D stage to boost a stripped-down Soyuz 7K-L1 spacecraft around the moon. The Korolev design was selected, and first flight came on 10 March 1967. The crash lunar program led to a poor launch record. Following a protracted ten year test period, the booster finally reached a level of launch reliability comparable to that of other world launch vehicles.



Proton 8K82K / 11S824 - L1 Configuration

AKA: 8K82K / 11S824;D-1e;SL-12.

Status: Retired 1975. **First Launch:**

1967-03-10. **Last Launch:** 1975-06-14.

Number: 39 . **Payload:** 5,390 kg (11,880 lb). **Thrust:** 8,847.00 kN (1,988,884 lbf).

Gross mass: 707,170 kg (1,559,040 lb). **Height:** 57.00 m (187.00 ft). **Diameter:** 4.15 m (13.61 ft). **Span:** 7.40 m (24.20 ft). **Apogee:** 400,000 km (240,000 mi).

Development of a three-stage version of the UR-500 was authorized in the decree of 3 August 1964. Decrees of 12 October and 11 November 1964 authorized development of the Almaz manned military space station and the manned circumlunar spacecraft LK-1 as payloads for the UR-500K. However at the same time Khrushchev was ousted from power. Chelomei lost his chief patron and his projects came under negative scrutiny by the new leadership.

On 8 September 1965 Korolev presented an several schemes for using Chelomei's UR-500 to fly around the moon. One alternate was a two-part spaceship, using the Proton with the upper stage Block D from Korolev's N1-L3 lunar project. This would launch Korolev's 7K-L1 spacecraft (derived from the 7K-OK Soyuz) onto a translunar trajectory. This project received the name UR-500K-L1, and was adopted in place of Chelomei's LK-1 circumlunar project. It required construction of 18 UR-500K rockets, which, in a combination flight-test and government trials program, would send L1 spacecraft around the moon, at first unmanned, then manned.

By 4 October 1966 a dummy rocket was mounted at the launch site. The dummy was loaded with imitation propellants (kerosene as fuel and water/ethyl alcohol as oxidizer). The nitrogen tetroxide oxidizer had to be kept above -11 degrees C, and it was originally planned for a thermostatically-controlled electrical heating of the tank walls to achieve this. It was ultimately decided that the risk of explosion of such a system was too great, and the system was abandoned.

The first flight rocket (serial number 22701) began assembly on 21 November 1966, with mechanical assembly completed by 29 November. Electrical connections and tests were completed by 4 December 1966. Due to New Year's holidays work did not resume until 28 January 1967. By 28 February the fully assembled booster / spacecraft unit was completed in the MIK, including the 7K-L1P boilerplate spacecraft. The launch tower was added on 2 March 1967 and the system was declared ready for launch. A serious potential problem during preparations was the discovery that fuel gases could lead to pump cavitation at the turbine exits. Tests on the ground showed that the problem was not the fuel itself, but in the monitoring equipment.

Although the first launch of the UR-500K-L1 on 10 March was successful, the record for the balance of the manned circumlunar project was dismal. Of the remaining 11 launches of the project, only that of Zond-7 was recognized as fully successful. In 60% of the failures the fault was in the launch vehicle; in 20% the Block D; and in 20% the spacecraft. Therefore the probability of successfully carrying out the objective of the project - safely flying a cosmonaut around the moon and returning him to earth - was only 9%.

Remarkably, due to continuing failures, the 8K82K did not satisfactorily complete its state trials until its 61st launch (Salyut 6 / serial number 29501 / 29 September 1977). Thereafter it reached a level of launch reliability comparable to that of other world launch vehicles.

Payload: 5,390 kg (11,880 lb) to a translunar trajectory. *Launch Price* \$: 70.000 million in 1994 dollars.

More at: [Proton-K/D](#)

Family: [orbital launch vehicle](#). *Country:* [Russia](#). *Engines:* [RD-0210](#), [RD-0212](#), [RD-253-11D48](#), [RD-58](#). *Spacecraft:* [Soyuz 7K-L1](#), [Luna Ye-8](#), [Mars M-69](#), [Luna Ye-8-5](#), [Soyuz 7K-L1E](#), [Mars M-71](#), [Luna Ye-8-LS](#), [DLB Beacon Lander](#), [Mars M-73](#), [Luna Ye-8-5M](#), [Venera 4V-1](#). *Projects:* [Luna](#), [Lunar L1](#), [Lunar L3](#), [Mars](#), [Venera](#). *Launch Sites:* [Baikonur](#), [Baikonur LC81/23](#), [Baikonur LC81/24](#). *Stages:* [Proton K-1](#), [Proton K-2](#), [Proton K-3](#), [Proton 11S824](#). *Agency:* [Chelomei bureau](#).

1965 September 8 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Development of four stage version of the Proton proposed.** - . *Nation:* [Russia](#). *Related Persons:* [Chelomei](#), [Korolev](#). The design was proposed by Korolev as an alternate to Chelomei's LK-1 circumlunar mission. It combined the Proton 8K82K booster for the LK-1 with the N1 lunar Block D stage to boost a stripped-down Soyuz 7K-L1 spacecraft around the moon..
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1966 October 4 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Dummy Proton/Block D mounted on pad.** - . *Nation:* [Russia](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#).

A dummy 8K82K/Block D rocket was mounted at the launch site. The dummy was loaded with imitation propellants (kerosene as fuel and water/ethyl alcohol as oxidiser). The nitrogen tetroxide oxidiser had to be kept above -11 degrees C, and it was originally planned for a thermostatically-controlled electrical heating of the tank walls to achieve this. It was ultimately decided that the risk of explosion of such a system was too great, and the system was abandoned.

1966 November 21 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **First Proton/Soyuz L1 begins assembly.** - . *Nation:* [Russia](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#).

The first flight rocket (serial number 22701) began assembly on 21 November 1966, with mechanical assembly completed by 29 November. Electrical connections and tests were completed by 4 December 1966. Due to New Year's holidays work did not resume until 28 January 1967. By 28 February the fully assembled booster / spacecraft unit was completed in the MIK, including the 7K-L1P boilerplate spacecraft.

1967 February 4 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **UR-500K/L1 manned circumlunar design authorised.** - . *Nation:* [Russia](#). *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#). Central Committee of the Communist Party and Council of Soviet Ministers Decree 115-46 'On the Progress of the Work on the Development of the UR500K-L1 --confirmation of schedule for piloted lunar missions' was issued..

1967 March 10 - . 11:30 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Cosmos 146** - . *Payload:* Soyuz 7K-L1P s/n 2P. *Mass:* 5,017 kg (11,060 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#). *Duration:* 7.90 days. *Decay Date:* 1967-03-18 . *USAF Sat Cat:* 2705 . *COSPAR:* 1967-021A. *Apogee:* 312 km (193 mi). *Perigee:* 178 km (110 mi). *Inclination:* 51.5000 deg. *Period:* 89.30 min.

Prototype Soyuz 7K-L1P launched by Proton into planned highly elliptical earth orbit. The first flight four-stage Proton rocket began assembly on 21 November 1966, with mechanical assembly completed by 29 November. Electrical connections and tests were completed by 4 December 1966. Due to New Year's holidays work did not resume until 28 January 1967. By 28 February the fully assembled booster / spacecraft unit was completed in the MIK, including the 7K-L1P boilerplate spacecraft. The launch tower was added on 2 March 1967 and the system was declared ready for launch. A serious potential problem during preparations was the discovery that fuel gases could lead to pump cavitation at the turbine exits. Tests on the ground showed that the problem was not the fuel itself, but in the monitoring

equipment. The launch vehicle and Block D stage functioned correctly and put the spacecraft into a translunar trajectory. The spacecraft was not aimed at the moon, did not have a heat shield for reentry, and no recovery was planned or attempted. A successful launch that created false confidence just before the string of failures that would follow.

1967 April 8 - . 09:00 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#). *FAILURE:* Block D ullage rocket failure; no restart.. *Failed Stage:* U.

- **Cosmos 154** - . *Payload:* Soyuz 7K-L1P s/n 3P. *Mass:* 5,020 kg (11,060 lb). *Nation:* [Russia](#). *Related Persons:* [Chelomei](#), [Mishin](#), [Tsybin](#). *Agency:* [RVSN](#). *Program:* [Lunar L1](#), [Soyuz](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#). *Duration:* 1.98 days. *Decay Date:* 1967-04-10 . *USAF Sat Cat:* 2745 . *COSPAR:* 1967-032A. *Apogee:* 203 km (126 mi). *Perigee:* 187 km (116 mi). *Inclination:* 51.5000 deg. *Period:* 88.30 min.

Prototype Soyuz 7K-L1 manned circumlunar spacecraft. There are high winds for the L1 launch, 15-17 m/s. The official limit is 20 m/s, but Chelomei wants to scrub the launch if winds go over 15 m/s. Nevertheless the launch proceeds in 17-18 m/s winds and the L1 reached earth orbit. However the Block D translunar injection stage failed to fire (ullage rockets, which had to fire to settle propellants in tanks before main engine fired, were jettisoned prematurely). The failure is blamed on Mishin and has Tsybin seething in anger. Mishin is disorganised and has made many mistakes. Spacecraft burned up two days later when orbit decayed. Later in the day comes the news the RTS has to be replaced on one of the Soyuz 1/2 spacecraft. This will have a 3 to 4 day schedule impact, and push the launch back to 15-20 April. The crews arrive the same day for the upcoming Soyuz launch.

1967 September 27 - . 22:11 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#). *FAILURE:* First stage -1 RD-253 failed, resulting at T+67 sec in deviation from flight path.. *Failed Stage:* 1.

- **Soyuz 7K-L1 s/n 4L** - . *Payload:* Soyuz 7K-L1 s/n 4L. *Mass:* 5,390 kg (11,880 lb). *Nation:* [Russia](#). *Related Persons:* [Barmin](#), [Mishin](#). *Agency:* [RVSN](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#). *Decay Date:* 1967-09-28 .

First attempted circumlunar flight. The UR-500K failed, crashing 50 to 60 km from the launch pad. The L1 radio beacon was detected 65 km north of the Baikonur aerodrome by an Il-14 search aircraft. An Mi-6 helicopter recovered the capsule and had it back to the cosmodrome by 13:30. Mishin's record: of seven launches of the Soyuz and L1, only one has been successful. Film of the launch shows that one engine of the first stage failed. Mishin still wants to launch the next L1 by 28 October. The other chief designers oppose the move. Barmin says at least five months are needed to diagnose the cause of the failures and makes fixes to ensure they don't happen again. Nevertheless the leadership sides with Mishin, and Barmin is ordered to prepare the left Proton pad for a launch within 30 to 40 days.

1967 November 22 - . 19:07 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#). *FAILURE:* Second stage - 1 x

RD-0210 failure, shutoff of stage 4 seconds after ignition. Launcher crashed downrange..
Failed Stage: 2.

- **Soyuz 7K-L1 s/n 5L - .** *Payload: Soyuz 7K-L1 s/n 5L. Mass: 5,390 kg (11,880 lb). Nation: [Russia](#). Related Persons: [Chelomei](#), [Glushko](#), [Leonov](#), [Mishin](#). Agency: [RVSN](#). Program: [Lunar L1](#). Class: [Manned](#). Type: Manned spacecraft. Spacecraft Bus: [Soyuz](#). Spacecraft: [Soyuz 7K-L1](#). Decay Date: 1967-11-21 .*

The launch takes place at 00:07 local time (22:07 on 22 November Moscow time). Glushko, Chelomei, and Kamanin observe the launch from an observation point in -5 deg C weather. Three to four seconds after second stage ignition, the SAS pulls the spacecraft away from the booster. Telemetry shows that engine number 4 of stage 2 never ignited, and after 3.9 seconds the remaining three engines were shut down by the SBN (Booster Safety System) and the SAS abort tower fired. The capsule's radio beacon was detected and the spacecraft was found 80 km southwest of Dzhezkazgan, 285 km down range. The Proton problems are maddening. Over 100 rocket launches have used engines from this factory, with no previous failure. Of ten of the last launches under Mishin's direction (6 Soyuz and 4 L1) only two have went well - an 80% failure rate! Mishin is totally without luck. Kamanin and Leonov take an An-12 to see the L1 at its landing point. Leonov wants to see proof that the cosmonauts would be saved in any conditions. The capsule landed in -17 deg C and 12 m/s winds. The parachute pulled the capsule along the ground for 550 m, and the soft landing rockets fired somewhere above the 1.2 m design height. After safing of the APO self-destruct package, the capsule is lifted to an airfield by a Mi-4.

1968 February 21 - . *LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#).*

- **L1 Launch Commission. - .** *Nation: [Russia](#). Related Persons: [Glushko](#), [Konopatov](#), [Mishin](#). Program: [Lunar L1](#), [Soyuz](#). Spacecraft: [Soyuz 7K-L1](#), [Soyuz 7K-OK](#).*

The booster failure on the previous launch was found to be due to premature fuel injection during engine start, causing initial chamber temperatures to rise 200 degrees above normal. Glushko and Konopatov both guarantee their engines for the next launch. The next L1 flight will use the 'Krug' landing predictor. This will predict the landing point to within a 150 x 150 km area two to three hours before re-entry. Landing points on the three previous flights would have been 2000 km from Madagascar and India, Novosibirsk, and the North Pole... Mishin plans the next dual Soyuz flight for 5-10 April. Kamanin protests that the parachute and sea trials of the redesigned capsule are not yet complete. Mishin, as usual, dismisses his concerns.

1968 February 29 - . *LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#).*

- **L1 commsion meeting. - .** *Nation: [Russia](#). Related Persons: [Chelomei](#). Program: [Lunar L1](#). Spacecraft Bus: [Soyuz](#). Spacecraft: [Soyuz 7K-L1](#).*

For this L1 launch Chelomei wants to film separation of the first and second stages of the Proton rocket at 126 seconds into the flight - altitude 41 km, distance downrange 47 km. To do this two An-12 and one Tu-124 with long focal-length cameras will orbit 35 to 40 km from base. The discussion turns to how to recover the L1 if it lands in the ice-bound Aral Sea. The circle of possible landing points has a radius of 500

km from a point west of Karaganda. For political reasons it is not possible to deploy recovery forces to areas of Iran and India that are within this circle.

1968 March 2 - . 18:29 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Zond 4** - . *Payload:* Soyuz 7K-L1 s/n 6L. *Mass:* 5,390 kg (11,880 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#) . *Duration:* 5.22 days. *Decay Date:* 1968-03-09 . *USAF Sat Cat:* 3134 . *COSPAR:* 1968-013A. *Apogee:* 400,000 km (240,000 mi). *Perigee:* 191 km (118 mi). *Inclination:* 51.6000 deg. *Period:* 15,561.71 min.

What at first seemed to be a success, very much needed by the L1 program, ended in failure. The Proton booster lifted off in 18 m/s winds, -3 deg C temperatures, and into very low clouds - it disappeared from view at only 150 m altitude. Aircraft at 9, 10, and 11 km altitude reported the cloud deck topped 8300 m, with 1.5 to 2.0 km visibility. The spacecraft was successfully launched into a 330,000 km apogee orbit 180 degrees away from the moon. On reentry, the guidance system failed, and the planned double skip maneuver to bring the descent module to a landing in the Soviet Union was not possible. Ustinov had ordered the self-destruct package to be armed and the capsule blew up 12 km above the Gulf of Guinea. Kamanin disagreed strongly with this decision; the spacecraft could have still been recovered in the secondary area by Soviet naval vessels after a 20 G reentry. The decision was made to recover the spacecraft in the future whenever possible.

Officially: Solar Orbit (Heliocentric). Study of remote regions of circumterrestrial space, development of new on-board systems and units of space stations.

1968 April 22 - . 23:01 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#). *FAILURE:* Second stage shut-off prematurely due to short-circuit in Zond control system.. *Failed Stage:* 2.

- **Soyuz 7K-L1 s/n 7L** - . *Payload:* Soyuz 7K-L1 s/n 7L. *Mass:* 5,390 kg (11,880 lb). *Nation:* [Russia](#). *Agency:* [RVSN](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#). *Decay Date:* 1968-04-22 .

L1 launch attempt, lift-off at 02:00 local time. The spacecraft was to separate at 589 seconds into the flight. Instead at 260 seconds, a short circuit in the malfunction detection system incorrectly indicated a launch vehicle failure. This in turn triggered the SAS abort system. The SAS shut down the good stage and separated the spacecraft from the booster. The capsule landed safely 520 km downrange from the launch site. This was the third such abort, which if nothing else proved the reliability of the SAS - all of the spacecraft landed safely.

1968 July 15 - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *Launch Pad:* LC81/pad?. *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **L1 pad explosion.** - . *Nation:* [Russia](#). *Agency:* [RVSN](#). *Program:* [Lunar L1](#). *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#).

During launch preparations with the fuelled Proton / L1, there was an explosion, killing three technicians. Their death alone indicates the area around the pad was unsafe at the time. The Block D oxidiser tank of the L1 exploded - the first such failure in 30 uses. The rocket and spacecraft were relatively undamaged. The third stage of the Proton had some external damage due to exposure to the Block D's fuel, but it can be cleaned. The real question is how to remove the L1 spacecraft on the pad. A helicopter could hoist the spacecraft away, but the available Mi-6 or V-10 helos can lift only 8 to 10 tonnes, and the L1 weighs 14 tonnes. A V-10 crew is sent to investigate the possibilities anyway. Some engineers suggest just firing the BPO abort tower and lifting the capsule away from the stack! Emergency political and military meetings are held at the cosmodrome to discuss the impending invasion of Czechoslovakia.

1968 September 14 - . 21:42 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Zond 5** - . *Payload:* Soyuz 7K-L1 s/n 9L. *Mass:* 5,390 kg (11,880 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#) . *Duration:* 5.76 days. *Decay Date:* 1968-09-21 . *USAF Sat Cat:* 3394 . *COSPAR:* 1968-076A. *Apogee:* 385,000 km (239,000 mi). *Perigee:* 200 km (120 mi). *Inclination:* 51.5000 deg. *Period:* 14,722.06 min.

First successful circumlunar flight with recovery. Test flight of manned spacecraft; launched from an earth parking orbit to make a lunar flyby and return to earth. On September 18, 1968, the spacecraft flew around the moon at an altitude of 1950 km. High quality photographs of the earth were taken at a distance of 90,000 km. A biological payload of turtles, wine flies, meal worms, plants, seeds, bacteria, and other living matter was included in the flight. Before re-entry the gyroscopic platform went off line due to ground operator failure. However this time the self destruct command was not given. After a ballistic 20G re-entry the capsule splashed down in the Indian Ocean at 32:63 S, 65:55 E on September 21, 1968 16:08 GMT. Soviet naval vessels were 100 km from the landing location and recovered the spacecraft the next day, shipping it via Bombay back to Soviet Union. *Additional Details:* [here....](#)

1968 November 10 - . 19:11 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Zond 6** - . *Payload:* Soyuz 7K-L1 s/n 12L. *Mass:* 5,375 kg (11,849 lb). *Nation:* [Russia](#). *Related Persons:* [Bushuyev](#). *Agency:* [MOM](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#) . *Duration:* 5.79 days. *Decay Date:* 1968-11-17 . *USAF Sat Cat:* 3535 . *COSPAR:* 1968-101A. *Apogee:* 400,000 km (240,000 mi). *Perigee:* 200 km (120 mi). *Inclination:* 51.5000 deg. *Period:* 15,562.22 min.

Test flight of manned circumlunar spacecraft. Successfully launched towards the moon with a scientific payload including cosmic-ray and micrometeoroid detectors, photography equipment, and a biological specimens. A midcourse correction on 12 November resulted in a loop around the moon at an altitude of 2,420 km on 14 November. Zond 6 took spectacular photos of the moon's limb with the earth in the

background. Photographs were also taken of the lunar near and far side with panchromatic film from distances of approximately 11,000 km and 3300 km. Each photo was 12.70 by 17.78 cm. Some of the views allowed for stereo pictures. On the return leg a gasket failed, leading to cabin depressurisation, which would have been fatal to a human crew. The 7K-L1 then made the first successful double skip trajectory, dipping into the earth's atmosphere over Antarctica, slowing from 11 km/sec to suborbital velocity, then skipping back out into space before making a final re-entry onto Soviet territory. The landing point was only 16 km from the pad from which it had been launched toward the moon. After the re-entry the main parachute ejected prematurely, ripping the main canopy, leading to the capsule being destroyed on impact with the ground. One negative was recovered from the camera container and a small victory obtained over the Americans. But the criteria for a manned flight had obviously not been met and Mishin's only hope to beat the Americans was a failure or delay in the Apollo 8 flight set for December. The next Zond test was set for January. *Additional Details:* [here...](#)

1969 January 20 - . 04:14 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#). *FAILURE:* Second stage - One RD-0210 engine fails at T+510 sec, resulting in flight path deviation, automatic shutoff of launch vehicle.. *Failed Stage:* 2.

- **Soyuz 7K-L1 s/n 13L** - . *Payload:* Soyuz 7K-L1 s/n 13L. *Mass:* 5,390 kg (11,880 lb). *Nation:* [Russia](#). *Related Persons:* [Mishin](#), [Smirnov](#), [Ustinov](#). *Agency:* [RVSN](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#). *Decay Date:* 1969-01-19 .

Launch failure - but the abort system again functioned perfectly, taking the capsule to a safe landing (in Mongolia!). At 501 seconds into the flight one of the four engines of the second stage shut down, and remained shut down for 25 seconds. The ever-reliable SAS abort system detected the failure, and separated the capsule from the failed booster. Yet again a successful capsule recovery after a booster failure. *Additional Details:* [here...](#)

1969 February 4 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **UR-500K failure state commission** - . *Nation:* [Russia](#). *Related Persons:* [Babakin](#), [Konopatov](#). *Program:* [Luna](#). *Spacecraft:* [Luna Ye-8](#).

At Area 81 a State Commission is held on failures of the UR-500K booster. A D Konopatov describes the analysis of the stage 2 and 3 failures on the 20 January launch attempt. The number 4 engine of stage 2 shut down 25 seconds into its burn due to high temperatures detected in the turbopump. The same thing occurred on the third stage. The couldn't pin down the source of the problem. Engines of this type had worked correctly 700 times on earlier flights. Despite the cause of the failure not being identified, approval is given at 14:30 for the launch of the Ye-8 to proceed. Babakin confirms the spacecraft is ready.

1969 February 19 - . 06:48 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#). *FAILURE:* First-stage engine failure caused the rocket to crash 15 km from the pad.. *Failed Stage:* 1.

- **Ye-8 s/n 201 + Lunokhod s/n 201 - first stage malfunction** - . *Payload: Ye-8 s/n 201 / 8EL No. 201. Mass: 5,600 kg (12,300 lb). Nation: [Russia](#). Agency: [RVSN](#). Program: [Luna](#). Class: [Moon](#). Type: Lunar probe. Spacecraft: [Luna Ye-8](#). Decay Date: 1969-02-19 .*

Attempted launch of a Ye-8 with a Lunokhod lunar rover. Evidently coordinate in some way with the N1 launch two days later. A first-stage booster engine failure causes the rocket to crash 15 km from the pad after a lift-off at 09:48 local time. Kamanin meanwhile has the Hong Kong flu.

1969 March 27 - . 10:40 GMT - . *Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#). FAILURE: T+51s payload shroud failed. Second stage continued but third stage failed to ignite.. Failed Stage: S.*

- **M-69 s/n 521** - . *Payload: M-69 s/n 521. Nation: [Russia](#). Agency: [RVSN](#). Program: [Mars](#). Class: [Mars](#). Type: Mars probe. Spacecraft Bus: [4MV](#). Spacecraft: [Mars M-69](#). Decay Date: 1969-03-27 . Mars probe intended to enter Martian orbit and comprehensively photograph Mars, together with a landing probe..*

1969 April 2 - . 10:33 GMT - . *Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/24](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#). FAILURE: First stage - 1 x RD-253 fire beginning at T+ 0.02 sec, rocket crashed near pad.. Failed Stage: 1.*

- **M-69 s/n 522** - . *Payload: M-69 s/n 522. Nation: [Russia](#). Agency: [RVSN](#). Program: [Mars](#). Class: [Mars](#). Type: Mars probe. Spacecraft Bus: [4MV](#). Spacecraft: [Mars M-69](#). Decay Date: 1969-04-02 .*

Mars probe intended to enter Martian orbit and comprehensively photograph Mars, together with a landing probe. Further Mars launches during the 1969 launch window were cancelled when this attempt resulted in a major accident, which almost wiped out all of the leaders of the space industry. The Proton rocket lifted off, but one engine failed. The vehicle flew at an altitude of 50 m horizontally, finally exploding only a short distance from the launch pad, spraying the whole complex with poisonous propellants that were quickly spread by the wind. Everyone took off in their autos to escape, but which direction to go? Finally it was decided that the launch point was the safest, but this proved to be even more dangerous - the second stage was still intact and liable to explode. The contamination was so bad that there was no way to clean up - the only possibility was just to wait for rain to wash it away. This didn't happen until the Mars launch window was closed, so the first such probe was not put into space until 1971. This accident also severely damaged plans to divert attention from America's Apollo programme during the rest of 1969. 10-12 UR-500K launches had been intended to land on the moon lunar soil return and rover robots to supplement the N1 launches.

1969 June 14 - . 04:00 GMT - . *Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/24](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#). FAILURE: Block D upper stage did not fire and payload did not attain earth orbit,. Failed Stage: U.*

- **Ye-8-5 s/n 402** - . *Payload: Ye-8-5 s/n 402. Mass: 5,600 kg (12,300 lb). Nation: [Russia](#). Agency: [RVSN](#). Program: [Lunar L1](#), [Luna](#). Class: [Moon](#). Type: Lunar probe. Spacecraft Bus: [Luna Ye-8](#). Spacecraft: [Luna Ye-8-5](#). Decay Date: 1969-06-04 .*

Another attempt to launch a Ye-8-5 to return lunar soil to the earth, 'scooping', the Americans' impending Apollo 11 mission. Yet another UR-500K launch failure. This time the UR-500K booster functioned perfectly, but the Block D upper stage did not fire, and the payload did not even attain earth orbit. Every UR-500K launch is costing the Soviet state 100 million roubles. This failure pretty much ended the chances for the Russians to trump the American moon landing. *Tass* yesterday began running stories to prepare the masses for the upcoming Apollo 11 triumph. The party line is that the Soviet Union is not about to risk the lives of its cosmonauts on flights to the moon, when automated probes can safely retrieve soil from the moon for study on earth. *Additional Details:* [here...](#)

1969 July 13 - . 02:54 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Luna 15** - . *Payload:* Ye-8-5 s/n 401. *Mass:* 5,600 kg (12,300 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-5](#). *Decay Date:* 1969-07-21 . *USAF Sat Cat:* 4036 . *COSPAR:* 1969-058A. *Apogee:* 870 km (540 mi). *Perigee:* 240 km (140 mi). *Inclination:* 126.0000 deg. *Period:* 160.00 min.

Unmanned soil return mission launched coincident with Apollo 11 mission in last ditch attempt to return lunar soil to earth before United States. After completing 86 communications sessions and 52 orbits of the Moon at various inclinations and altitudes, crashed on the moon on 20 July in an attempted landing. Altitude data used in programming inaccurate or guidance system unable to cope with effect of lunar mascons.

Officially: Testing of on-board systems of the automatic station and further scientific investigation of the moon and circumlunar space. Parameters are for lunar orbit.

1969 August 1 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **The DOS Conspiracy begins** - . *Nation:* [Russia](#). *Related Persons:* [Chelomei](#), [Mishin](#). *Program:* [Lunar L3](#), [Almaz](#), [Salyut](#). *Spacecraft:* [Almaz OPS](#), [LK](#), [MKBS](#), [Soyuz 7K-LOK](#).

With the collapse of the work on the N1, the whole reason for Mishin's design bureau's existence simply vanished in the air. A new high-priority project was needed. Korolev had begun development of a Multi-Module Space Base (MKBS) before 1966. However MKBS was to be launched by the N1; as long as this was not available, there would be no MKBS. Almaz on the other hand did not require a new launch vehicle, although the UR-500 was in a period of intense 'baby sickness'. So while TsKBEM was in a period of analysis and instability, Chelomei's Reutov and Fili facilities were building space stations for the Ministry of Defence.

On one of these August 1969 days, three of Chelomei's TsKBM engineers came to the office of Mishin's deputy, Chertok, with a plan to get a space station orbited before the American Skylab. They wanted a collaboration between the two competing design bureaux. Their plan was to take an Almaz spaceframe, install Soyuz systems, add a new docking tunnel with a hatch to reach the interior, and presto - a space station was finished. Tentative discussions with potential allies within Chelomei's

design bureau found support there as well. The DOS 'long-duration orbiting station' was the result of this 'conspiracy'.

1969 August 7 - . 23:48 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Zond 7** - . *Payload:* Soyuz 7K-L1 s/n 11. *Mass:* 5,379 kg (11,858 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Lunar L1](#). *Class:* [Manned](#). *Type:* Manned spacecraft. *Spacecraft Bus:* [Soyuz](#). *Spacecraft:* [Soyuz 7K-L1](#) . *Duration:* 5.00 days. *Decay Date:* 1969-08-14 . *USAF Sat Cat:* 4062 . *COSPAR:* 1969-067A. *Apogee:* 400,000 km (240,000 mi). *Perigee:* 200 km (120 mi). *Inclination:* 51.5000 deg. *Period:* 15,562.22 min.

Circumlunar flight; successfully recovered in USSR August 13, 1969. Only completely successful L1 flight that could have returned cosmonauts alive or uninjured to earth. Official mission was further studies of the moon and circumlunar space, to obtain colour photography of the earth and the moon from varying distances, and to flight test the spacecraft systems. Earth photos were obtained on August 9, 1969. On August 11, 1969, the spacecraft flew past the moon at a distance of 1984.6 km and conducted two picture taking sessions. Successfully accomplished double-dip re-entry and landed 50 km from aim point near Kustani in the USSR.

1969 September 23 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Two Volga buses transport the cosmonauts and VVS specialists to Area 31** - . *Nation:* [Russia](#). *Related Persons:* [Beregovoi](#), [Chelomei](#), [Mishin](#). *Program:* [Luna](#). *Flight:* [Soyuz 6](#), [Soyuz 7](#), [Soyuz 8](#). *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-5](#).

To ensure the buses do not exceed 60 km/hour checkpoints are manned along the roads. The readiness review is conducted from 10:00 to 13:00. The crews, and spacecraft are ready. Mishin is away 'sick' again. General Pushkin and Beregovoi are at Area 81 to view the Ye-8-5 launch. Kamanin likes Chelomei's UR-500K rocket. He blames its series of failures on its engines and Block D upper stage, not on the fundamental booster design. If it had been more successful, the Russians would have beaten the Americans in a lunar flyby. The launch proceeds as planned at 15:00, but the Block D fails to restart in parking orbit, and is given the cover name 'Cosmos 300'.

1969 September 23 - . 14:07 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#). *FAILURE:* Block D lost LOX due to valve defect.. *Failed Stage:* U.

- **Cosmos 300** - . *Payload:* Ye-8-5 s/n 403. *Mass:* 5,600 kg (12,300 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-5](#). *Decay Date:* 1969-09-27 . *USAF Sat Cat:* 4104 . *COSPAR:* 1969-080A. *Apogee:* 189 km (117 mi). *Perigee:* 184 km (114 mi). *Inclination:* 51.5000 deg. *Period:* 88.20 min. Robotic lunar soil return mission. Failed to leave low earth orbit due to Block D stage failure..
-

1969 September 24 - . LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#).

- **Ye-8-5 failure analysis** - . Nation: [Russia](#). Related Persons: [Savin](#), [Smirnov](#), [Tyulin](#). Program: [Luna](#). Flight: [Soyuz 6](#), [Soyuz 7](#), [Soyuz 8](#). Spacecraft Bus: [Luna Ye-8](#). Spacecraft: [Luna Ye-8-5](#).

The cause of the Ye-8-5 failure is found to be a valve that was stuck open after the first stage burn, resulting in the oxidiser boiling away in the vacuum of space. Tyulin inquires about the possibility of commanding the Ye-8-5 to conduct a series of manoeuvres and testing re-entry of the soil return capsule in the earth's atmosphere. An interesting concept, but the engineers have not planned for such an eventuality.

NII-2 MO, represented by Lt General Korolev and Chief Designer Savin present plans for their Svinets experiment. It will observe ICBM rocket plumes from space in order to aid design of anti-ballistic missile systems. They had asked Smirnov to conduct a solid propellant rocket launch in order to test the device properly, but he could only schedule a liquid propellant rocket launch. Kamanin had wanted this experiment to be conducted aboard Voskhod 3, but Smirnov has cancelled that mission as well - delaying Soviet ABM development, in Kamanin's view.

1969 October 22 - . 14:09 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/24](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#). FAILURE: Block D control system failure.. Failed Stage: U.

- **Cosmos 305** - . Payload: Ye-8-5 s/n 404. Mass: 5,600 kg (12,300 lb). Nation: [Russia](#). Agency: [MOM](#). Program: [Luna](#). Class: [Moon](#). Type: Lunar probe. Spacecraft Bus: [Luna Ye-8](#). Spacecraft: [Luna Ye-8-5](#). Decay Date: 1969-10-24 . USAF Sat Cat: 4150 . COSPAR: 1969-092A. Apogee: 208 km (129 mi). Perigee: 182 km (113 mi). Inclination: 51.4000 deg. Period: 88.40 min. Robotic lunar soil return mission. Failed to leave low earth orbit due to Block D stage failure..

1969 November 28 - . 09:00 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#). FAILURE: First stage malfunction.. Failed Stage: 1.

- **Soyuz 7K-L1E s/n 1 - first stage malfunction** - . Payload: Soyuz 7K-L1E s/n 1. Mass: 10,380 kg (22,880 lb). Nation: [Russia](#). Agency: [RVSN](#). Program: [Luna](#). Class: [Moon](#). Type: Manned lunar spacecraft. Spacecraft Bus: [Block D](#). Spacecraft: [Soyuz 7K-L1E](#). Decay Date: 1969-11-16 .

Attempted test flight of Block D upper stage in N1 lunar crasher configuration. Payload was a modified Soyuz 7K-L1 circumlunar spacecraft, which provided guidance to the Block D and was equipped with television cameras that viewed the behavior of the Block D stage propellants under zero-G conditions. Mission flown successfully over a year later as Cosmos 382.

1970 February 6 - . 04:16 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). Launch Pad: LC81/23?. LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#). FAILURE: Failure of vehicle on launch.. Failed Stage: 1.

- **Ye-8-5 s/n 405 - failure of vehicle on launch** - . Payload: Ye-8-5 s/n 405. Mass: 5,600 kg (12,300 lb). Nation: [Russia](#). Agency: [RVSN](#). Program: [Luna](#). Class: [Moon](#). Type: Lunar probe. Spacecraft Bus: [Luna Ye-8](#). Spacecraft: [Luna Ye-8-5](#). Decay Date: 1970-02-06 . Robotic lunar soil return mission..
-

1970 September 12 - . 13:25 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#).

- **Luna 16** - . Payload: Ye-8-5 s/n 406. Mass: 5,600 kg (12,300 lb). Nation: [Russia](#). Agency: [MOM](#). Program: [Luna](#). Class: [Moon](#). Type: Lunar probe. Spacecraft Bus: [Luna Ye-8](#). Spacecraft: [Luna Ye-8-5](#). Decay Date: 1970-09-24 . USAF Sat Cat: 4527 . COSPAR: 1970-072A. Apogee: 110 km (60 mi). Perigee: 110 km (60 mi). Inclination: 70.0000 deg. Period: 119.00 min.

Lunar Sample Return. Landed on Moon 20 September 1970 at 05:18:00 GMT, Latitude 0.68 S, Longitude 56.30 E - Mare Fecunditatis. Luna 16 was launched toward the Moon from a preliminary earth orbit and entered a lunar orbit on September 17, 1970. On September 20, the spacecraft soft landed on the lunar surface as planned. The spacecraft was equipped with an extendable arm with a drilling rig for the collection of a lunar soil sample. After 26 hours and 25 minutes on the lunar surface, the ascent stage, with a hermetically sealed soil sample container, left the lunar surface carrying 100 grams of collected material. It landed in the Soviet Union on September 24, 1970. The lower stage of Luna 16 remained on the lunar surface and continued transmission of lunar temperature and radiation data. Parameters are for lunar orbit.

1970 October 20 - . 19:55 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#).

- **Zond 8** - . Payload: Soyuz 7K-L1 s/n 14. Mass: 5,390 kg (11,880 lb). Nation: [Russia](#). Agency: [MOM](#). Program: [Lunar L1](#). Class: [Manned](#). Type: Manned spacecraft. Spacecraft Bus: [Soyuz](#). Spacecraft: [Soyuz 7K-L1](#) . Duration: 5.17 days. Decay Date: 1970-10-27 . USAF Sat Cat: 4591 . COSPAR: 1970-088A. Apogee: 400,000 km (240,000 mi). Perigee: 200 km (120 mi). Inclination: 51.6000 deg. Period: 15,562.22 min.

Final circumlunar flight; successfully recovered October 26, 1970. The announced objectives were investigations of the moon and circumlunar space and testing of onboard systems. The spacecraft obtained photographs of the earth on October 21 from a distance of 64,480 km. The spacecraft transmitted flight images of the earth for three days. Zond 8 flew past the moon on October 24, 1970, at a distance of 1,110.4 km and obtained both black and white and colour photographs of the lunar surface. Scientific measurements were also obtained during the flight. The spacecraft used a new variant of the double-dip re-entry, coming in over the north pole, bouncing off the atmosphere, being tracked by Soviet radar stations as it soared south over the Soviet Union, then making a final precision re-entry followed by splashdown at the recovery point in the Indian Ocean.

1970 November 10 - . 14:44 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#).

- **Luna 17** - . Payload: Ye-8 s/n 203. Mass: 5,600 kg (12,300 lb). Nation: [Russia](#). Agency: [MOM](#). Program: [Luna](#). Class: [Moon](#). Type: Lunar probe. Spacecraft: [Ye-8](#). Decay Date: 1970-11-17 . USAF Sat Cat: 4691 . COSPAR: 1970-095A. Apogee: 85 km (52 mi). Perigee: 85 km (52 mi). Inclination: 141.0000 deg. Period: 116.00 min.

Luna 17 was launched from an earth parking orbit towards the Moon and entered lunar orbit on November 15, 1970. Luna 17 landed on Moon 17 November 1970 at 03:47:00 GMT, Latitude 38.28 N, Longitude 325.00 E - Mare Imbrium (Sea of Rains). The payload, the Lunokhod 1 unmanned rover, rolled down a ramp from the landing stage and began exploring the surface. Lunokhod was intended to operate through three lunar days but actually operated for eleven lunar days (earth months). The operations of Lunokhod officially ceased on October 4, 1971, the anniversary of Sputnik 1. By then it had traveled 10,540 m and had transmitted more than 20,000 TV pictures and more than 200 TV panoramas. It had also conducted more than 500 lunar soil tests. Parameters are for lunar orbit.

1970 December 2 - . 17:00 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#).

- **Cosmos 382** - . Payload: Soyuz 7K-L1E s/n 2K. Mass: 10,380 kg (22,880 lb). Nation: [Russia](#). Agency: [MOM](#). Program: [Lunar L3](#). Class: [Manned](#). Type: Manned spacecraft. Spacecraft Bus: [Block D](#). Spacecraft: [Soyuz 7K-L1E](#). Duration: 8,549.30 days. USAF Sat Cat: 4786 . COSPAR: 1970-103A. Apogee: 5,269 km (3,273 mi). Perigee: 2,384 km (1,481 mi). Inclination: 55.9000 deg. Period: 171.00 min.

Test of Block D upper stage in its N1 lunar crasher configuration in earth orbit. The three maneuvers simulated the lunar orbit insertion burn; the lunar orbit circularization burn; and the descent burn to bring the LK lunar lander just over the surface. Payload was a modified Soyuz 7K-L1 circumlunar spacecraft, which provided guidance to the Block D and was equipped with television cameras that viewed the behavior of the Block D stage propellants under zero-G conditions.

Maneuver Summary:

190km X 300km orbit to 303km X 5038km orbit. Delta V: 982 m/s
 318km X 5040km orbit to 1616km X 5071km orbit. Delta V: 285 m/s
 1616km X 5071km orbit to 2577km X 5082km orbit. Delta V: 1311 m/s
 Total Delta V: 2578 m/s.

1971 May 10 - . 16:58 GMT - . Launch Site: [Baikonur](#). Launch Complex: [Baikonur LC81/23](#). LV Family: [Proton](#). Launch Vehicle: [Proton-K/D](#). **FAILURE:** No Block D ignition due wrong timer setting.. Failed Stage: U.

- **Cosmos 419** - . Payload: M-71 s/n 170. Mass: 4,650 kg (10,250 lb). Nation: [Russia](#). Agency: [MOM](#). Program: [Mars](#). Class: [Mars](#). Type: Mars probe. Spacecraft Bus: [4MV](#). Spacecraft: [Mars M-71](#). Decay Date: 1971-05-12 . USAF Sat Cat: 5221 . COSPAR: 1971-042A. Apogee: 187 km (116 mi). Perigee: 134 km (83 mi). Inclination: 51.5000 deg. Period: 87.70 min.

Mars probe intended to enter Martian orbit and comprehensively photograph Mars. Rocket block failed to reignite in Earth Orbit. It is widely believed this spacecraft was launched with the primary purpose of overtaking Mariner 8, which had been launched (unsuccessfully, as it turned out) two days earlier, and becoming the first

Mars orbiter. The Proton booster successfully put the spacecraft into low (174 km x 159 km) Earth parking orbit with an inclination of 51.4 degrees, but the Block D stage 4 failed to function due to a bad ignition timer setting (the timer, which was supposed to start ignition 1.5 hours after orbit was erroneously set for 1.5 years.) The orbit decayed and the spacecraft re-entered Earth's atmosphere 2 days later on 12 May 1971. The mission was designated Cosmos 419.

1971 May 19 - . 16:22 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Mars 2** - . *Payload:* M-71 s/n 171. *Mass:* 4,650 kg (10,250 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Mars](#). *Class:* [Mars](#). *Type:* Mars probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Mars M-71](#). *USAF Sat Cat:* 5234 . *COSPAR:* 1971-045A. *Apogee:* 25,000 km (15,000 mi). *Perigee:* 1,380 km (850 mi). *Inclination:* 48.9000 deg. *Period:* 1,080.00 min.

Mars probe intended to conduct of a series of scientific investigations of the planet Mars and the space around it. Parameters are for Mars orbit. Mid-course corrections were made on 17 June and 20 November. Mars 2 released the descent module (1971-045D) 4.5 hours before reaching Mars on 27 November 1971. The descent system malfunctioned and the lander crashed at 45 deg S, 302 deg W, delivering the Soviet Union coat of arms to the surface. Meanwhile, the orbiter engine performed a burn to put the spacecraft into a 1380 x 24,940 km, 18 hour orbit about Mars with an inclination of 48.9 degrees. Scientific instruments were generally turned on for about 30 minutes near periapsis. Data was sent back for many months. It was announced that Mars 2 and 3 had completed their missions by 22 August 1972. On-orbit dry mass: 2265 kg. Had the lander survived, data would have been relayed to the earth via the orbiter.

1971 May 28 - . 15:26 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Mars 3** - . *Payload:* M-71 s/n 172. *Mass:* 4,643 kg (10,236 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Mars](#). *Class:* [Mars](#). *Type:* Mars probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Mars M-71](#). *USAF Sat Cat:* 5252 . *COSPAR:* 1971-049A. *Apogee:* 214,500 km (133,200 mi). *Perigee:* 1,528 km (949 mi). *Inclination:* 60.0000 deg. *Period:* 18,243.00 min.

Mars probe intended to conduct of a series of scientific investigations of the planet Mars and the space around it. Parameters are for Mars orbit. The Mars 3 orbiter also carried a French-built experiment which was not carried on Mars 2. Called Spectrum 1, the instrument measured solar radiation at metric wavelengths in conjunction with Earth-based receivers to study the cause of solar outbursts. The Spectrum 1 antenna was mounted on one of the solar panels. A mid-course correction was made on 8 June. The descent module (COSPAR 1971-049F) was released at 09:14 GMT on 2 December 1971 about 4.5 hours before reaching Mars. Through aerodynamic braking, parachutes, and retro-rockets, the lander achieved a soft landing at 45 S, 158 W and began operations. However, after 20 sec the instruments stopped working for unknown reasons. Meanwhile, the orbiter engine performed a burn to put the spacecraft into a long 11-day period orbit about Mars with an inclination thought to

be similar to that of Mars 2 (48.9 degrees). Data was sent back for many months. It was announced that Mars 2 and 3 had completed their missions by 22 August 1972.

1971 September 2 - . 13:40 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Luna 18** - . *Payload:* Ye-8-5 s/n 407. *Mass:* 5,600 kg (12,300 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-5](#). *Decay Date:* 1971-09-11 . *USAF Sat Cat:* 5448 . *COSPAR:* 1971-073A. *Apogee:* 100 km (60 mi). *Perigee:* 100 km (60 mi). *Inclination:* 35.0000 deg. *Period:* 119.00 min.

Attempted lunar soil return mission; crashed while attempting to soft land at Latitude 3.57 N, Longitude 50.50 E - Mare Fecunditatis. Luna 18 used a new method of navigation in lunar orbit and for landing. The spacecraft's designer, Babakhin, had died at age 56 only the month before. Luna 18 successfully reached earth parking orbit before being put on a translunar trajectory. On September 7, 1971, it entered lunar orbit. The spacecraft completed 85 communications sessions and 54 lunar orbits before it was sent towards the lunar surface by use of braking rockets. It impacted the Moon on September 11, 1971, in a rugged mountainous terrain. Signals ceased at the moment of impact. Parameters are for lunar orbit.

1971 September 28 - . 10:00 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Luna 19** - . *Payload:* Ye-8-LS s/n 202. *Mass:* 5,810 kg (12,800 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-LS](#). *USAF Sat Cat:* 5488 . *COSPAR:* 1971-082A. *Apogee:* 140 km (80 mi). *Perigee:* 140 km (80 mi). *Inclination:* 40.6000 deg. *Period:* 121.75 min.

Heavy lunar Orbiter; conducted lunar surface mapping. Luna 19 entered an intermediate earth parking orbit and was then put on a translunar trajectory by the Proton Block D stage. It entered lunar orbit on October 3, 1971. Luna 19 extended the systematic study of lunar gravitational fields and location of mascons (mass concentrations). It also studied the lunar radiation environment, the gamma-active lunar surface, and the solar wind. Photographic coverage via a television system was also obtained. Parameters are for lunar orbit.

1972 February 14 - . 03:27 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Luna 20** - . *Payload:* Ye-8-5 s/n 408. *Mass:* 5,600 kg (12,300 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-5](#). *Decay Date:* 1972-02-25 . *USAF Sat Cat:* 5835 . *COSPAR:* 1972-007A. *Apogee:* 100 km (60 mi). *Perigee:* 100 km (60 mi). *Inclination:* 65.0000 deg. *Period:* 118.00 min.

Soft landed on Moon; returned soil samples to Earth. Landed on Moon 21 February 1972 at 19:19:00 GMT, Latitude 3.57 N, Longitude 56.50 E - Mare Fecunditatis. Luna 20 was placed in an intermediate earth parking orbit and from this orbit was sent

towards the Moon. It entered lunar orbit on February 18, 1972. On 21 February 1972, Luna 20 soft landed on the Moon in a mountainous area known as the Apollonius highlands, 120 km from where Luna 18 had crashed. While on the lunar surface, the panoramic television system was operated. Lunar samples were obtained by means of an extendable drilling apparatus. The ascent stage of Luna 20 was launched from the lunar surface on 22 February 1972 carrying 30 grams of collected lunar samples in a sealed capsule. It landed in the Soviet Union on 25 February 1972. The lunar samples were recovered the following day.

1972 October 18 - . *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **UR-500K failure investigation.** - . *Nation:* [Russia](#). *Related Persons:* [Afanasyev, Sergei](#). Afanasyev was back at the cosmodrome for investigation of the latest UR-500K failure..
-

1973 January 8 - . 06:55 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Luna 21** - . *Payload:* Ye-8 s/n 204. *Mass:* 5,567 kg (12,273 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft:* [Luna Ye-8](#). *Decay Date:* 1973-01-15 . *USAF Sat Cat:* 6333 . *COSPAR:* 1973-001A. *Apogee:* 110 km (60 mi). *Perigee:* 90 km (55 mi). *Inclination:* 60.0000 deg. *Period:* 118.00 min.

The Proton / Block D launcher put the spacecraft into Earth parking orbit followed by translunar injection. On 12 January 1973, Luna 21 braked into a 90 x 100 km orbit about the Moon. On 13 and 14 January, the perilune was lowered to 16 km altitude. On 15 January after 40 orbits, the braking rocket was fired at 16 km altitude, and the craft went into free fall. At an altitude of 750 meters the main thrusters began firing, slowing the fall until a height of 22 meters was reached. At this point the main thrusters shut down and the secondary thrusters ignited, slowing the fall until the lander was 1.5 meters above the surface, where the engine was cut off. Landing occurred at 23:35 GMT in LeMonnier crater at 25.85 degrees N, 30.45 degrees E. The lander carried a bas relief of Lenin and the Soviet coat-of-arms. After landing, Lunokhod 2 took TV images of the surrounding area, then rolled down a ramp to the surface at 01:14 GMT on 16 January and took pictures of the Luna 21 lander and landing site. It stopped and charged batteries until 18 January, took more images of the lander and landing site, and then set out over the Moon. The rover would run during the lunar day, stopping occasionally to recharge its batteries via the solar panels. At night the rover would hibernate until the next sunrise, heated by the radioactive source. Lunokhod 2 operated for about 4 months, covered 37 km of terrain including hilly upland areas and rilles, and sent back 86 panoramic images and over 80,000 TV pictures. Many mechanical tests of the surface, laser ranging measurements, and other experiments were completed during this time. On June 4 it was announced that the program was completed, leading to speculation that the vehicle probably failed in mid-May or could not be revived after the lunar night of May-June. The Lunokhod was not left in a position such that the laser retroreflector could be used, indicating that the failure may have happened suddenly.

1973 July 21 - . 19:30 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Mars 4** - . *Payload:* M-73 s/n 52S. *Mass:* 4,650 kg (10,250 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Mars](#). *Class:* [Mars](#). *Type:* Mars probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Mars M-73](#). *USAF Sat Cat:* 6742 . *COSPAR:* 1973-047A.

Failed; did not enter Martian orbit as planned; intended to be a Mars orbiter mission. Mars 4 reached Mars on 10 February 1974. Due to use of helium in preflight tests of the computer chips, which resulted in degradation of the chips during the voyage to Mars, the retro-rockets never fired to slow the craft into Mars orbit. Mars 4 flew by the planet at a range of 2,200 km. It returned one swath of pictures and some radio occultation data. Final heliocentric orbit 1.02 x 1.63 AU, 2.2 degree inclination, 556 day period.

1973 July 25 - . 18:55 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Mars 5** - . *Payload:* M-73 s/n 53S. *Mass:* 4,650 kg (10,250 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Mars](#). *Class:* [Mars](#). *Type:* Mars probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Mars M-73](#). *USAF Sat Cat:* 6754 . *COSPAR:* 1973-049A.

Mars probe intended to enter Martian orbit and comprehensively photograph Mars. Parameters are for Mars orbit. Mars 5 reached Mars on 12 February 1974 and was inserted into a 1760 km x 32,586 km orbit. Due to computer chip failures the orbiter operated only a few days and returned atmospheric data and images of a small portion of the Martian southern hemisphere.

1973 August 5 - . 17:45 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/23](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Mars 6** - . *Payload:* M-73 s/n 50P. *Mass:* 4,650 kg (10,250 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Mars](#). *Class:* [Mars](#). *Type:* Mars probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Mars M-73](#). *USAF Sat Cat:* 6768 . *COSPAR:* 1973-052A.

Mars probe intended to make a soft landing on Mars. Total fueled launch mass of the lander and orbital bus was 3260 kg. It reached Mars on 12 March 1974, separated from the bus, and entered the atmosphere, where a parachute opened, slowing the descent. As the probe descended through the atmosphere it transmitted data for 150 seconds, representing the first data returned from the atmosphere of Mars. Unfortunately, the data were largely unreadable due to a flaw in a computer chip which led to degradation of the system during its journey to Mars. When the retro-rockets fired for landing, contact was lost with the craft. Mars 6 landed at about 24 degrees south, 25 degrees west in the Margaritifer Sinus region of Mars. Bus ended up in a final heliocentric orbit 1.01 x 1.67 AU, 2.2 degree inclination, 567 day period.

1973 August 9 - . 17:00 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Mars 7** - . *Payload:* M-73 s/n 51P. *Mass:* 4,650 kg (10,250 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Mars](#). *Class:* [Mars](#). *Type:* Mars probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Mars M-73](#). *USAF Sat Cat:* 6776 . *COSPAR:* 1973-053A.

Mars probe intended to make a soft landing on Mars. Mars 7 reached Mars on 9 March 1974. Due to a problem in the operation of one of the onboard systems (attitude control or retro-rockets) the landing probe separated prematurely and missed the planet by 1,300 km. The early separation was probably due to a computer chip error which resulted in degradation of the systems during the trip to Mars. Ended up in a final heliocentric orbit 1.01 x 1.69 AU, 2.2 degree inclination, 574 day period.

1974 May 29 - . 08:56 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Luna 22** - . *Payload:* Ye-8-LS s/n 206. *Mass:* 5,835 kg (12,863 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-LS](#). *Decay Date:* 1975-12-31 . *USAF Sat Cat:* 7315 . *COSPAR:* 1974-037A. *Apogee:* 220 km (130 mi). *Perigee:* 220 km (130 mi). *Inclination:* 19.6000 deg. *Period:* 130.00 min.

Heavy lunar orbiter. Scientific investigation of the moon and circumlunar space from the orbit of an artificial satellite of the Moon, which was begun by the Luna 19 automatic station. The spacecraft carried imaging cameras and also had the objectives of studying the Moon's magnetic field, surface gamma ray emissions and composition of lunar surface rocks, and the gravitational field, as well as micrometeoroids and cosmic rays. Luna 22 braked into a circular lunar orbit on 2 June 1974. The spacecraft made many orbit adjustments over its 18 month lifetime in order to optimise the operation of various experiments, lowering the perilune to as low as 25 km. Manoeuvring fuel was exhausted on 2 September and the mission was ended in early November. Parameters are for lunar orbit.

1974 October 28 - . 14:30 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Luna 23** - . *Payload:* Ye-8-5M s/n 410. *Mass:* 5,300 kg (11,600 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Luna](#). *Class:* [Moon](#). *Type:* Lunar probe. *Spacecraft Bus:* [Luna Ye-8](#). *Spacecraft:* [Luna Ye-8-5](#). *Decay Date:* 1974-11-06 . *USAF Sat Cat:* 7491 . *COSPAR:* 1974-084A. *Apogee:* 105 km (65 mi). *Perigee:* 17 km (10 mi).

Failed lunar soil return mission. After successfully entering earth orbit, flying to the moon, entering lunar orbit, and descending toward the surface, the spacecraft was damaged during landing in Mare Crisium (Sea of Crises). The sample collecting apparatus could not operate and no samples were returned. The lander continued transmissions for three days after landing. In 1976, Luna 24 landed several hundred meters away and successfully returned samples. Parameters are for lunar orbit.

1975 June 8 - . 02:38 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Venera 9** - . *Payload:* 4V-1 s/n 660. *Mass:* 4,936 kg (10,882 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Venera](#). *Class:* [Venus](#). *Type:* Venus probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Venera 4V-1](#). *USAF Sat Cat:* 7915 . *COSPAR:* 1975-050A. *Apogee:* 112,200 km (69,700 mi). *Perigee:* 1,510 km (930 mi). *Inclination:* 34.1500 deg. *Period:* 2,898.00 min.

Combined Venus orbiter/lander mission. After separation of the lander, the orbiter spacecraft entered Venus orbit and acted as a communications relay for the lander and explored cloud layers and atmospheric parameters. On October 20, 1975, the Descent Craft was separated from the Orbiter, and landing was made with the sun near zenith at 05:13 GMT on October 22. The Descent Craft included a system of circulating fluid to distribute the heat load. This system, plus precooling prior to entry, permitted operation of the spacecraft for 53 min after landing. The landing was about 2,200 km from the Venera 10 landing site. Preliminary results indicated: (A) clouds 30-40 km thick with bases at 30-35 km altitude, (B) atmospheric constituents including HCl, HF, Br, and I, (C) surface pressure about 90 (earth) atmospheres, (D) surface temperature 485 deg C, (E) light levels comparable to those at earth midlatitudes on a cloudy summer day, and (F) successful TV photography showing shadows, no apparent dust in the air, and a variety of 30-40 cm rocks which were not eroded. Venera 9 and 10 were the first probes to send back black and white pictures from the Venusian surface. They were supposed to make 360 degree panoramic shots, but on both landers one of two camera covers failed to come off, restricting their field of view to 180 degrees. Parameters are for Venus orbit.

1975 June 14 - . 03:00 GMT - . *Launch Site:* [Baikonur](#). *Launch Complex:* [Baikonur LC81/24](#). *LV Family:* [Proton](#). *Launch Vehicle:* [Proton-K/D](#).

- **Venera 10** - . *Payload:* 4V-1 s/n 661. *Mass:* 5,033 kg (11,095 lb). *Nation:* [Russia](#). *Agency:* [MOM](#). *Program:* [Venera](#). *Class:* [Venus](#). *Type:* Venus probe. *Spacecraft Bus:* [4MV](#). *Spacecraft:* [Venera 4V-1](#). *USAF Sat Cat:* 7947 . *COSPAR:* 1975-054A. *Apogee:* 113,900 km (70,700 mi). *Perigee:* 1,620 km (1,000 mi). *Inclination:* 29.5000 deg. *Period:* 2,963.00 min.

The orbiter spacecraft entered Venus orbit and was separated from the lander on October 23, 1975. The lander touched down with the sun near zenith, at 05:17 GMT, on October 25. A system of circulating fluid was used to distribute the heat load. This system, plus precooling prior to entry, permitted operation of the spacecraft for 65 min after landing. During descent, heat dissipation and deceleration were accomplished sequentially by protective hemispheric shells, three parachutes, a disk-shaped drag brake, and a compressible, metal, doughnut-shaped, landing cushion. The landing was about 2,200 km distant from Venera 9. Preliminary results provided: (A) profile of altitude (km)/pressure (earth atmospheres) / temperature (deg C) of 42/3.3/158, 15/37/363, and 0/92/465, (B) successful TV photography showing large pancake rocks with lava or other weathered rocks in between, and (C) surface wind speed of 3.5 m/s. Venera 9 and 10 were the first probes to send back black and white pictures from the Venusian surface. They were supposed to make 360 degree panoramic shots, but on both landers one of two camera covers failed to come off, restricting their field of view to 180 degrees.

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