Summary of Russian Planetary Lander Missions

By Tibor Balint, Deep Space Mission Architecture Group, 311B, NASA-JPL
December 19, 2002

The information presented in the table and below, including the pictures were obtained from various Internet web sites, including

- http://nssdc.gsfc.nasa.gov/planetary/
- http://www.astronautix.com/craft/lunae6.htm
- http://vsm.host.ru/r_photos.htm
- http://www.skyrocket.de/space/index_frame.htm?http://www.skyrocket.de/space/doc_sdat/mars-73-lander.htm
- http://www.terra.es/personal/heimdall/eng/urss.htm

Summary Table

	Year	**Type / Method**	**Comment**	**Method EDL**
Venus				
Venera 3 *FAILED*	1965	Venus Lander	Impacted Venus, Contact Lost	Parachute
Venera 4 FAILED	1967	Venus Probe	Failed at altitude 24.96 km	Parachute
Venera 5 FAILED	1969	Venus Probe	During parachute descent data was transmitted from the atmosphere for 53 minutes before failure	Parachute
Venera 6 FAILED	1969	Venus Probe	During parachute descent data was transmitted from the atmosphere for 51 minutes before failure	Parachute
Venera 7 *PARTIAL FAILURE*	1970	Venus Lander	35 minutes of data during descent, 23 min. weak signal from the surface (1st man made object to return data after landing on another planet)	Aerobraking then parachute
Venera 8	1972	Venus Lander	Data during descent, plus 50 minutes after landing	Aerobraking/ D2.5m parachute at 60km

	Year	Type / Method	Comment	Method EDL
Venera 9	1975	Venus Orbiter and Lander	Operated for 53 minutes after landing	Protective hemispherical shell/ three parachutes/ disk shaped drag brake/ metal, compressible doughnut-shaped landing cushion
Venera 10	1975	Venus Orbiter and Lander	Operated for 65 minutes after landing	See Venera 9
Venera 11	1978	Venus Lander	Transmitted data after touchdown for 95 minutes, until it moved out of range with Earth.	Aerodynamic ~/ parachute ~/ atmospheric braking/ soft landing
Venera 12	1978	Venus Lander	Worked until out of range , transmitted from the surface for 110 minutes.	See Venera 11
Venera 13	1981	Venus Lander	The lander survived for 127 minutes.	Parachute/ at 47km parachute released/ airobraking
Venera 14	1981	Venus Lander	The lander survived for 57 minutes	See Venera 13
Moon				
Luna 2	Launched 12 Sep 1959	Impacted Moon 14 Sep 1959 at ~07:30:00 UT	First Probe to impact the Lunar surface. Lat. 29.10 N, Long.0.00 - Palus Putredinis	Impactor (spherical) (Same as Luna 1, which missed the moon by ~6000km)
Luna 5 *FAILED*	Launched 09 May 1965	Impacted Moon	Retrorockets failed, spacecraft impacted the surface. - Sea of Clouds	Retrorockets for soft landing
Luna 6 *FAILED*	Launched 08 Jun 1965	Attempted Lander	Midcourse correction failed, missed the Moon by 159km	Possibly retrorockets
Luna 7 *FAILED*	Launched 04 Oct 1965	Lunar Impact	Premature retrofire and cutoff of the retrorockets, the spacecraft impacted the surface. - Sea of Storms	Retrorockets
Luna 8 *FAILED*	Launched 03 Dec 1965	Lunar Impact	Retrofire was late, spacecraft impacted the lunar surface.	Retrorockets

	Year	Type / Method	Comment	Method EDL
			- Sea of Storms	
Luna 9	Launched 31 Jan 1966	Landed on Moon 03 Feb 1966 at 18:44:52 UT	First spacecraft to achieve a lunar **soft landing** and to transmit photographic data to Earth for 3 days Lat. 7.08 N, Long. 295.63 E - Oceanus Procellarum	Retrorockets
Luna 13	Launched 21 Dec 1966	Landed on Moon 24 Dec 1966 at 18:01:00 UT	Soft landing, television transmission, soil property measurements Latitude 18.87 N, 297.95 E – Oceanus Procellarum	Retrorockets
Luna 16	Launched 12 Sep 1970	Landed on Moon 20 Sep 1970 at 05:18:00 UT Lunar Sample Return	Soft landing; returned soil density data, photos, sample return. Latitude 0.68 S, Longitude 56.30 E - Mare Fecunditatis	Main descent engine until cutoff point, then a bank of lower thrust jets were used for final landing to 2m, then freefall
Luna 17	Launched 10 Nov 1970	Landed on Moon 17 Nov 1970 at 03:47:00 UT Lunar Rover - Lunokhod 1	Soft landing, Lunar Rover, ~10 months operation, 10km covered, pictures, lunar soil test Latitude 38.28 N, Longitude 325.00 E - Mare Imbrium	
Luna 18	Launched 02 Sep 1971	Lunar Impact	Intentional impact of a communication spacecraft. Lat. 3.57 N, Long. 50.50 E - Mare Fecunditatis	Braking rockets accelerated the spacecraft towards the Moon, following a multi-orbit comm. session
Luna 20	Launched 14 Feb 1972	Landed on Moon 21 Feb 1972 at 19:19:00 UT Lunar Sample Return to Earth 25 Feb 1972	Soft landing, television pictures, drilling, successful sample return Lat. 3.57 N, Long. 56.50 E - Mare Fecunditatis	
Luna 21	Launched	Landed on	Second lunar rover, 4	90x100km orbit/

	Year	Type / Method	Comment	Method EDL
	08 Jan 1973	Moon 15 Jan 1973 at 23:35:00 UT Lunar Rover - Lunokhod 2	months operation, 37km covered Lat. 25.85 N, Long. 30.45 E - LeMonnier Crater	perilune lowered to 16 km alt./ braking rockets to freefall/ thrusters at 750m/ main thrusters off at 22m/ secondary thrusters to 1.5m/ freefall to the Moon
Luna 23 *FAILED*	Launched 28 Oct 1974	Lunar Lander	Damaged during landing, no sample return, 3 days transmission from the surface - Mare Crisium	
Luna 24	Launched 14 Aug 1976	Lunar Sample Return Landed on Moon 18 Aug 1976 at 02:00:00 UT	Successful return of 170gr lunar samples Lat. 12.25 N, Long. 62.20 E - Mare Crisium	
Mars				
Mars 2 *FAILED*	1971	Mars orbiter and lander	The Mars 2 lander descent sequence failed and the spacecraft impacted the surface and was destroyed.	Gas micro-engines and pressurized nitrogen for attitude control, 4 gunpowder engines for pitch/yaw, main and auxiliary parachutes, radar altimeter, foam shock absorber
Mars 3 FAILED	1971	Mars orbiter and lander	Soft landing, after 20 sec the instruments stopped working for unknown reasons.	See Mars 2
Mars 5 *FAILED*	1973	Mars orbiter	Collected data for 22 orbits until a loss of pressurization in the transmitter housing ended the mission	Orbiter not lander
Mars 6 *FAILED*	1973	Mars lander	The landing probe separated prematurely and missed the planet by 1,300 km	Entry at 5.6km/s / aerobraking to 600 m/s / parachute / retrorockets

Venus

Venera 3

Venera 3	NSSDC ID:1965-092A
Other Name(s)	Venus 3 ; 01733
Launch Date/Time:	1965-11-16 at 04:19:00 UTC
On-orbit dry mass:	960 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

Venera 3 was launched from a Tyazheliy Sputnik (65-092B) towards the planet Venus. The mission of this spacecraft was to land on the Venusian surface. The entry body contained a radio communication system, scientific instruments, electrical power sources, and medallions bearing the coat of arms of the U.S.S.R. The station impacted Venus on March 1, 1966, making Venera 3 the first spacecraft to impact on the surface of another planet. However, the communications systems had failed before planetary data could be returned.

Venera 3


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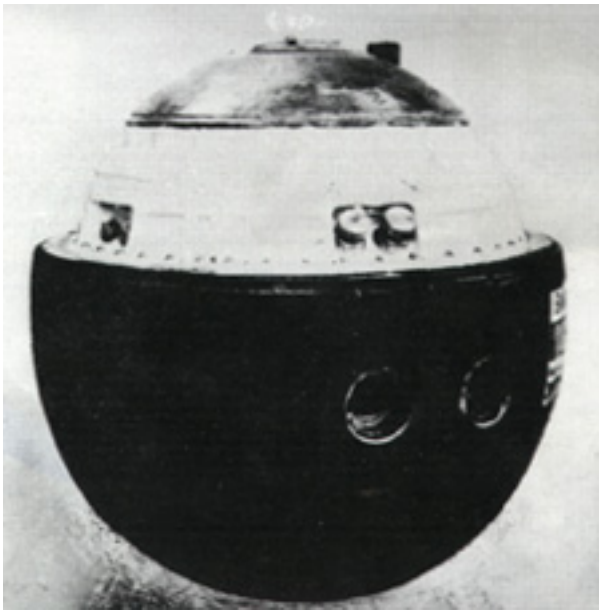


Stamp depicting the descent method

References:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

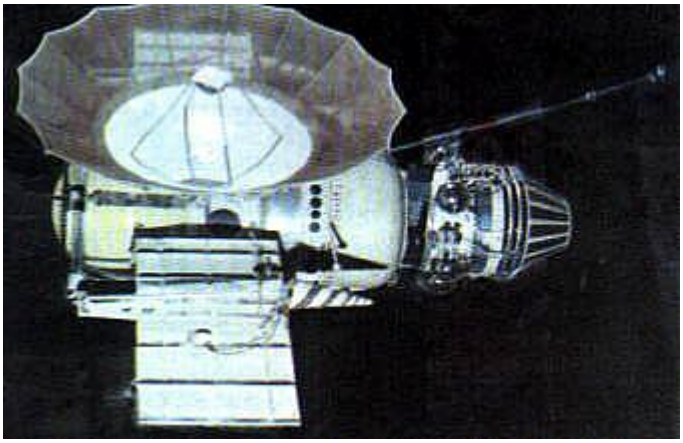
B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Venera 4

Venera 4	**NSSDC ID:**1967-058A
Other Name(s)	Venus 4, 02840
Launch Date/Time:	1967-06-12 at 02:40:00 UTC
On-orbit dry mass:	1106 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

Venera 4 was launched from a Tyazheliy Sputnik (67-058B) towards the planet Venus with the announced mission of direct atmospheric studies. On October 18, 1967, the spacecraft entered the Venusian atmosphere and released two thermometers, a barometer, a radio altimeter, and atmospheric density gauge, 11 gas analyzers, and two radio transmitters operating in the DM waveband. The main bus, which had carried the capsule to Venus, carried a magnetometer, cosmic ray detectors, hydrogen and oxygen indicators, and charged particle traps. Signals were returned by the spacecraft, which braked and then deployed a parachute system after entering the Venusian atmosphere, until it reached an altitude of 24.96 km.



Venera 4 Stamp

References:

B01579-000A
Reese, D. E. and P. R. Swan, Venera 4 probes atmosphere of Venus, *Science*, 159, 1228-1230, Mar. 1968.

B02505-000A
Vakhnin, V. M., Review of the Venera 4 flight and its scientific program, *J. Atmos. Sci.*, 25, 533-534, July 1968.

B04465-000A
Petrov, B. N., Space research in the USSR and the Venera 4 experiment, Spaceflight, 11, 171-173, May 1969.

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

Venera 5

Venera 5	**NSSDC ID:**1969-001A
Other Name(s)	Venus 5, 03642
Launch Date/Time:	1969-01-05 at 06:28:00 UTC
On-orbit dry mass:	1130 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

Venera 5 was launched from a Tyazheliy Sputnik (69-001C) towards Venus to obtain atmospheric data. The spacecraft was very similar to Venera 4 although it was of a stronger design. When the atmosphere of Venus was approached, a capsule weighing 405 kg and containing scientific instruments was jettisoned from the main spacecraft. During satellite descent towards the surface of Venus, a parachute opened to slow the rate of descent. For 53 min on May 16, 1969, while the capsule was suspended from the parachute, data from the Venusian atmosphere were returned. The spacecraft also carried a medallion bearing the coat of arms of the U.S.S.R. and a bas-relief of V.I. Lenin to the night side of Venus.

Modifications were made to the descent module for the 1969 Venus launch window. The capsule was given better thermal and pressure shielding, thus allowing a reduction of two-thirds in the parachute size, which in turn facilitated a faster descent and closer approach to the Venusian surface.

Venus 5 Stamp

References:

B13088-000A
Vinogradov, A. P., *et al*, Investigation of the Venus atmosphere by Venera 4, Venera 5 and Venera 6 probes, In -- Astronaut. Res. 1970, Unnumbered, 211-214, North-Holland Publ. Co., Amsterdam, Netherlands, 1971.
B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.
B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Venera 6

Venera 6	**NSSDC ID:**1969-002A
Other Name(s)	Venus 6, 03648
Launch Date/Time:	1969-01-10 at 05:52:00 UTC
On-orbit dry mass:	1130 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

Venera 6 was launched from a Tyazheliy Sputnik (69-002C) towards Venus to obtain atmospheric data. The spacecraft was very similar to Venera 4 although it was of a stronger design. When the atmosphere of Venus was approached, a capsule weighing 405 kg was jettisoned from the main spacecraft. This capsule contained scientific instruments. During descent towards the surface of Venus, a parachute opened to slow the rate of descent. For 51 min on May 17, 1969, while the capsule was suspended from the parachute, data from the Venusian atmosphere were returned. The spacecraft also carried a medallion bearing the coat of arms of the U.S.S.R. and a bas-relief of V.I. Lenin to the night side of Venus.

References:

B13088-000A
Vinogradov, A. P., *et al*, Investigation of the Venus atmosphere by Venera 4, Venera 5 and Venera 6 probes, In -- Astronaut. Res. 1970, Unnumbered, 211-214, North-Holland Publ. Co., Amsterdam, Netherlands, 1971.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Venera 7

Venera 7	**NSSDC ID:**1970-060A
Other Name(s)	Venus 7; 04489
Launch Date/Time:	1970-08-17 at 05:38:00 UTC
On-orbit dry mass:	1180 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

Venera 7 was launched from a Tyazheliy Sputnik in an earth parking orbit towards Venus to study the Venusian atmosphere and other phenomena of the planet. Venera 7 entered the atmosphere of Venus on December 15, 1970, and a landing capsule was jettisoned. After aerodynamic braking, a parachute system was deployed. The capsule antenna was extended, and signals were returned for 35 min. Another 23 min of very weak signals were received after the spacecraft landed on Venus. The capsule was the first man-made object to return data after landing on another planet.

Venera 7 Capsule [V-70 #1]

References:

B23902-000A
Avduyevskii, V. S., *et al*, Soft landing of Venera 7 on the Venus surface and preliminary results of investigations of the Venus atmosphere, *J. Atmos. Sci.*, 28, 263-269, Mar. 1971.
B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.
B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

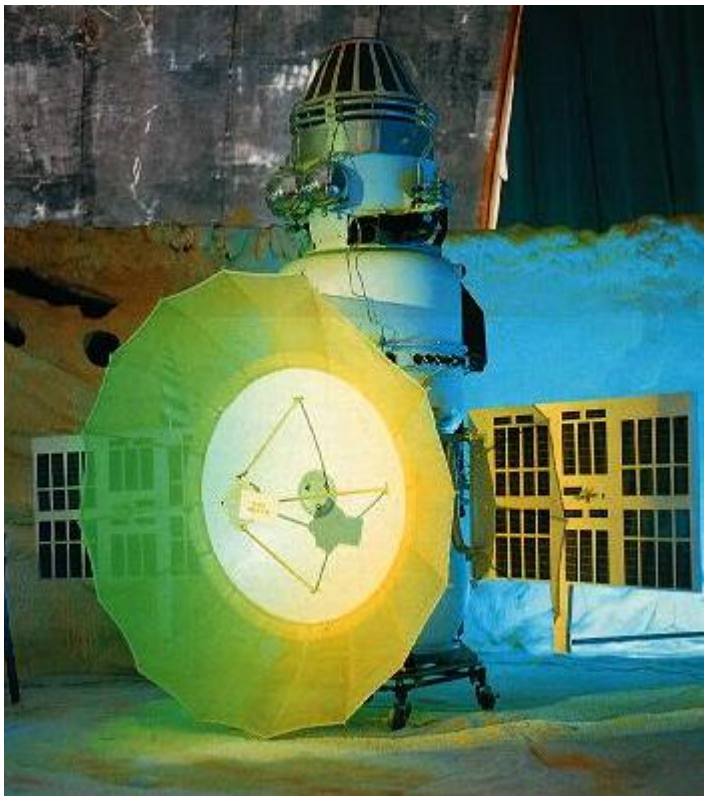
Venera 8

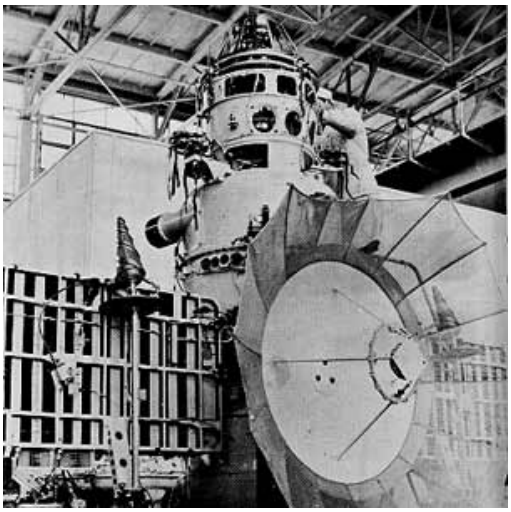
Venera 8	**NSSDC ID:**1972-021A
Other Name(s)	Venus 8; 05912
Launch Date/Time:	1972-03-27 at 04:15:01 UTC
On-orbit dry mass:	1180 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

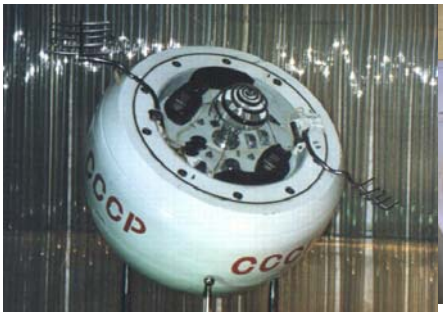
Venera 8 was a Venus atmospheric probe. Its instrumentation included temperature, pressure, and light sensors as well as radio transmitters. The spacecraft took 117 days to reach Venus, entering the atmosphere on 22 July 1972. Descent speed was reduced from 41,696 km/hr to about 900 km/hr by aerobraking. The 2.5 meter diameter parachute opened at an altitude of 60 km, and a refrigeration system was used to cool the interior components. Venera 8 transmitted data during the descent and continued to send back data for 50 minutes after landing. The probe confirmed the earlier data on the high Venus surface temperature and pressure returned by Venera 7, and also measured the light level as being suitable for surface photography, finding it to be similar to the amount of light on Earth on an overcast day. Modifications to the Venera 8 mission included a soil classification device and a decision to land the vehicle on the planet's day side (all other landings had been on the night side).

Venera 8





Model of the Venera 8 descent module at the Memorial Museum of Cosmonautics
[Courtesy of Alexander Chernov and the Virtual Space Museum (http://vsm.host.ru/)]



Venera 8 Stamp

References:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.
B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

Venera 9 Descent Craft

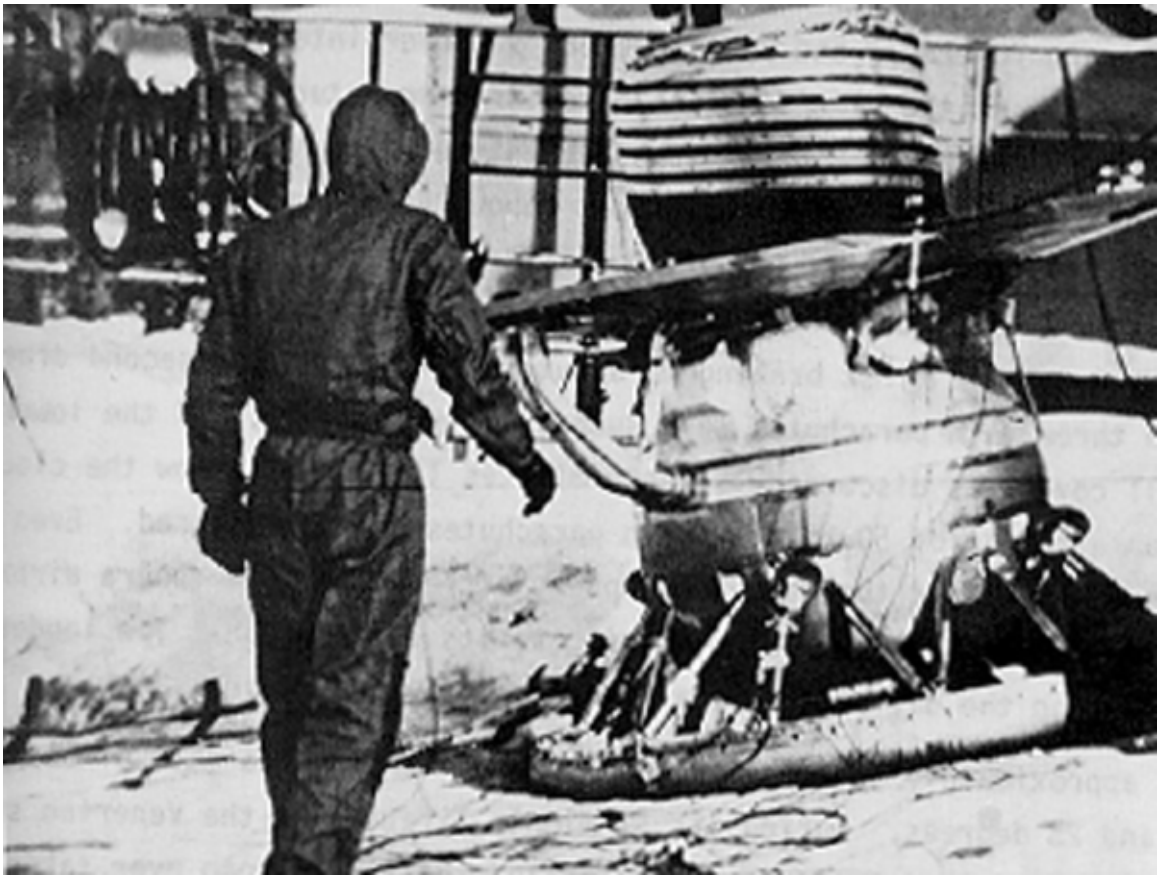
Venera 9	**NSSDC ID:**1975-050D
Other Name(s)	(orbiter) Venus 9; Venera 9 Orbiter; 07915
Launch Date/Time:	1975-06-08 at 02:38:00 UTC
On-orbit dry mass:	2015 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Soviet Academy of Sciences/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Venus	1975.295:00:00:00 (22 Oct)		291.00000	32.00000

Description

On October 20, 1975, this spacecraft was separated from the Orbiter, and landing was made with the sun near zenith at 0513 UT on October 22. 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 53 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 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 Lander image of the surface of Venus at about 32 S, 291 E. The Lander touched down at 5:13 UT with the sun near zenith on 22 October 1975 and operated for 53 minutes, allowing return of this single image. The white object at the bottom of the image is part of the lander. The distortion is caused by the Venera imaging system. Angular and partly weathered rocks, about 30 to 40 cm across, dominate the landscape, many partly buried in soil. The horizon is visible in the upper left and right corners. (Venera 9 Lander, surface image)

Surface of Venus from Venera 9

Venera 9 stamp

References:

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.
B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Venera 10 Descent Craft

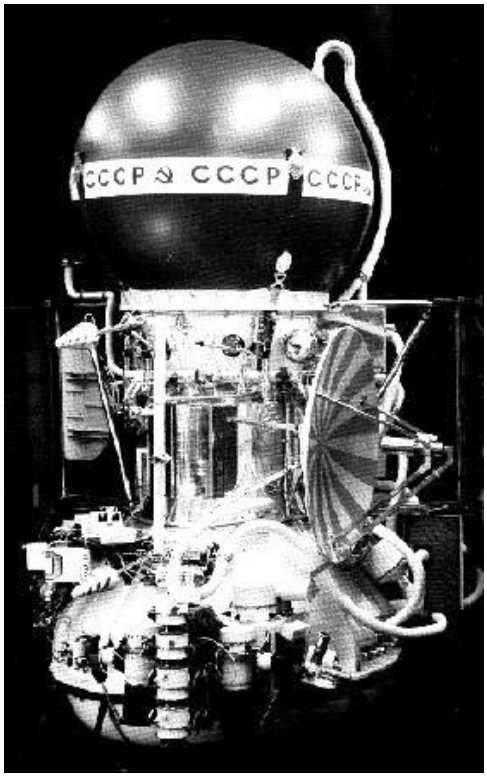
Venera 10	**NSSDC ID:**1975-054D
Other Name(s)	(orbiter) Venera 10 Orbiter; 07947
Launch Date/Time:	1975-06-14 at 03:00:31 UTC
On-orbit dry mass:	2015 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Venus	1975.298:00:00:00 (25 Oct)		291.00000	16.00000

Description

On October 23, 1975, this spacecraft was separated from the Orbiter, and landing was made with the sun near zenith, at 0517 UT, 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 10 Lander image of the surface of Venus at about 16 N, 291 E. The Lander touched down at 5:17 UT on 25 October 1975 and returned this image during the 65 minutes of operation on the surface. The sun was near zenith during this time, the lighting was about what would be seen on Earth on an overcast summer day. The objects at the bottom of the image are parts of the spacecraft. The image shows flat slabs of rock, partly covered by fine-grained material, not unlike a volcanic area on Earth. The large slab in the foreground extends over 2 meters across. (Venera 10 Lander, surface image)

References:

B28822-000A
Surkov, Yu. A., *et al*, Investigations of the density of the Venusian surface rocks by Venera 10, Pres. at 19th COSPAR Plenary Meet., June 8-19, 1975, Philadelphia, PA.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Venera 11 Descent Craft

Venera 11	**NSSDC ID:**1978-084D
Other Name(s)	Venera 11 Lander
Launch Date/Time:	1978-09-09 at 03:25:39 UTC
On-orbit dry mass:	2015 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Soviet Academy of Sciences/U.S.S.R
NSSDC Contact	Dr. V. G. Kurt, Project Scientist, Institut Kosmicheskich Issledovaniya (Institute of Space Research); Dr. David R. Williams, NSSDC Contact, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Venus	1978.359:03:24:00 (25 Dec)	1978.359:04:59:00 (25 Dec)	299.00000	-14.00000

Description

The Venera 11 descent craft carried instruments designed to study the detailed chemical composition of the atmosphere, the nature of the clouds, and the thermal balance of the atmosphere. Separating from its flight platform on December 23, 1978 it entered the Venus atmosphere two days later at 11.2 km/sec. During the descent, it employed aerodynamic braking followed by parachute braking and ending with atmospheric braking. It made a soft landing on the surface at 06:24 Moscow time on 25 December after a descent time of approximately 1 hour. The touchdown speed was 7-8 m/s. Information was transmitted to the flight platform for retransmittal to earth until it moved out of range 95 minutes after touchdown.

It is unknown whether the Lander Probe carried an imaging system. No mention of it occurs in the Soviet literature examined by the author. Two other experiments on the Lander did fail, and their failure was acknowledged by the Soviets. Some U.S. literature on the subject notes that the imaging system "failed" but did return some data. Among the instruments on board was a gas chromatograph to measure the composition of the Venus atmosphere, instruments to study scattered solar radiation and soil composition, and a device named Groza which was designed to measure atmospheric electrical discharges.

Results reported included evidence of lightning and thunder, a high Ar36/Ar40 ratio, and the discovery of carbon monoxide at low altitudes.

Venera 11 was part of a two-spacecraft mission to study Venus and the interplanetary medium. Each of the two spacecraft, Venera 11 and Venera 12, consisted of a flight platform and a lander probe. Identical instruments were carried on both spacecraft. The flight platform had instruments to study solar-wind composition, gamma-ray bursts, ultraviolet radiation, and the electron density of the ionosphere of Venus. The lander probe carried instruments to study the characteristics and composition of the atmosphere of Venus.

Venera 11 was launched into a 177 x 205 km, 51.5 degree inclination Earth orbit from which it was propelled into a 3.5 month Venus transfer orbit. After ejection of the lander probe, the flight platform continued on past Venus in a heliocentric orbit. Near encounter with Venus occurred on December 25, 1978, at approximately 34,000 km altitude. The flight platform acted as a data relay for the descent craft for 95 minutes until it flew out of range and returned its own measurements on interplanetary space. The platform was equipped with a gamma-ray spectrometer, retarding potential traps, UV grating monochromator, electron and proton spectrometers, gamma-ray burst detectors, solar wind plasma detectors, and two-frequency transmitters.
(More information on the Venera 11 flight platform is available at:
http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1978-084A)

Venera 11 stamp

Reference:

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Venera 12 Descent Craft

Venera 12	**NSSDC ID:**1978-086C
Other Name(s)	Venera 12 Lander
Launch Date/Time:	1978-09-14 at 02:25:13 UTC
On-orbit dry mass:	2015 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Soviet Academy of Sciences/U.S.S.R
NSSDC Contact	Dr. V. G. Kurt, Project Scientist, Institut Kosmicheskich Issledovaniya (Institute of Space Research); Dr. David R. Williams, NSSDC Contact, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Venus	1978.355:03:30:00 (21 Dec)	1978.355:05:20:00 (21 Dec)	294.00000	-7.00000

Description

The Venera 12 descent craft carried instruments designed to study the detailed chemical composition of the atmosphere, the nature of the clouds, and the thermal balance of the atmosphere. Separating from its flight platform on December 19, 1978, it entered the Venus atmosphere two days later at 11.2 km/sec. During the descent, it employed aerodynamic braking followed by parachute braking and ending with atmospheric braking. It made a soft landing on the surface at 06:30 Moscow time on 21 December after a descent time of approximately 1 hour. The touchdown speed was 7-8 m/s. Information was transmitted to the flight platform for retransmittal to earth. until it moved out of range 110 minutes after touchdown. It is unknown whether the Lander Probe carried an imaging system. No mention of it occurs in the Soviet literature examined by the author. Two other experiments on the Lander did fail, and their failure was acknowledged by the Soviets. Some U.S. literature on the subject notes that the imaging system "failed" but did return some data. Among the instruments on board was a gas chromatograph to measure the composition of the Venus atmosphere, instruments to study scattered solar radiation and soil composition, and a device named Groza, which was designed to measure atmospheric electrical discharges. Results reported included evidence of lightning and thunder, a high Ar36/Ar40 ratio, and the discovery of carbon monoxide at low altitudes.

More information on the Venera 12 flight platform is available at:
http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1978-086A

Reference:

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Venera 13 Descent Craft

Venera 13	**NSSDC ID:**1981-106D
Other Name(s)	Venera 13 Lander
Launch Date/Time:	1981-10-30 at 06:04:00 UTC
On-orbit dry mass:	760 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Soviet Academy of Sciences/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

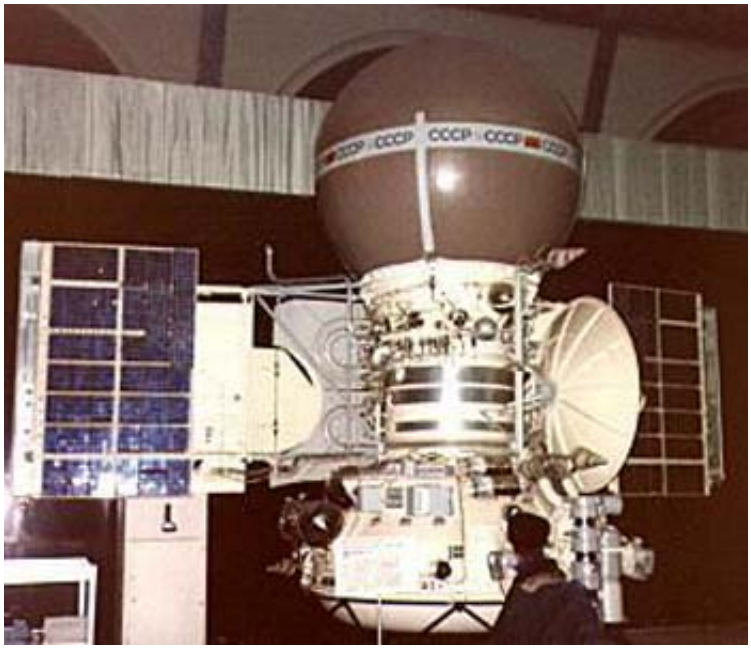
Orbital Information:

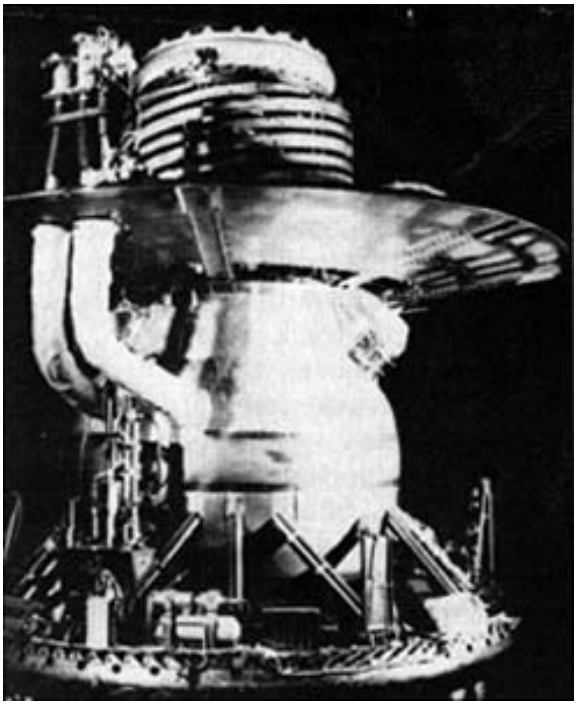
Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Venus	1982.060:00:00:00 (01 Mar)		303.00000	-7.50000

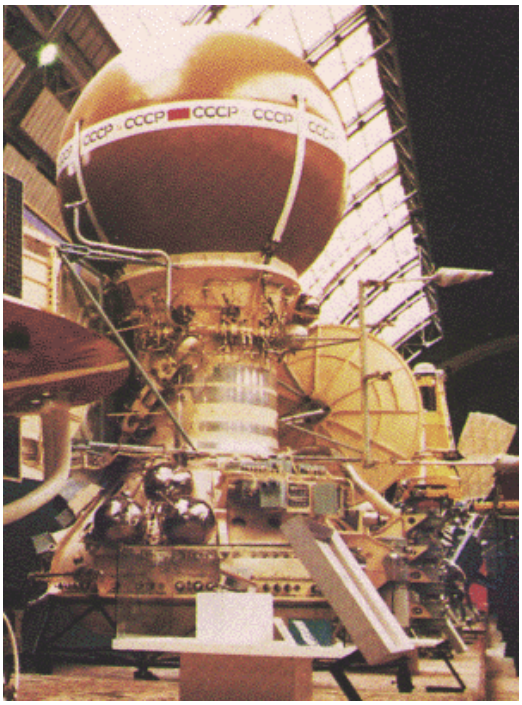
Description

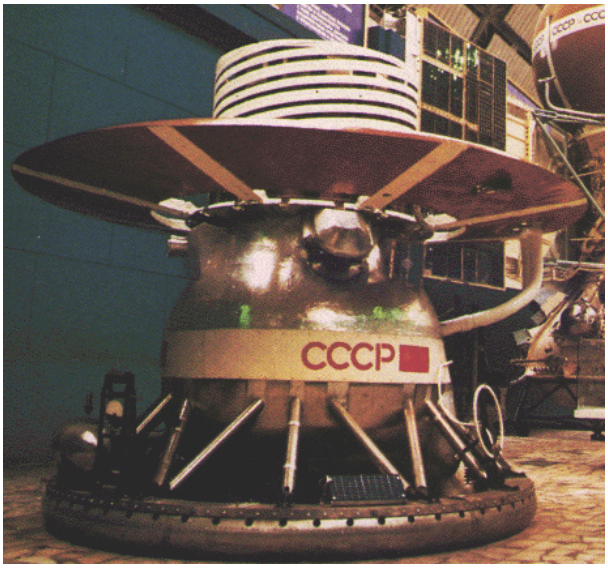
Venera 13 and 14 were identical spacecraft built to take advantage of the 1981 Venus launch opportunity and launched 5 days apart. The Venera 13 mission consisted of a bus (81-106A) and an attached descent craft (81-106D). The Venera 13 descent craft/lander was a hermetically sealed pressure vessel, which contained most of the instrumentation and electronics, mounted on a ring-shaped landing platform and topped by an antenna. The design was similar to the earlier Venera 9-12 landers. It carried instruments to take chemical and isotopic measurements, monitor the spectrum of scattered sunlight, and record electric discharges during its descent phase through the Venusian atmosphere. The spacecraft utilized a camera system, an X-ray fluorescence spectrometer, a screw drill and surface sampler, a dynamic penetrometer, and a seismometer to conduct investigations on the surface.

After launch and a four month cruise to Venus, the descent vehicle separated from the bus and plunged into the Venus atmosphere on 1 March 1982. After entering the atmosphere a parachute was deployed. At an altitude of 47 km the parachute was released and simple airbraking was used the rest of the way to the surface. Venera 13 landed about 950 km northeast of Venera 14 at 7 deg 30 min S, 303 E, just east of the eastern extension of an elevated region known as Phoebe Regio. The area was composed of bedrock outcrops surrounded by dark, fine-grained soil. After landing an imaging panorama was started and a mechanical drilling arm reached to the surface and obtained a sample, which was deposited in a hermetically sealed chamber, maintained at 30 degrees C and a pressure of about .05 atmospheres. The composition of the sample determined by the X-ray flourescence spectrometer put it in the class of weakly differentiated melanocratic alkaline gabbroids. The lander survived for 127 minutes (the planned design life was 32 minutes) in an environment with a temperature of 457 degrees C and a pressure of 84 Earth atmospheres. The descent vehicle transmitted data to the bus, which acted as a data relay as it flew by Venus.





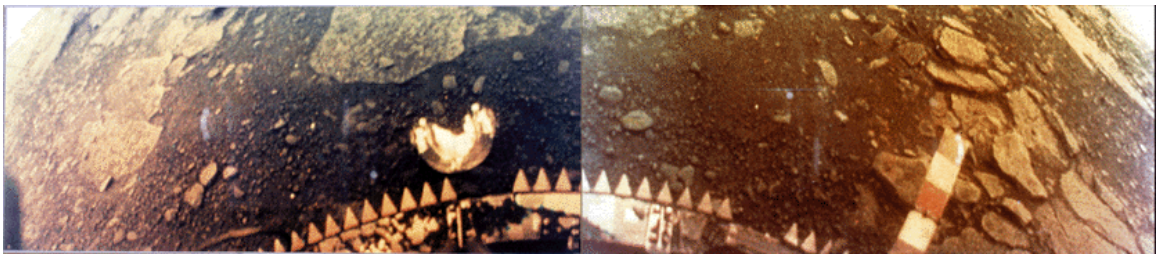




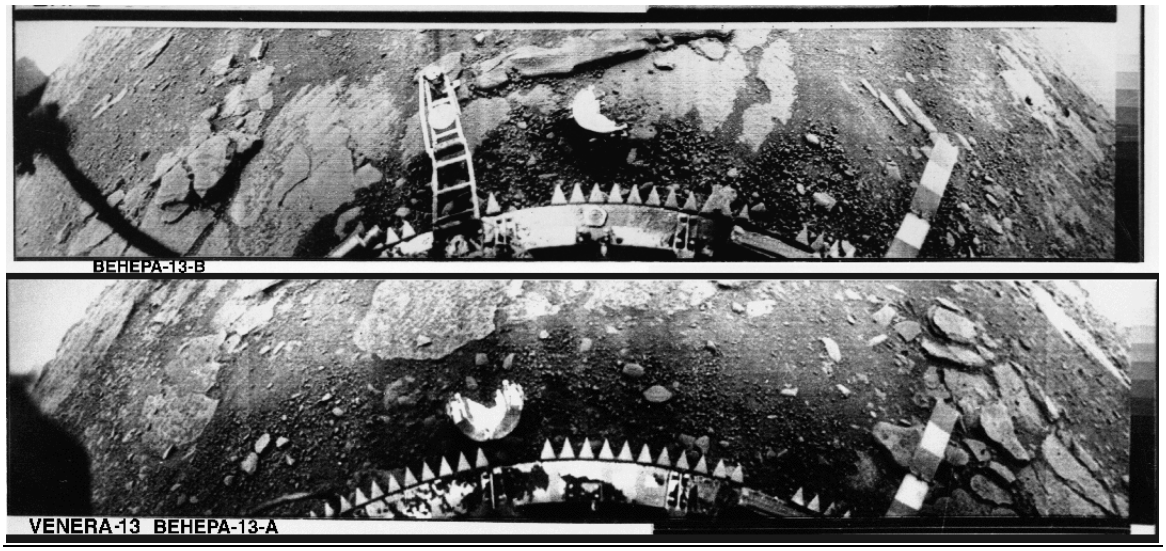
Venara 13 stamp

Venera 13 soil sampler

Venera 13 Descent Craft: The panoramic photometer camera system carried on the Venera 13 lander was an improvement on the ones carried on Veneras 9 and 10. The design of the camera allowed for a 360 degree field of view, although the effective field of view for a single frame was 37 x 180 degrees. The panning axis deviated from the vertical axis of the lander by 50 degrees, so the middle part of the image shows the surface directly in front of the camera at a distance of 1.5 to 2 meters. Further from the center the image shows more distant areas. The angular resolution of the camera is 11', allowing details as small as 4 to 5 mm to be seen at a distance of 1.5 meters. The camera had red, green, and blue filters. Eight panoramas were obtained giving a nearly 360 degree color view of the area around the lander.



Venera 13 Lander black and white images of Venus' surface
Venera 13 Lander images of the surface of Venus. The lander touched down at 7.5 S, 303 E, east of Phoebe Regio, on 1 March, 1982. It survived on the surface for 2 hours, 7 minutes. These pictures were taken from its two opposite-facing cameras. The top image is a black and white frame of the color image vg261_262. The bottom frame shows the lander testing arm. The surface is made up of flat, platy rocks and soil. Parts of the lander and semi-circular lens covers can be seen in both images. (Venera 13 Lander, YG06847)



Reference:

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46862-000A
Surkov, Yu. A., *et al*, New data on the composition, structure, and properties of Venus rock obtained by Venera 13 and Venera 14, *J. Geophys. Res.*, 89, 8393-8402, Feb. 1984.

Venera 14 Descent Craft

Venera 14	**NSSDC ID:**1981-110D (descent), **NSSDC ID:**1981-110A (flight platform)
Other Name(s)	Venera 14 Lander; Venera 14 Flight Platform, 12939
Launch Date/Time:	1981-11-04 at 05:31:00 UTC
On-orbit dry mass:	760 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Soviet Academy of Sciences/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

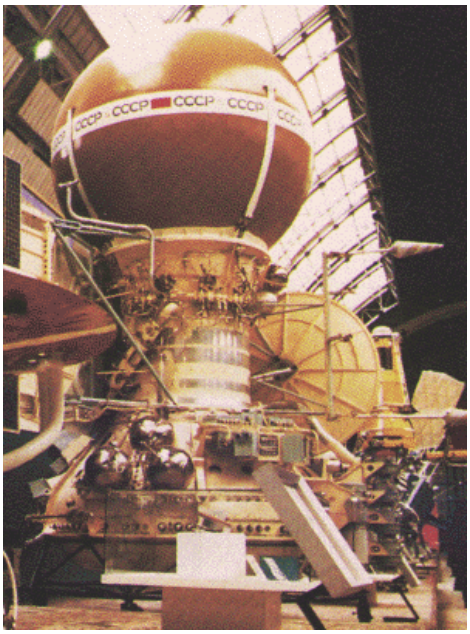
Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Venus	1982.064:00:00:00 (05 Mar)		310.00000	-13.25000

Description

Venera 13 and 14 were identical spacecraft built to take advantage of the 1981 Venus launch opportunity and launched 5 days apart. The Venera 14 mission consisted of a bus (81-110A) and an attached descent craft (81-110D). The Venera 14 descent craft/lander was a hermetically sealed pressure vessel, which contained most of the instrumentation and electronics, mounted on a ring-shaped landing platform and topped by an antenna. The design was similar to the earlier Venera 9-12 landers. It carried instruments to take chemical and isotopic measurements, monitor the spectrum of scattered sunlight, and record electric discharges during its descent phase through the Venusian atmosphere. The spacecraft utilized a camera system, an X-ray fluorescence spectrometer, a screw drill and surface sampler, a dynamic penetrometer, and a seismometer to conduct investigations on the surface.

After launch and a four month cruise to Venus, the descent vehicle separated from the bus and plunged into the Venus atmosphere on 5 March 1982. After entering the atmosphere a parachute was deployed. At an altitude of about 50 km the parachute was released and simple airbraking was used the rest of the way to the surface. Venera 14 landed about 950 km southwest of Venera 13 near the eastern flank of Phoebe Regio at 13 deg 15 min S by 310 E on a basaltic plain. After landing an imaging panorama was started and a mechanical drilling arm reached to the surface and obtained a sample, which was deposited in a hermetically sealed chamber, maintained at 30 degrees C and a pressure of about .05 atmospheres. The composition of the sample was determined by the X-ray flourescence spectrometer, showing it to be similar to oceanic tholeiitic basalts. The lander survived for 57 minutes (the planned design life was 32 minutes) in an environment with a temperature of 465 degrees C and a pressure of 94 Earth atmospheres. The descent vehicle transmitted data to the bus, which acted as a data relay as it flew by Venus.



Venera 13 and 14 were identical spacecraft built to take advantage of the 1981 Venus launch opportunity and launched 5 days apart. The Venera 14 mission consisted of a bus (81-110A) and an attached descent craft (81-110D). After launch and a four month cruise to Venus, the descent vehicle separated and plunged into the Venus atmosphere on 5 March 1982. As it

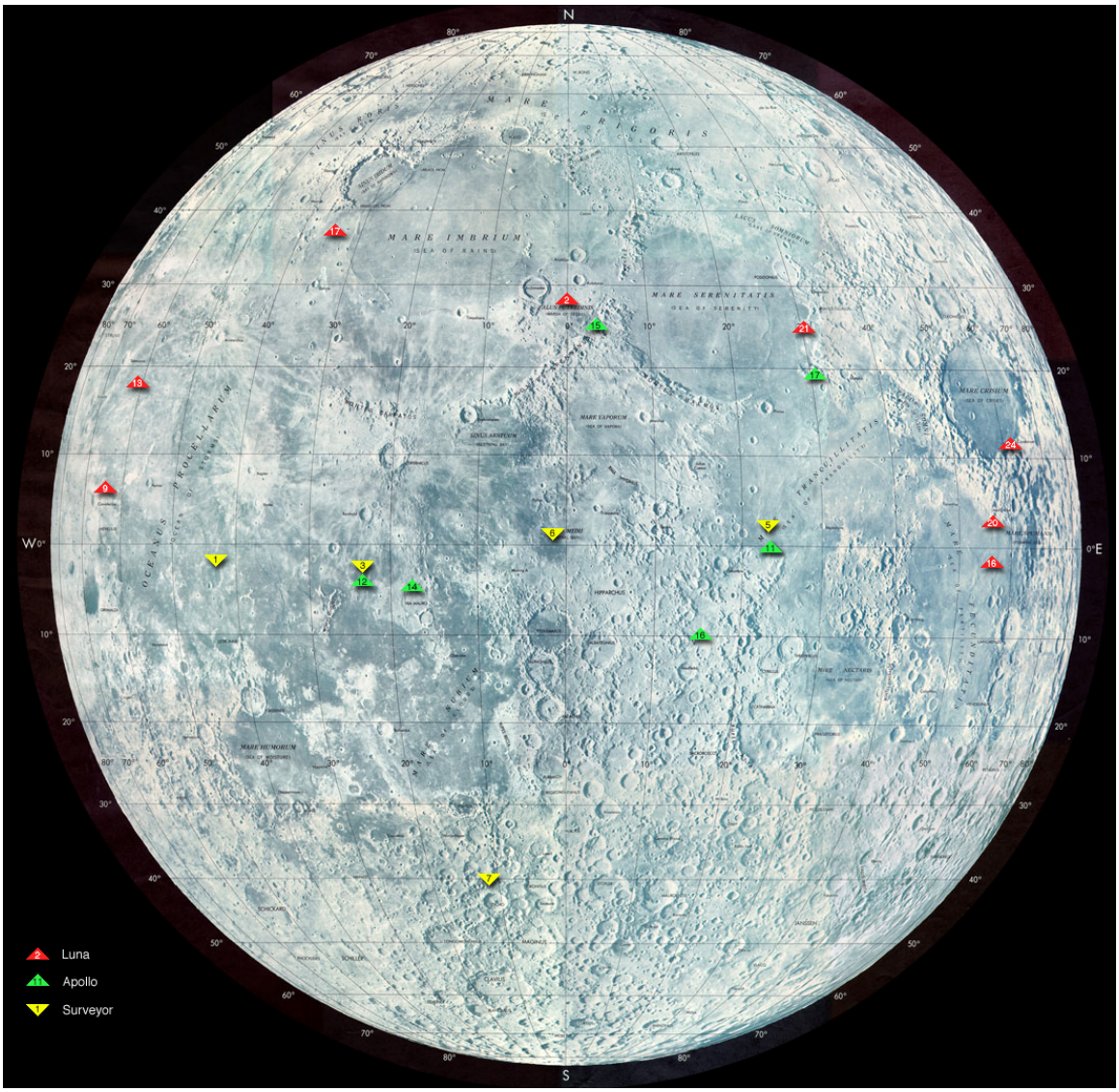
flew by Venus the bus acted as a data relay for the brief life of the descent vehicle, and then continued on into a heliocentric orbit. The bus was equipped with instrumentation including a gamma-ray spectrometer, retarding potential traps, UV grating monochromator, electron and proton spectrometers, gamma-ray burst detectors, solar wind plasma detectors, and two-frequency transmitters which made measurements before, during, and after the Venus flyby.

Venera 14 Lander black and white images of the surface of Venus
Venera 14 Lander images of the surface of Venus at 13 S, 310 E on 5 March 1982. The lander survived for 60 minutes. Both images show part of the lander at the bottom. This area is composed of flat basalt-like rocks, but little soil or fine-grained material as was seen at other Venera Lander sites. Near the center of the top image is a lens cover, and the bottom image shows a test arm. (Venera 14 Lander, YG06848)

Reference:

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.
B46862-000A
Surkov, Yu. A., *et al*, New data on the composition, structure, and properties of Venus rock obtained by Venera 13 and Venera 14, *J. Geophys. Res.*, 89, 8393-8402, Feb. 1984.

Moon



http://www.astronautix.com/lvs/luna8k72.htm
http://nssdc.gsfc.nasa.gov/planetary/planets/moonpage.html

Soviet Lunar Lander Missions

The image at the top of the page is the first image of the far side of the Moon, taken by the Luna 3 spacecraft in October, 1959.

The Soviet Lunar program had 20 successful missions to the Moon and achieved a number of notable lunar "firsts": first probe to impact the Moon, first flyby and image of the lunar farside, first soft landing, first lunar orbiter, and the first circumlunar probe to return to Earth. The two successful series of Soviet probes were the Luna (24 lunar missions) and the Zond (5 lunar missions).

NSSDC currently holds data from the Luna 3, 9, 13, 21, and 22 and the Zond 3, 6, 7, and 8 missions. All this data is photographic in nature, except for the lunar libration data from the Luna 21 Orbiter. Lunar flyby missions (Luna 3, Zond 3, 6, 7, 8) obtained photographs of the lunar surface, particularly the limb and farside regions. The Zond 6, 7, and 8 missions circled the Moon and returned to Earth where they were recovered, Zond 6 and 7 in Siberia and Zond 8 in the Indian Ocean. The purpose of the photography experiments on the lunar landers (Luna 9, 13, 22) was to obtain closeup images of the surface of the Moon for use in lunar studies and determination of the feasibility of manned lunar landings.

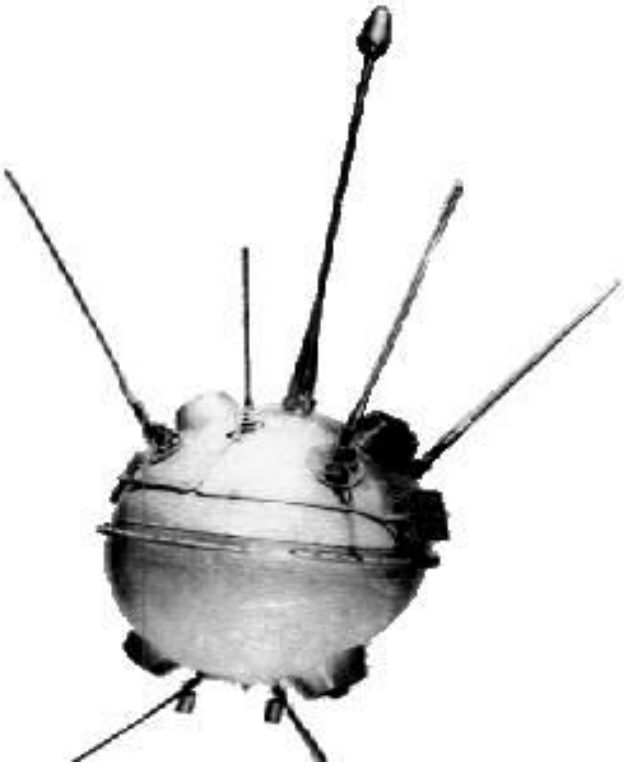
Luna 2

Luna 2	**NSSDC ID:**1959-014A
Other Name(s)	Lunik 2, 00114
Launch Date/Time:	1959-09-12 at 22:02:24 UTC
On-orbit dry mass:	390.2 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation (Longer) Upper Stage
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Moon	1959.257:07:30:00 (14 Sep)		.00000	29.10000

Description



Luna 2 was the second of a series of spacecraft launched in the direction of the Moon. The first spacecraft to land on the Moon, it impacted the lunar surface east of Mare Serenitatis near the Aristides, Archimedes, and Autolycus craters. Luna 2 was similar in design to Luna 1, a spherical spacecraft with protruding antennae and instrument parts. The instrumentation was also similar, including scintillation- and geiger-counters, a magnetometer, and micrometeorite detectors. The spacecraft also carried Soviet pennants. There were no propulsion systems on Luna 2 itself.
After launch and attainment of escape velocity on 12 September 1959 (13 September Moscow time), Luna 2 separated from its third stage, which travelled along with it towards the Moon. On 13 September the spacecraft released a bright orange cloud of sodium gas which aided in spacecraft tracking and acted as an experiment on the behavior of gas in space. On 14 September, after 33.5 hours of flight, radio signals from Luna 2 abruptly ceased, indicating it had impacted on the Moon. The impact point, in the Palus Putredinus region, is roughly estimated to have occurred at 0 degrees longitude, 29.1 degrees N latitude. Some 30 minutes after Luna 2, the third stage of its rocket also impacted the Moon. The mission confirmed that the Moon had no appreciable magnetic field, and found no evidence of radiation belts at the Moon.

(Lunik 1, a spherical vehicle with four protruding antennas and a probe was the first Soviet attempt to strike the Moon. The spacecraft missed the Moon by around 6000 Km and, with the help of lunar gravity, sped out into the solar system as the **first artificial satellite to acheive solar orbit**.)
Luna 1 stamp

Like its predecessor, Lunik 2 was primarily an attempt to impact the Moon's surface via direct ascent trajectory. This attempt was a success, impacting the lunar surface at 1W/30N.

Luna 2 stamp

Reference:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B48299-000A
Clark, E., Soviets hit moon, data flow improves, Space Technol., 2, No. 4, 4-6, Oct. 1959.

Luna 5

Luna 5	**NSSDC ID:**1965-036A
Other Name(s)	Lunik 5, 01366
Launch Date/Time:	1965-05-09 at 07:55:00 UTC
On-orbit dry mass:	1474 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

The Luna 5 automatic interplanetary station was designed to continue investigations of a lunar soft landing. The retrorocket system failed, and the spacecraft impacted the lunar surface at the Sea of Clouds.

Reference:

B01001-000A
Lyubimov, G. P., Measurement of the intensity of cosmic radiation during the flights of automatic interplanetary stations Zond 1, Zond 2, Zond 3, Luna 5, Luna 6, NASA, ST-CR-IS-10655, Oct. 1967.

B10043-000A
Lunik 5 and 6, TRW Space Log, TRW Systems, 5, No. 2, 55, Redondo Beach, Calif., 1965.

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Luna 6

Luna 6	**NSSDC ID:**1965-044A
Other Name(s)	Lunik 6, 01393
Launch Date/Time:	1965-06-08 at 07:41:00 UTC
On-orbit dry mass:	1440 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

Luna 6 was intended to travel to the Moon, but, because a midcourse correction failed, it missed the Moon by 159,612.8 Km.

Reference:

B10043-000A
Lunik 5 and 6, TRW Space Log, TRW Systems, 5, No. 2, 55, Redondo Beach, Calif., 1965.
B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.
B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Luna 7

Luna 7	**NSSDC ID:**1965-077A
Other Name(s)	Lunik 7, 01610
Launch Date/Time:	1965-10-04 at 07:55:00 UTC
On-orbit dry mass:	1504 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

The Luna 7 spacecraft was intended to achieve a soft landing on the Moon. However, due to premature retrofire and cutoff of the retrorockets, the spacecraft impacted the lunar surface in the Sea of Storms.

Reference:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Luna 8

Luna 8	**NSSDC ID:**1965-099A
Other Name(s)	Lunik 8, 01810
Launch Date/Time:	1965-12-03 at 10:48:00 UTC
On-orbit dry mass:	1550 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Description

Luna 8 was launched with the probable mission of achieving a soft landing on the Moon. However, the retrofire was late, and the spacecraft impacted the lunar surface in the Sea of Storms. The mission did complete the experimental development of the star-orientation system and ground control of radio equipment, flight trajectory, and other instrumentation.

Reference:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.
B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.
B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Luna 9

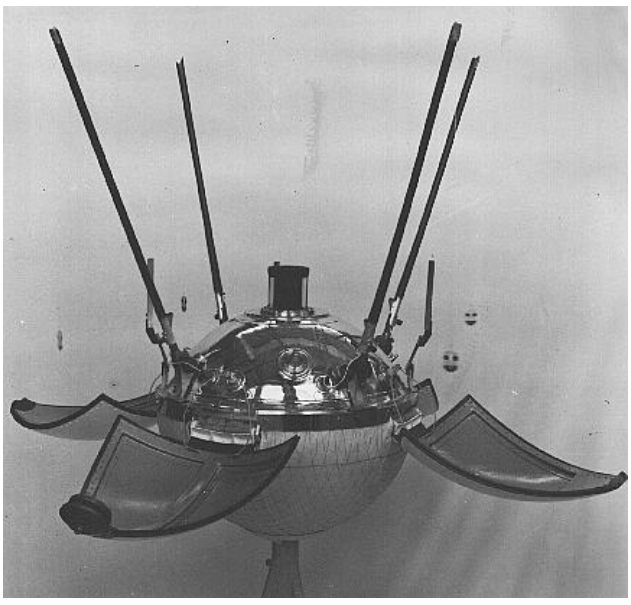
Luna 9	**NSSDC ID:**1966-006A
Other Name(s)	Lunik 9, 01954 (E-6 type probe)
Launch Date/Time:	1966-01-31 at 11:45:00 UTC
On-orbit dry mass:	1580 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown (RVSN)/U.S.S.R (*Manufacturer*: Korolev)
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Moon	1966.034:18:44:52 (03 Feb)		295.63000	7.08000

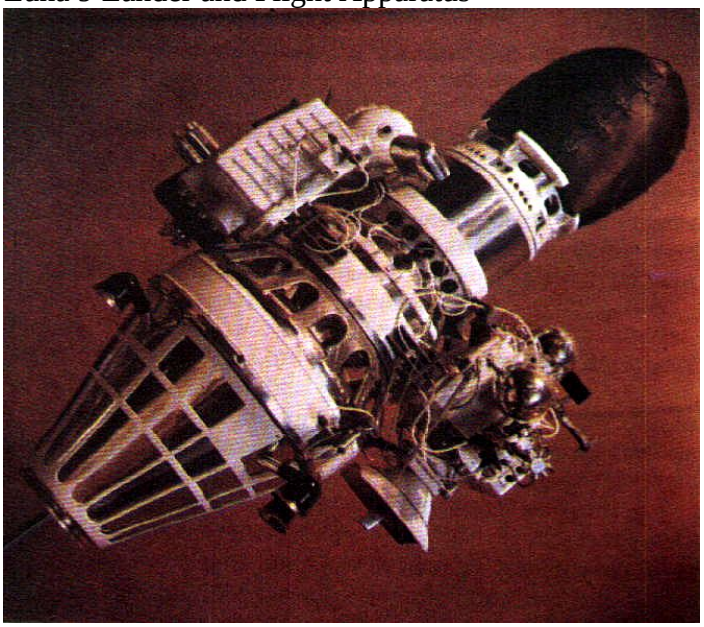
Description

The Luna 9 spacecraft was the first spacecraft to achieve a lunar soft landing and to transmit photographic data to Earth. The second generation Luna landers were composed of three main elements: The 100-kilogran payload was contained in a spherical capsule at one end of the essentially cylindrical vehicle. Below the payload was the main body, which contained the flight control instrumentation. Two strap-on modules were attached to either side of the vehicle's waist. The automatic lunar station that achieved the soft landing weighed 99 Kg. It was a hermetically sealed container with radio equipment, a program timing device, heat control systems, scientific apparatus, power sources, and a television system. The Luna 9 payload was carried to Earth orbit by an A-2-E vehicle and then conveyed toward the Moon by a fourth stage rocket that

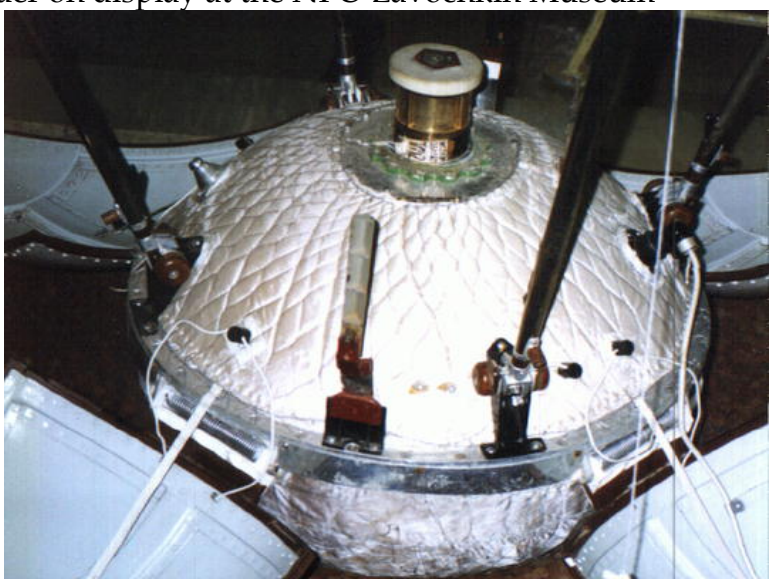


separated itself from the payload. Flight apparatus separated from the payload shortly before Luna 9 landed. After landing in the Ocean of Storms on February 3, 1966, the four petals, which formed the spacecraft, opened outward and stabilized the spacecraft on the lunar surface. Spring-controlled antennas assumed operating positions, and the television camera rotatable mirror system, which operated by revolving and tilting, began a photographic survey of the lunar environment. Seven radio sessions, totaling 8 hours and 5 minutes, were transmitted as were three series of TV pictures. When assembled, the photographs provided a panoramic view of the nearby lunar surface. The pictures included views of nearby rocks and of the horizon 1.4 Km away from the spacecraft.

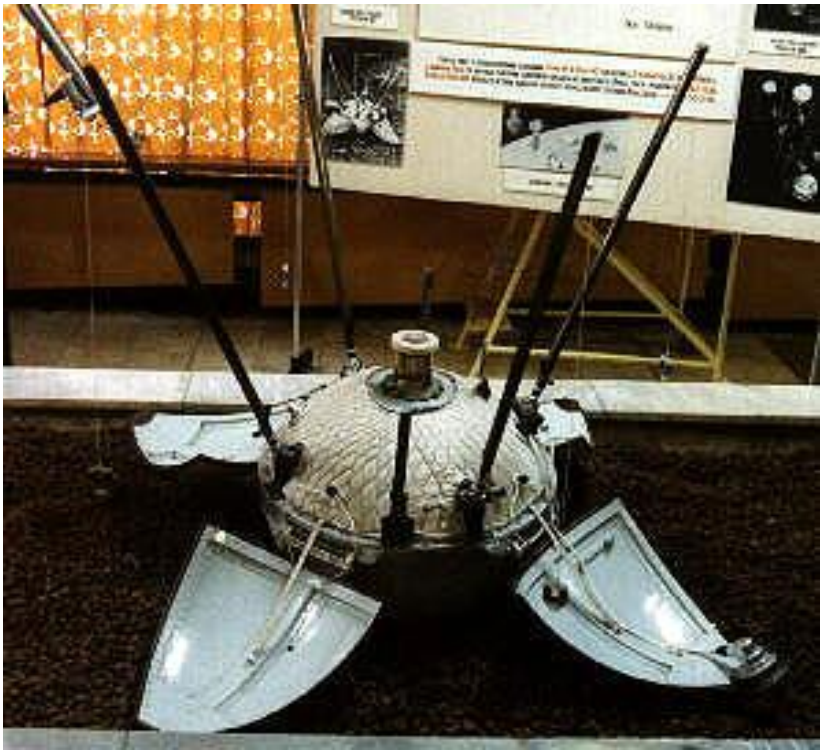
Luna 9 Lander and Flight Apparatus



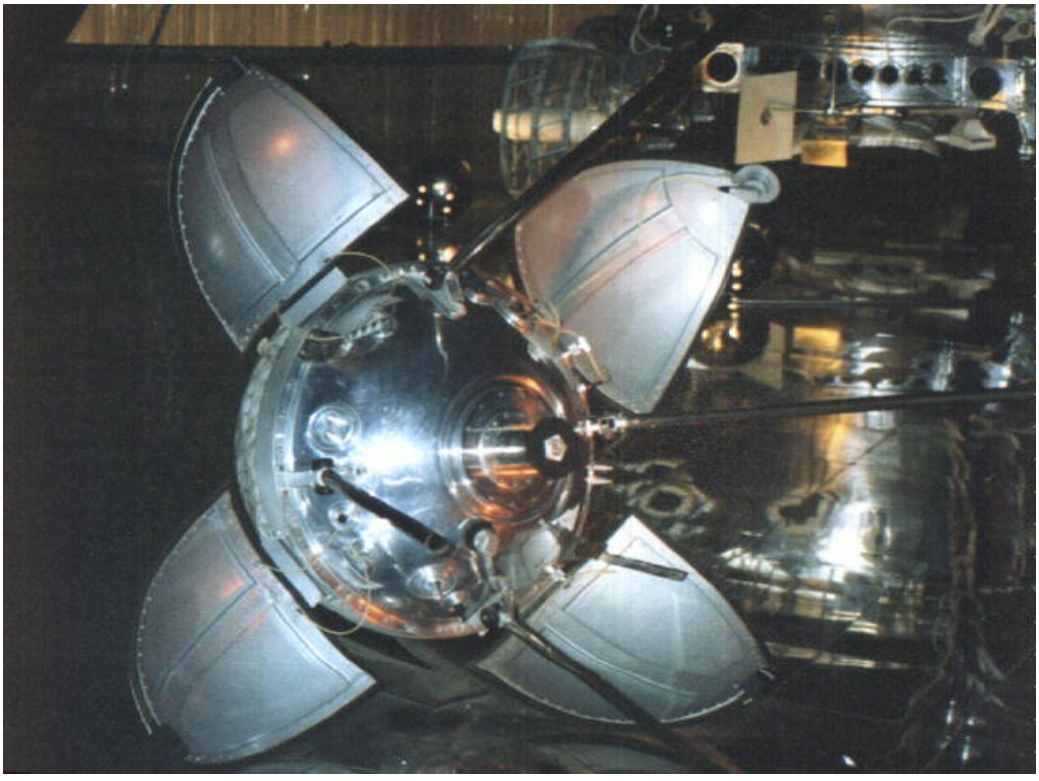
Models of the Luna 9 bus and lander on display at the NPO Lavochkin Museum



Luna 9 Surface



Luna 9 Lander



Luna 9 Bus

Luna 9 stamp

Reference:

B05703-000A
Davies, J. G., *et al*, Observations of the Russian moon probe Lunar 9, *Nature*, 209, 848-850, Feb. 1966.
B06287-000A
Kuiper, G. P., *et al*, Russian Luna 9 pictures, provisional analysis, *Science*, 12, 1561-1563, Mar. 1966.
B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.
Semenov, Yuri P Editor, *Raketno-kosmicheskaya korporatsiya 'Energia' imeni S P Koroleva*, Moscow, Russia, 1996
Varfolomyev, Timothy, *Spaceflight*, "Soviet Rocketry that Conquered Space - Part 5", 1998, Volume 40, page 85
National Space Science Center Planetary Page, As of 19 February 1999.. Web Address when accessed: http://nssdc.gsfc.nasa.gov/planetary/planetary_home.html.

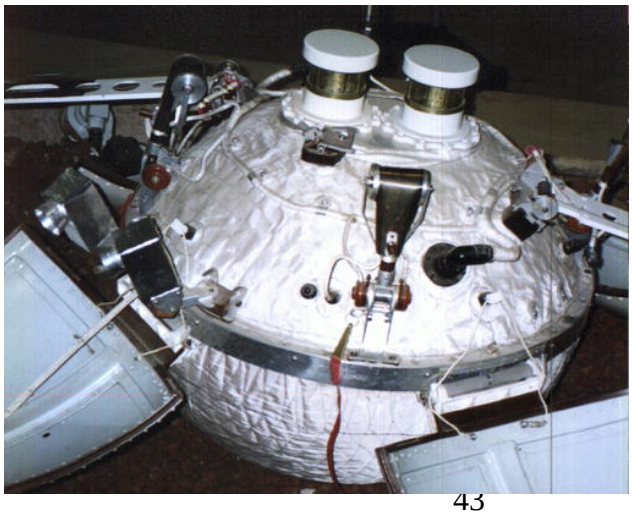
Luna 13

Luna 13	**NSSDC ID:**1966-116A
Other Name(s)	Lunik 13, 02626
Launch Date/Time:	1966-12-21 at 10:19:00 UTC
On-orbit dry mass:	1700 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Modified SS-6 (Sapwood) with 2nd Generation Upper Stage + Escape Stage
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Moon	1966.358:18:01:00 (24 Dec)		297.95000	18.87000

Description



The Luna 13 spacecraft was launched toward the Moon from an earth-orbiting platform and accomplished a soft landing on December 24, 1966, in the region of Oceanus Procellarum. The petal encasement of the spacecraft was opened, antennas were erected, and radio transmissions to Earth began four minutes after the landing. On

December 25 and 26, 1966, the spacecraft television system transmitted panoramas of the nearby lunar landscape at different sun angles. Each panorama required approximately 100 minutes to transmit. The spacecraft was equipped with a mechanical soil-measuring penetrometer, a dynamograph, and a radiation densitometer for obtaining data on the mechanical and physical properties and the cosmic-ray reflectivity of the lunar surface. It is believed that transmissions from the spacecraft ceased before the end of December 1966.

Luna 13

Reference:

B20268-000A
Vinogradov, A. P., *et al*, Study of the lunar surface by the Soviet Luna 9 and Luna 13 automatic stations, In -- Proc. of UN Conf. of the Expl. and Peaceful Uses of Outer Space, Vienna, Austria, Aug. 14-27, 1968, UN, Paper 68-95769, New York, NY, 1969.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

McDowell, Jonathan, *The United Nations Registry of Space Objects*, Harvard University, 1997. Web Address when accessed: http://hea-www.harvard.edu/QEDT/jcm/space/un/un.html

JPL Mission and Spacecraft Library, Jet Propulsion Laboratory, 1997. Web Address when accessed: http://msl.jpl.nasa.gov/home.html.

Semenov, Yuri P Editor, *Raketno-kosmicheskaya korporatsiya 'Energia' imeni S P Koroleva*, Moscow, Russia, 1996

Varfolomyev, Timothy, *Spaceflight*, "Soviet Rocketry that Conquered Space - Part 5", 1998, Volume 40, page 85.

National Space Science Center Planetary Page, As of 19 February 1999.. Web Address when accessed: http://nssdc.gsfc.nasa.gov/planetary/planetary_home.html.

Luna 16

Luna 16	**NSSDC ID:**1970-072A
Other Name(s)	Lunik 16, 04527
Launch Date/Time:	1970-09-12 at 13:25:53 UTC
On-orbit dry mass:	5600 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start/End Date(s)/Time(s)	Periapsis	Apoapsis	Period	Inclination(°)	Eccentricity
Orbiter	Moon	1970.260:00:00:00 (17 Sep) - 1970.263:00:00:00 (20 Sep)	111 km	111 km	119 m	70	0
Lander	Moon	1970.263:05:18:00 (20 Sep) - 1970.264:07:43:00 (21 Sep)					
Interplanetary cruise	Earth	1970.264:07:43:00 (21 Sep) - 1970.267:03:26:00 (24 Sep)					

Description

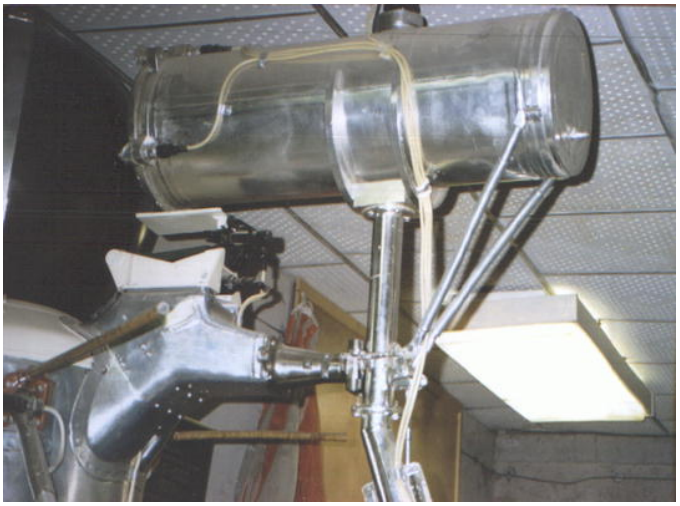
Luna 16 was the first robotic probe to land on the Moon and return a sample to Earth and represented the first lunar sample return mission by the Soviet Union and the third overall, following the Apollo 11 and 12 missions. The spacecraft consisted of two attached stages, an ascent stage mounted on top of a descent stage. The descent stage was a cylindrical body with four protruding landing legs, fuel tanks, a landing radar, and a dual descent engine complex. A main descent engine was used to slow the craft until it reached a cutoff point, which was determined by the onboard computer based on altitude and velocity. After cutoff a bank of lower thrust jets was used for the final landing. The

descent stage also acted as a launch pad for the ascent stage. The ascent stage was a smaller cylinder with a rounded top. It carried a cylindrical hermetically sealed soil sample container inside a re-entry capsule. The spacecraft descent stage was equipped with a television camera, radiation and temperature monitors, telecommunications equipment, and an extendable arm with a drilling rig for the collection of a lunar soil sample.

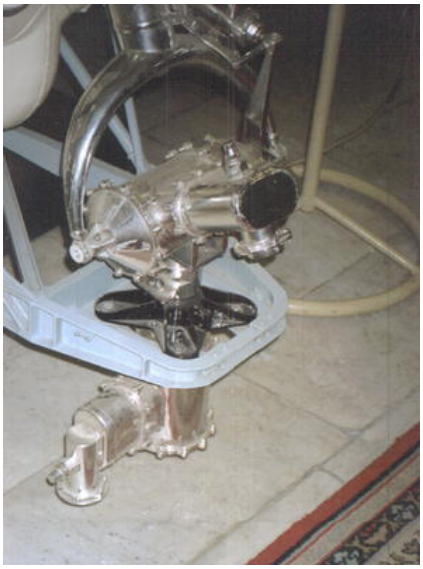
Mission profile

The Luna 16 automatic station was launched toward the Moon from a preliminary Earth orbit and after one mid-course correction on 13 September it entered a circular 111 km lunar orbit on 17 September 1970. The lunar gravity was studied from this orbit, and then the spacecraft was fired into an elliptical orbit with a perilune of 15.1 km. The main braking engine was fired on 20 September, initiating the descent to the lunar surface. The main descent engine cut off at an altitude of 20 m and the landing jets cut off at 2 m height at a velocity less than 2.4 m/s, followed by vertical free-fall. At 05:18 UT, the spacecraft soft landed on the lunar surface in Mare Foecunditatis (the Sea of Fertility) as planned, approximately 100 km west of Webb crater. This was the first landing made in the dark on the Moon, as the Sun had set about 60 hours earlier. According to the Bochum Radio Space Observatory in the Federal Republic of Germany, strong and good quality television pictures were returned by the spacecraft. However, such pictures were not made available to the U.S. by any sources so there is question as to the reliability of the Bochum report. The drill was deployed and penetrated to a depth of 35 cm before encountering hard rock or large fragments of rock. The column of regolith in the drill tube was then transferred to the soil sample container. After 26 hours and 25 minutes on the lunar surface, the ascent stage, with the hermetically sealed soil sample container, lifted off from the Moon carrying 101 grams of collected material at 07:43 UT on 21 September. The lower stage of Luna 16 remained on the lunar surface and continued transmission of lunar temperature and radiation data. The Luna 16 re-entry capsule returned directly to Earth without any mid-course corrections, made a ballistic entry into the Earth's atmosphere on 24 September and deployed parachutes. The capsule landed approximately 80 km SE of the city of Dzhezkazgan in Kazakhstan at 03:26 UT.

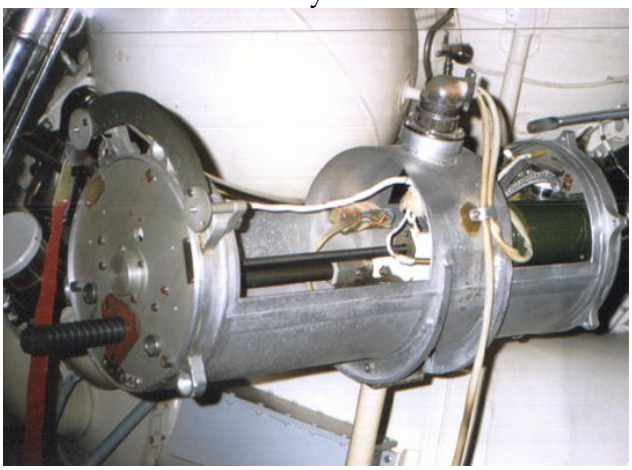
Luna 16 Drill



Luna 16 Drill Base



Luna 16 Drill Cutaway



Luna 16 Return Capsule

Luna 16 stamp

Reference:

B09525-000A
Vinogradov, A. P., Preliminary data on the lunar soil brought to earth by automatic probe 'Luna-16', J. Brit. Interplanet. Soc., 24, 475-495, Aug. 1971.

B13134-000A
Luna 16 returns with lunar rock samples, Soviet Rept., 4, No. 8, Oct. 1970..

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Luna 17/Lunokhod 1

Luna 17	**NSSDC ID:**1970-095A
Other Name(s)	Lunik 17, Lunokhod 1, Luna 17, 04691
Launch Date/Time:	1970-11-10 at 14:44:01 UTC
On-orbit dry mass:	5600 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

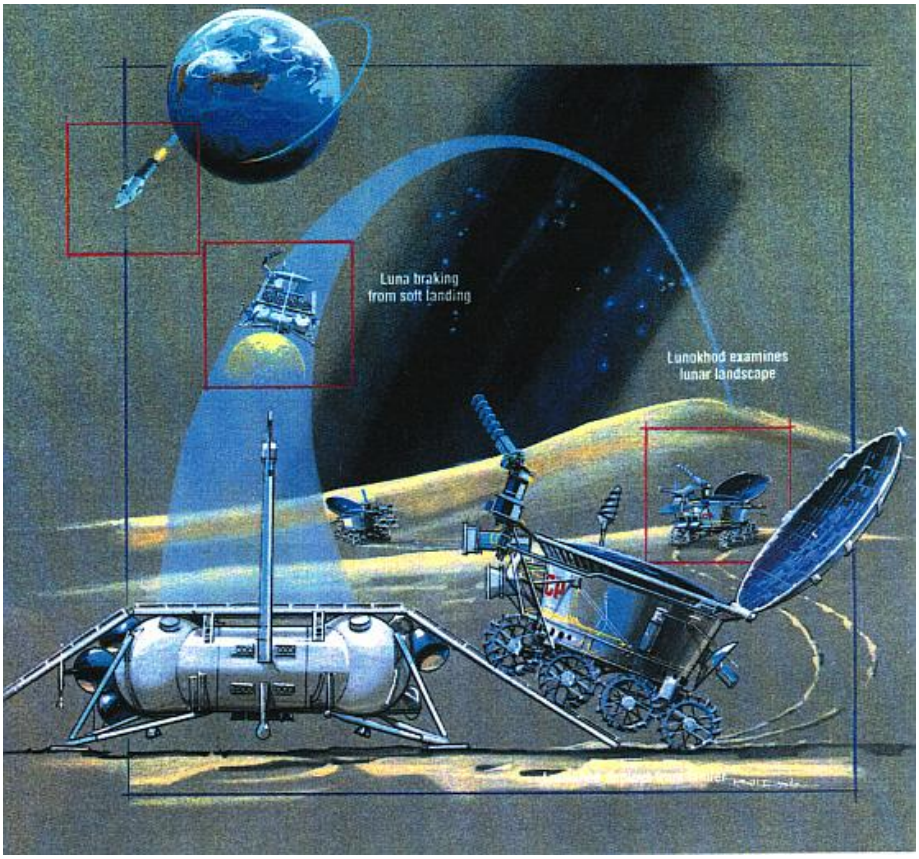
Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Moon	1970.321:03:47:00 (17 Nov)		325.00000	38.28000

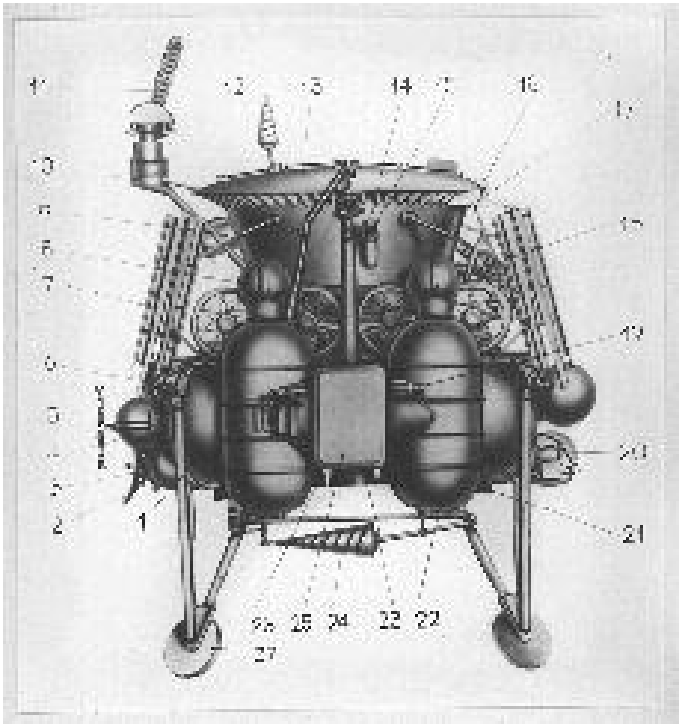
Description

Luna 17 was launched from an earth parking orbit towards the Moon and entered lunar orbit on November 15, 1970. The spacecraft soft landed on the Moon in the Sea of Rains. The spacecraft had dual ramps by which the payload, Lunokhod 1, descended to the lunar surface. Lunokhod 1 was a lunar vehicle formed of a tub-like compartment with a large convex lid on eight independently powered wheels. Lunokhod was equipped with a cone-shaped antenna, a highly directional helical antenna, four television cameras, and special extendable devices to impact the lunar soil for soil density and mechanical property tests. An x-ray spectrometer, an x-ray telescope, cosmic-ray detectors, and a laser device were also included. The vehicle was powered by a solar cell array mounted on the underside of the lid. Lunokhod was intended to operate through three lunar days but actually operated for eleven lunar days. The operations of Lunokhod officially ceased on October 4, 1971, the anniversary of Sputnik 1. Lunokhod 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.

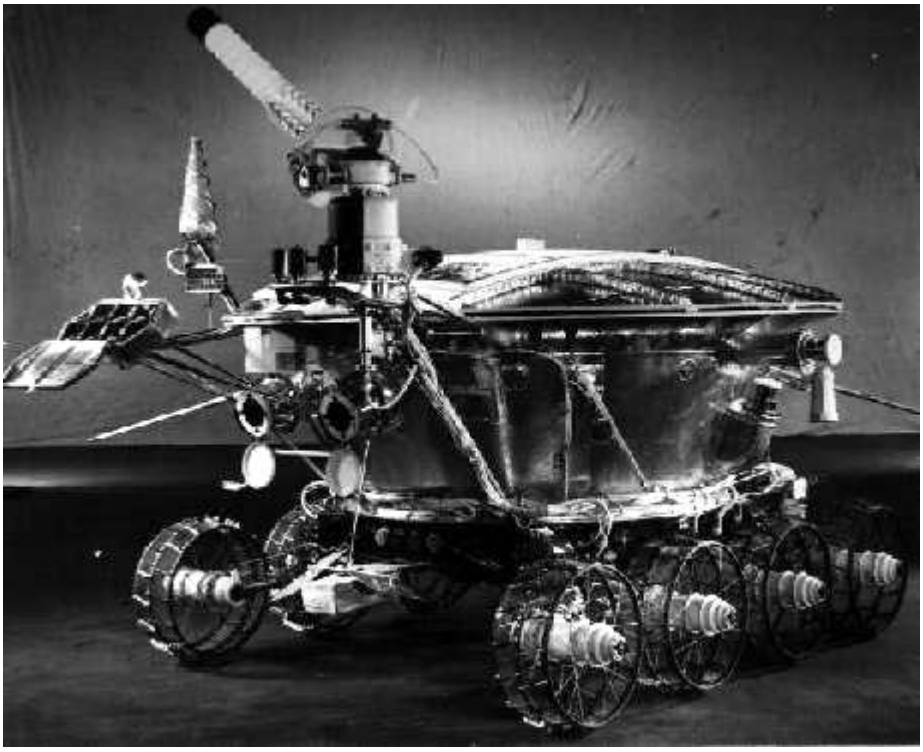
Lunokhod Mission Profile

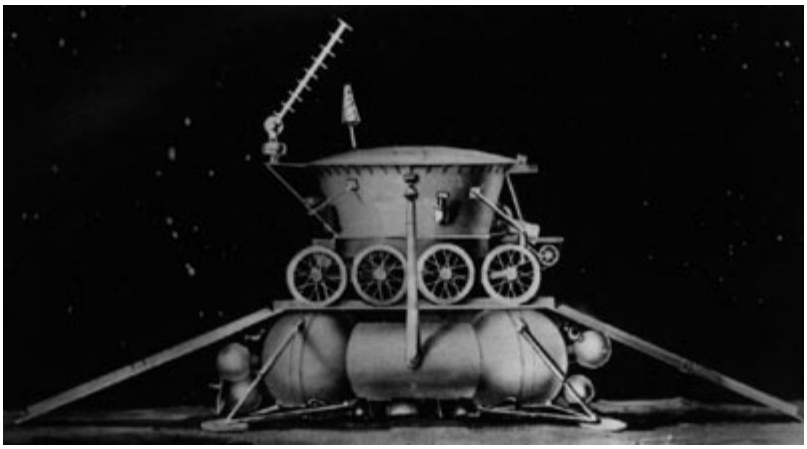


Lunokhod 1 Rover



The Lunokhod 1 Rover

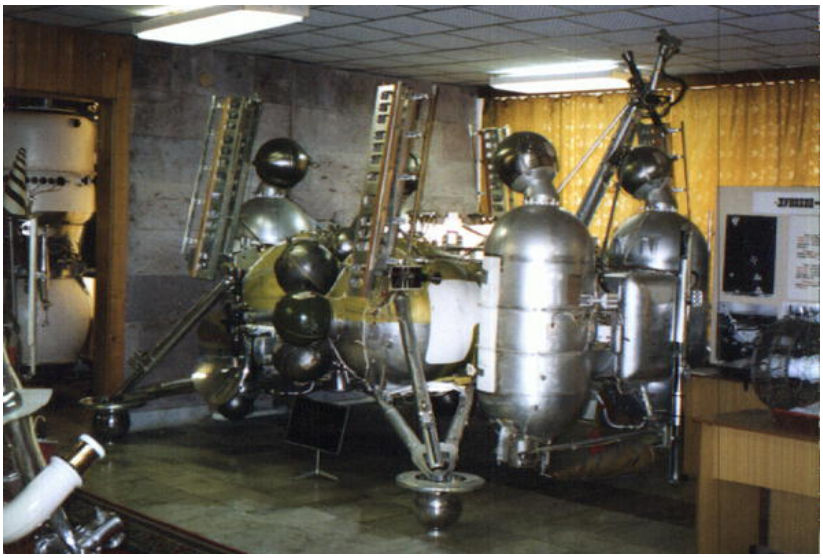




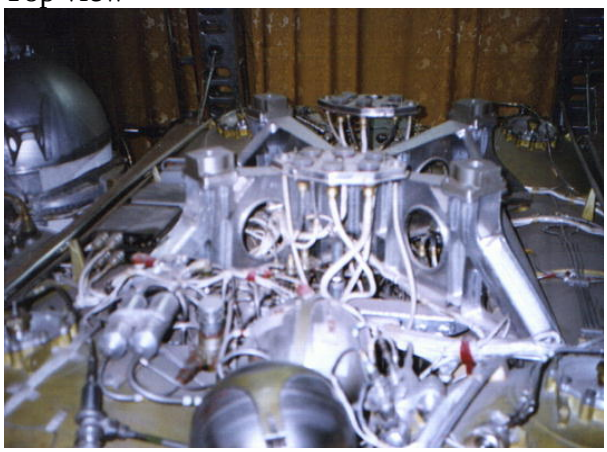
Luna 17 stamp

Lunokhod stamp

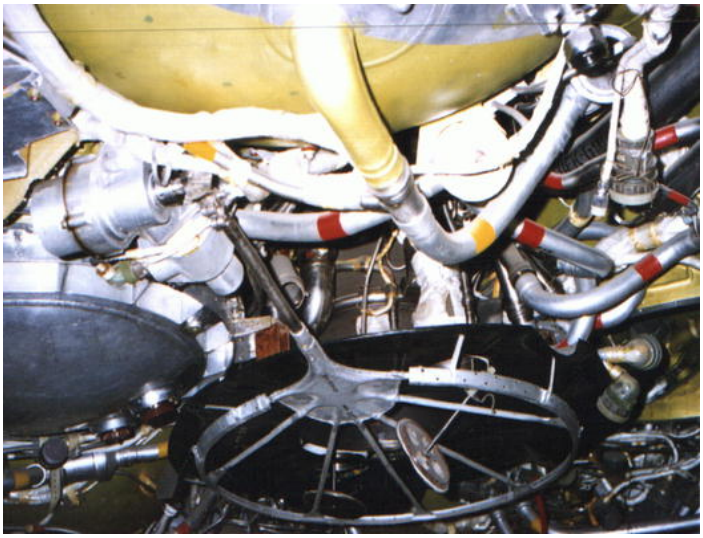
Base



Top view

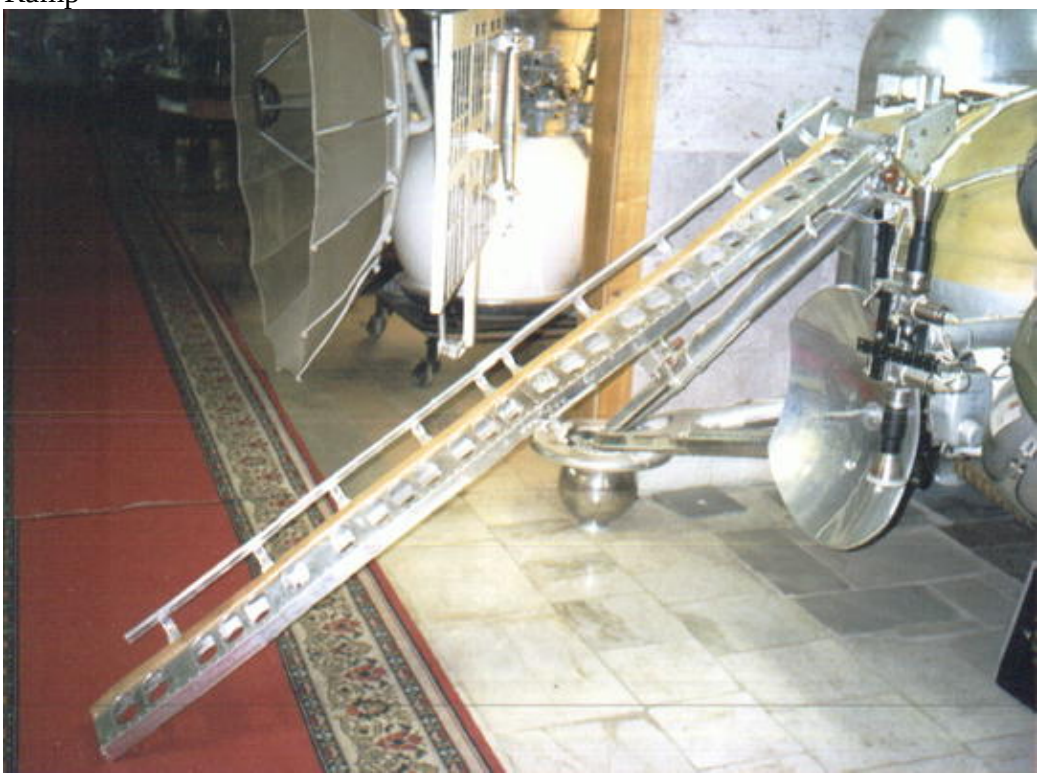


Bottom view



Closeup

Ramp



Reference:

B09666-000A
Luna-17, Soviet Report, 4, No. 10, Dec. 1970.

B26940-000A
Gurshteyn, A. A., *et al,* Automatic station Luna-17 in the Sea of Rains, Priroda, No. 11, 2-4, 1971.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Luna 18

Luna 18	**NSSDC ID:**1971-073A
Other Name(s)	Lunik 18, 05448
Launch Date/Time:	1971-09-02 at 13:40:40 UTC
On-orbit dry mass:	5600 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start/End Date(s)/Time(s)	Periapsis	Apoapsis	Period	Inclination(°)	Eccentricity
Orbiter	Moon	1971.250:00:00:00 (07 Sep) - 1971.254:00:00:00 (11 Sep)	1.055 RL	1.058 RL	119 m	35	.001361

Key:

Code	Meaning
RL	Lunar radii (1 RL = 1738 km)

Description

Luna 18 was placed in an earth parking orbit after it was launched and was then sent towards the Moon. 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, at 3 degrees 34 minutes N, 56 degrees 30 minutes E (selenographic coordinates) in a rugged mountainous terrain. Signals ceased at the moment of impact.

Reference:

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

B46866-000A
Soviet space programs, 1971-75 - volume 1, Unpublished, Unnumbered, 1976.

Luna 20

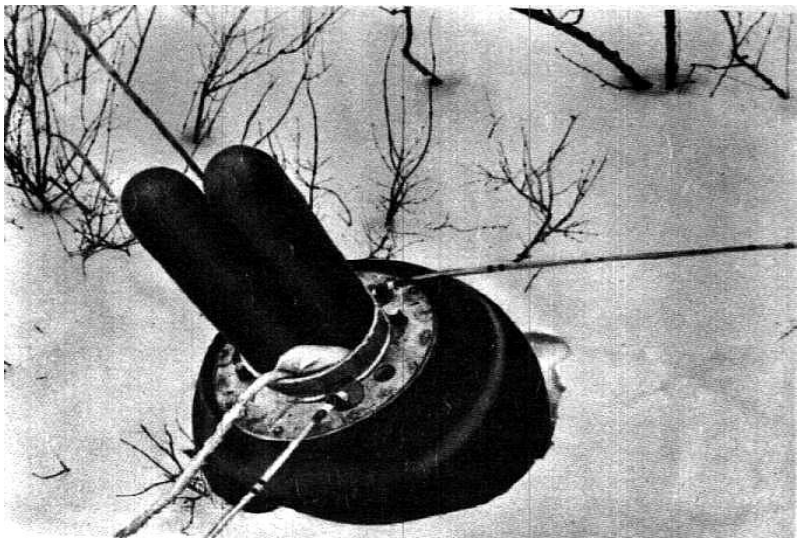
Luna 20	**NSSDC ID:**1972-007A
Other Name(s)	Lunik 20, 05835
Launch Date/Time:	1972-02-14 at 03:27:59 UTC
On-orbit dry mass:	5600 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start	Epoch End	Longitude	Latitude

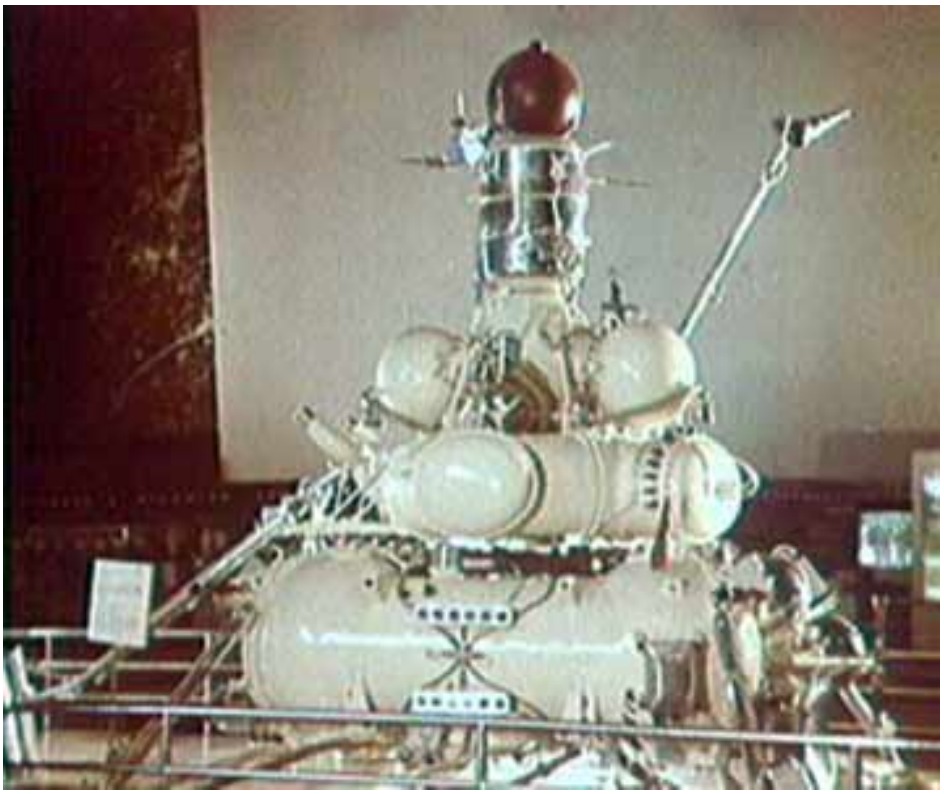
		Date/Time	Date/Time		
Lander	Moon	1972.052:19:19:00 (21 Feb)		56.50000	3.57000

Description



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 near Mare Foecunditatis (Sea of Fertility), 120 km from where Luna 16 had impacted. 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.

Sample return capsules from Luna 16, 20, and 24 on display at the NPO Lavochkin Museum



Reference:

B12158-000A
Luna 20 sample return system detailed, Aviat. Week Space Technol., 96, No. 12, 20, Mar. 1972.

B16795-000A
Vinogradov, A. P., Preliminary data on lunar soil collected by the Luna-20 unmanned spacecraft, Geochim. et Cosmochim. Acta, 37, No. 4, 721-729, Apr. 1973. (Presented at a Meeting of the Presidium of the U.S.S.R. Academy of Sciences, 11 May, 1972). (Trans. from Geokhimiya, 763-774, 1972).

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

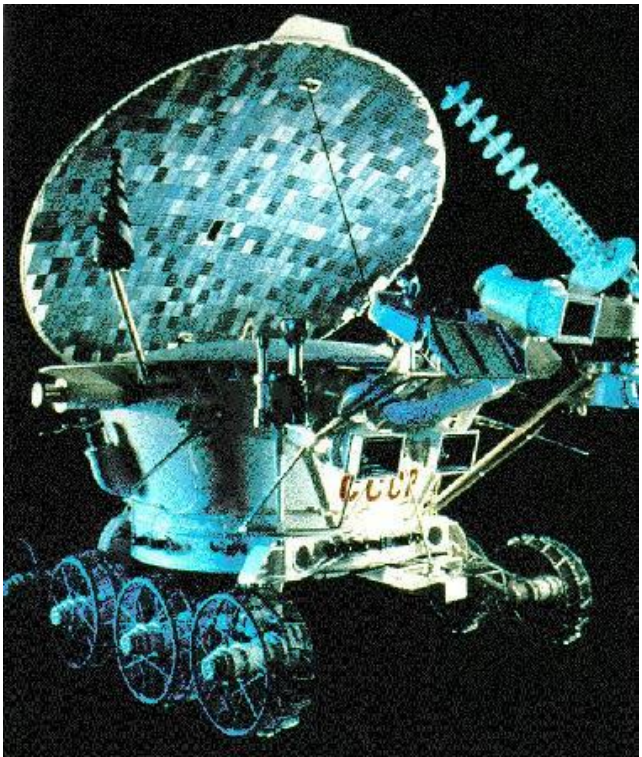
Luna 21/Lunokhod 2

Luna 21/Lunokhod 2	**NSSDC ID:**1973-001A
Other Name(s)	Lunokhod 2, Luna 21, 06331
Launch Date/Time:	1973-01-08 at 06:55:38 UTC
On-orbit dry mass:	4850 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start/End Date(s)/Time(s)	Periapsis	Apoapsis	Period	Inclination(°)	Eccentricity
Orbiter	Earth	1973.008:00:00:00 (08 Jan)	183 km	236 km	88.54 m	51.6	.004
Orbiter	Moon	1973.012:00:00:00 (12 Jan) - 1973.013:00:00:00 (13 Jan)	90 null	100 null	118 m	60	
Lander	Moon	1973.015:23:35:00 (15 Jan) - 1973.154:00:00:00 (03 Jun)	90 null		118 m	60	

Description
The Luna 21 spacecraft landed on the Moon and deployed the second Soviet lunar rover (Lunokhod 2). The primary objectives of the mission were to collect images of the lunar surface, examine ambient light levels to determine the feasibility of astronomical observations from the Moon, perform laser ranging experiments from Earth, observe solar X-rays, measure local magnetic fields, and study mechanical properties of the lunar surface material.



Lunokhod 2 Rover and Subsystems

The rover stood 135 cm high and had a mass of 840 kg. It was about 170 cm long and 160 cm wide and had 8 wheels each with an independent suspension, motor and brake. The rover had two speeds, ~1 km/hr and ~2 km/hr. Lunokhod 2 was equipped with three TV cameras, one mounted high on the rover for navigation, which could return high resolution images at different rates (3.2, 5.7, 10.9 or 21.1 seconds per frame). These images were used by a five-man team of controllers on Earth who sent driving commands to the rover in real time. Power was supplied by a solar panel on the inside of a round hinged lid which covered the instrument bay, which would charge the batteries when opened. A polonium-210 isotopic heat source was used to keep the rover warm during the lunar nights. There were 4 panoramic cameras mounted on the rover. Scientific instruments included a soil mechanics tester, solar X-ray experiment, an astrophotometer to measure visible and UV light levels, a magnetometer deployed in front of the rover on the end of a 2.5 m boom, a radiometer, a photodetector (Rubin-1) for laser detection experiments, and a French-supplied laser corner-reflector. The lander and rover together weighed 1814 kg.

Mission Profile

The SL-12/D-1-e launcher put the spacecraft into Earth parking orbit followed by translunar injection. On 12 January 1973, Luna 21 was 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 UT 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, the Lunokhod 2 took TV images of the surrounding area, then rolled down a ramp to the surface at 01:14 UT 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.

Reference:

B12565-000A
Soviet space programs, 1966-70, Govt. Printing Office, Senate Doc. No. 92-51, Wash., D.C., Dec. 1971.

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B50256-000A
Davies, M. E. and T. R. Colvin, Lunar coordinates in the regions of the Apollo landers, *J. Geophys. Res.*, 105, No. E8, 20277-20280, Aug. 2000.

Luna 23

Luna 23	**NSSDC ID:**1974-084A
Other Name(s)	
Launch Date/Time:	1974-10-28 at 14:30:32 UTC
On-orbit dry mass:	5600 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS

	david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start/End Date(s)/Time(s)	Periapsis	Apoapsis	Period	Inclination(°)	Eccentricity
Orbiter	Moon	1974.304:00:00:00 (31 Oct) - 1974.310:00:00:00 (06 Nov)					

Description

Luna 23 was a Moon lander mission, which was intended to return a lunar sample to Earth. Launched to the Moon by a Proton SL-12/D-1-e booster, 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 3 days after landing. In 1976, Luna 24 landed several hundred meters away and successfully returned samples.

Reference:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

Luna 24

Luna 24	**NSSDC ID:**1976-081A, 1976-081E
Other Name(s)	
Launch Date/Time:	1976-08-09 at 15:04:12 UTC
On-orbit dry mass:	4800 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS

	david.r.williams@gsfc.nasa.gov

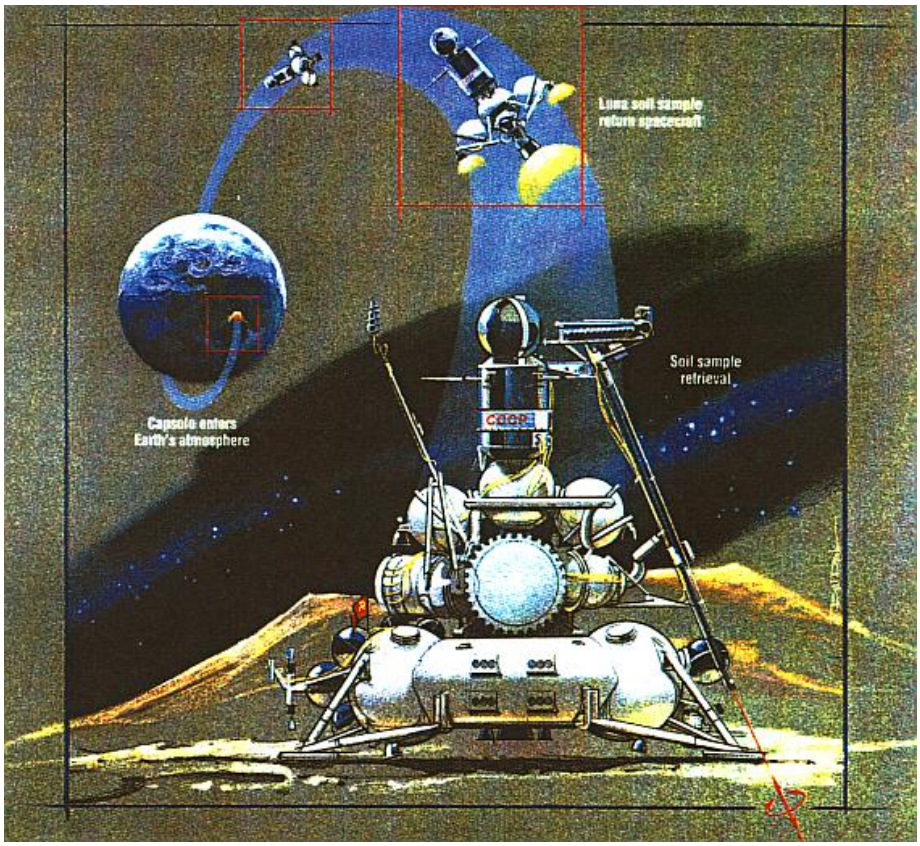
Orbital Information

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Moon	1976.231:02:00:00 (18 Aug)		62.20000	12.25000

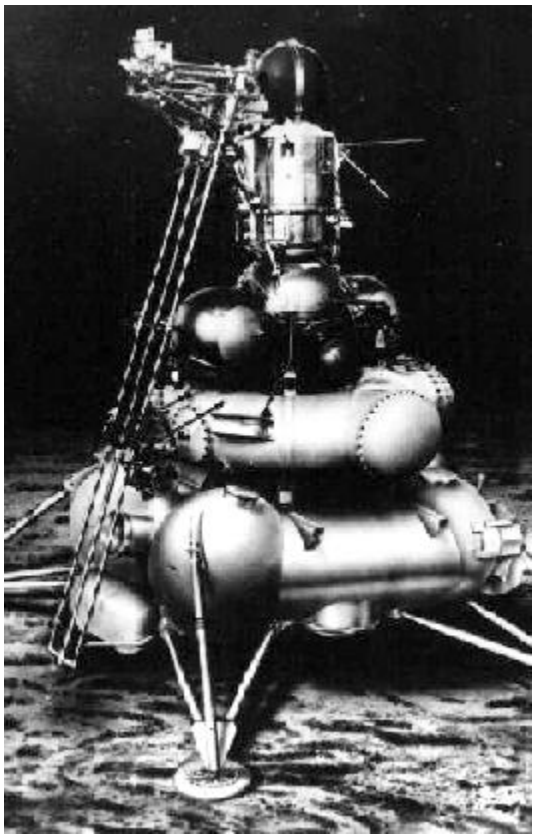
Description

The last of the Luna series of spacecraft, the mission of the Luna 24 probe was the third Soviet mission to retrieve lunar ground samples (the first two were returned by Luna 16 and 20). The probe landed in the area known as Mare Crisium (Sea of Crisis). The mission successfully returned 170 grams of lunar samples to the Earth on 22 August 1976.

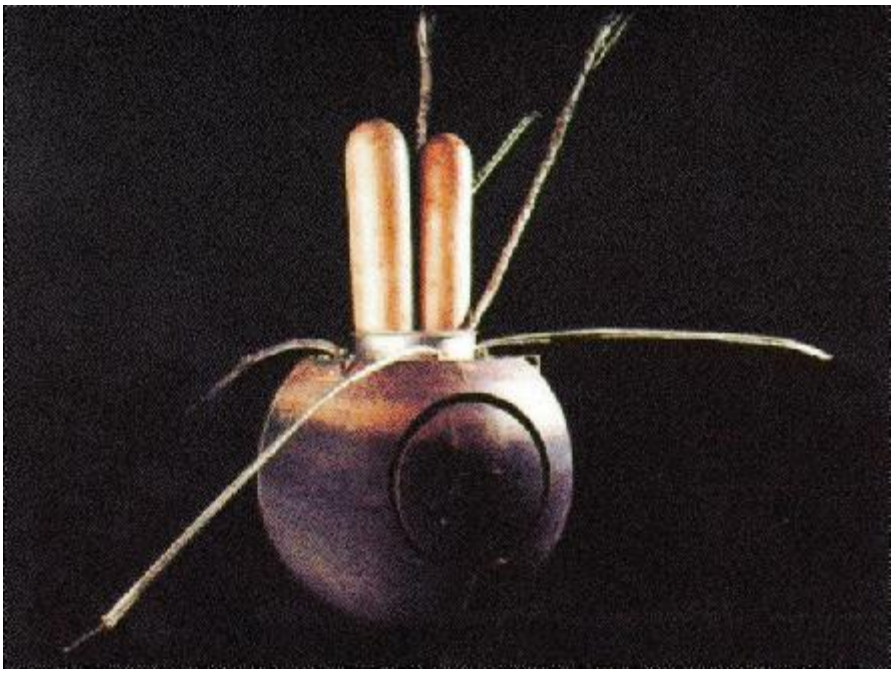
Mission Scenario



Luna 24 landing craft



Luna 24 sample return capsule



Sample return capsules from Luna 16, 20, and 24 on display at the NPO Lavochkin Museum

Reference:

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

Mars

Soviet Landing Missions to Mars

Mars 2 - Soviet Mars orbiter and lander (1971)
Mars 3 - Soviet Mars orbiter and lander (1971)
Mars 4 - failed
Mars 6 - Soviet Mars lander (1973)
Mars 7 - failed

Mars 2 Lander

Mars 2 Lander	**NSSDC ID:**1971-045D
Other Name(s)	
Launch Date/Time:	1971-05-19 at 16:22:44 UTC
On-orbit dry mass:	358 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Mars	1971.331:00:00:00 (27 Nov)	1971.331:00:00:00 (27 Nov)	313.20000	-44.20000

Reference:

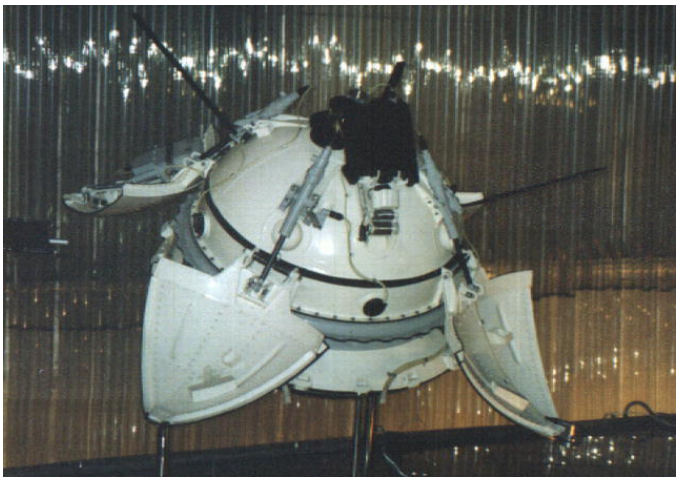
B11416-000A
Soviets land TV on Mars - blame failure on wind, dust, Aviat. Week Space Technol., 95, No. 24, 20, Dec. 1971.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

B46866-000A
Soviet space programs, 1971-75 - volume 1, Unpublished, Unnumbered, 1976.

Description



The Mars 2 and Mars 3 missions consisted of identical spacecraft, each with a bus/orbiter module and an attached descent/lander module. The primary scientific objective of the Mars 2 descent module was to perform a soft landing on Mars, return images from the surface, and return data on meteorological conditions, atmospheric composition, and mechanical and chemical properties of the soil. The Mars 2 lander descent sequence failed and the spacecraft impacted the surface and was destroyed.

Spacecraft and Subsystems

The Mars 2 descent module was mounted on the bus/orbiter opposite the propulsion system. It consisted of a spherical 1.2 m diameter landing capsule, a 2.9 m diameter conical aerodynamic braking shield, a parachute system and retro-rockets. The entire descent module had a fueled mass of 1210 kg, the spherical landing capsule accounted for 358 kg of this. An automatic control system consisting of gas micro-engines and pressurized nitrogen containers provided attitude control. Four "gunpowder" engines were mounted to the outer edge of the cone to control pitch and yaw. The main and auxiliary parachutes, the engine to initiate the landing, and the radar altimeter were mounted on the top section of the lander. Foam was used to absorb shock within the descent module. The landing capsule had four triangular petals, which would open after landing, righting the spacecraft and exposing the instrumentation.

The lander was equipped with two television cameras with a 360 degree view of the surface as well as a mass spectrometer to study atmospheric composition; temperature, pressure, and wind sensors; and devices to measure mechanical and chemical properties of the surface, including a mechanical scoop to search for organic materials and signs of life. It also contained a pennant with the Soviet coat of arms. Four aerials protruded from the top of the sphere to provide communications with the orbiter via an onboard radio system. The equipment was powered by batteries, which were charged by the orbiter prior to separation. Temperature control was maintained through thermal insulation and a system of radiators. The landing capsule was sterilized before launch to prevent contamination of the Martian environment.

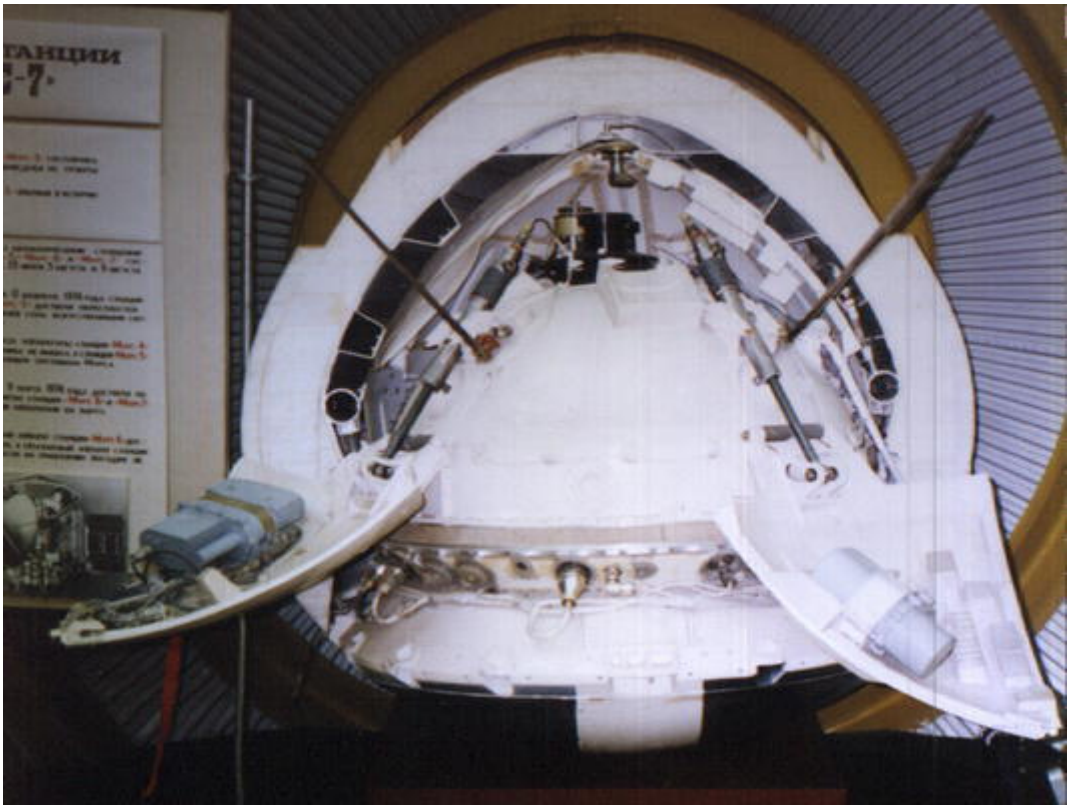
Prop-M Rover

The Mars 2 and 3 landers carried a small walking robot called PROP-M. The robot had a mass of 4.5 kg and was tethered to the lander by a cable for direct communication. The rover was designed to "walk" on a pair of skis to the limit of the 15 m cable length. The rover carried a dynamic penetrometer and a radiation densitometer. The main PROP-M frame was a squat box with a small protrusion at the center. The frame was supported on two wide flat skis, one extending down from each side elevating the frame slightly above the surface. At the front of the box were obstacle detection bars. The rover was planned to be placed on the surface after landing by a manipulator arm and to move in the field of view of the television cameras and stop to make measurements every 1.5 meters. The traces of movement in the Martian soil would also be recorded to determine material properties.

Mission Profile

The descent module was separated from the orbiter on 27 November 1971 about 4.5 hours before reaching Mars. After entering the atmosphere at approximately 6 km/sec, the descent system on the module malfunctioned for unknown reasons and the descent sequence did not operate as planned. The lander impacted the Mars at high velocity near 45 S, 313 W. The cause of the failure may have been related to the extremely powerful martian dust storm taking place at the time. Mars 2 was the first manmade object to reach the surface of Mars.

This image shows a cut-away view of the Mars 3 Lander at the NPO Lavochkin Museum. The image at the top of the page shows a Mars 3 Lander model at the Memorial Museum of Cosmonautics in Russia



Mars 3 Lander

Mars 3 Lander	**NSSDC ID:**1971-049F
Other Name(s)	
Launch Date/Time:	1971-05-28 at 15:26:30 UTC
On-orbit dry mass:	358 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start Date/Time	Epoch End Date/Time	Longitude	Latitude
Lander	Mars	1971.336:13:50:35 (02 Dec)	1971.336:13:52:25 (02 Dec)	158.00000	-45.00000

Reference:

B11416-000A
Soviets land TV on Mars - blame failure on wind, dust, Aviat. Week Space Technol., 95, No. 24, 20, Dec. 1971.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B46865-000A
Johnson, N. L., Handbook of soviet lunar and planetary exploration - volume 47 science and technology series, Amer. Astronau. Soc. Publ., 1979.

McDowell, Jonathan, *The United Nations Registry of Space Objects*, Harvard University, 1997. Web Address when accessed: http://hea-www.harvard.edu/QEDT/jcm/space/un/un.html

JPL Mission and Spacecraft Library, Jet Propulsion Laboratory, 1997. Web Address when accessed: http://msl.jpl.nasa.gov/home.html.
Kaesmann, Ferdinand, et. al., *Journal of the British Interplanetary Society*, "Proton - Development of A Russian Launch Vehicle", 1998, Volume 51, page 3.

Novosti Kosmonavtiki, "Na Mars!", 1996, Issue 20, page 53.

National Space Science Center Planetary Page, As of 19 February 1999.. Web Address when accessed:
http://nssdc.gsfc.nasa.gov/planetary/planetary_home.html.

Description

The Mars 2 and Mars 3 missions consisted of identical spacecraft, each with a bus/orbiter module and an attached descent/lander module. The primary scientific objective of the Mars 3 descent module was to perform a soft landing on Mars, return images from the surface, and return data on meteorological conditions, atmospheric composition, and mechanical and chemical properties of the soil. Mars 3 was the first spacecraft to make a successful soft landing on Mars.

Spacecraft and Subsystems
The Mars 3 descent module was mounted on the bus/orbiter opposite the propulsion system. It consisted of a spherical 1.2 m diameter landing capsule, a 2.9 m diameter conical aerodynamic braking shield, a parachute system and retro-rockets. The entire descent module had a fueled mass of 1210 kg, the spherical landing capsule accounted for 358 kg of this. An automatic control system consisting of gas micro-engines and pressurized nitrogen containers provided attitude control. Four "gunpowder" engines were mounted to the outer edge of the cone to control pitch and yaw. The main and auxiliary parachutes, the engine to initiate the landing, and the radar altimeter were mounted on the top section of the lander. Foam was used to absorb shock within the descent module. The landing capsule had four triangular petals which would open after landing, righting the spacecraft and exposing the instrumentation.
The lander was equipped with two television cameras with a 360 degree view of the surface as well as a mass spectrometer to study atmospheric composition; temperature, pressure, and wind sensors; and devices to measure mechanical and chemical properties of the surface, including a mechanical scoop to search for organic materials and signs of life. It also contained a pennant with the Soviet coat of arms. Four aerials protruded from the top of the sphere to provide communications with the orbiter via an onboard radio system. The equipment was powered by batteries which were charged by the orbiter prior to separation. Temperature control was maintained through thermal insulation and a system of radiators. The landing capsule was sterilized before launch to prevent contamination of the martian environment.

Prop-M Rover
The Mars 2 and 3 landers carried a small walking robot called PROP-M. The robot had a mass of 4.5 kg and was tethered to the lander by a cable for direct communication. The rover was designed to "walk" on a pair of skis to the limit of the 15 m cable length. The rover carried a dynamic penetrometer and a radiation densitometer. The main PROP-M frame was a squat box with a small protrusion at the center. The frame was supported on two wide flat skis, one extending down from each side elevating the frame slightly above

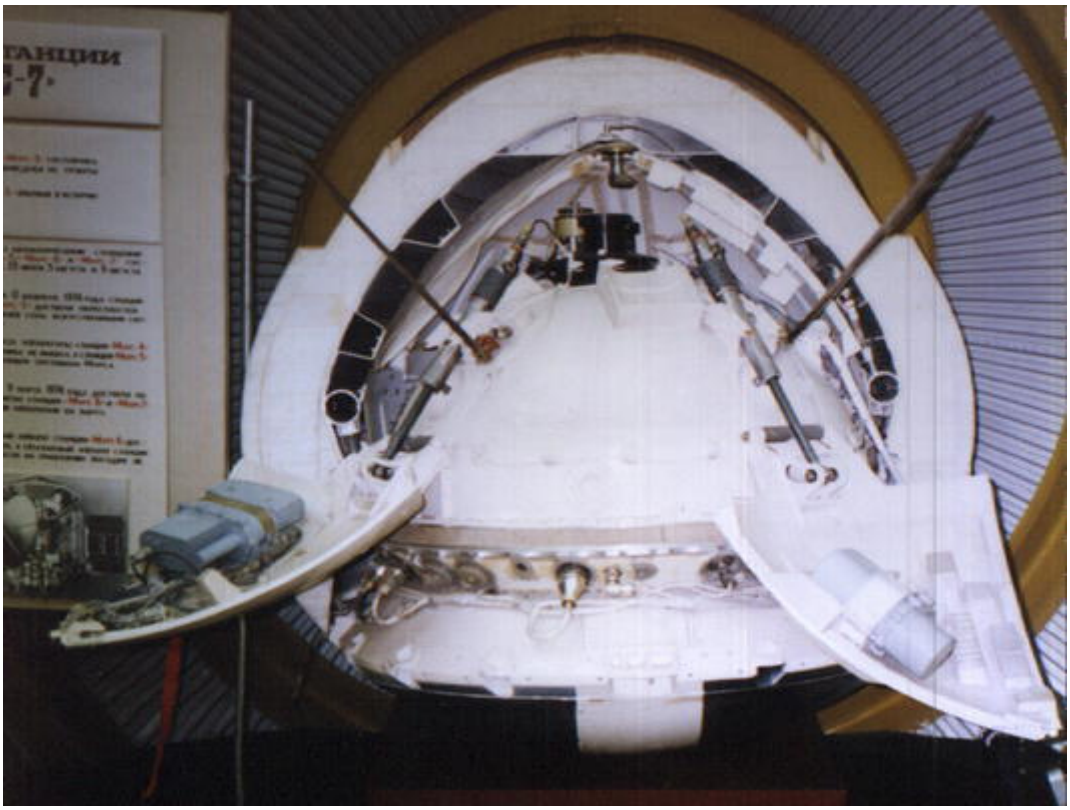
the surface. At the front of the box were obstacle detection bars. The rover was planned to be placed on the surface after landing by a manipulator arm and to move in the field of view of the television cameras and stop to make measurements every 1.5 meters. The traces of movement in the Martian soil would also be recorded to determine material properties.

Mission Profile

The descent module was separated from the orbiter on 2 December 1971 at 09:14 UT. (There is an uncertainty in the absolute times stated here of about 3 minutes.) Fifteen minutes later the descent engine was fired to point the aeroshield forward. At 13:47 UT the module entered the Martian atmosphere at 5.7 km/sec at an angle less than 10 degrees. The braking parachute was then deployed, followed by the main chute which was reefed until the craft dropped below supersonic velocity, at which time it was fully deployed, the heat shield was ejected, and the radar altimeter was turned on. At an altitude of 20 to 30 meters at a velocity of 60 - 110 m/s the main parachute was disconnected and a small rocket propelled it off to the side. Simultaneously the lander retrorockets were fired. The entire atmospheric entry sequence took a little over 3 minutes.

Mars 3 impacted the surface at a reported 20.7 m/s at approximately 45 degrees S, 158 degrees W, at 13:50:35 UT. Shock absorbers inside the capsule were designed to prevent damage to the instruments. The four petal shaped covers opened and the capsule began transmitting to the Mars 3 orbiter at 13:52:05 UT, 90 seconds after landing. After 20 seconds, at 13:52:25, transmission stopped for unknown reasons and no further signals were received at Earth from the martian surface. It is not known whether the fault originated with the lander or the communications relay on the orbiter. A partial panoramic image returned showed no detail and a very low illumination of 50 lux. The cause of the failure may have been related to the extremely powerful martian dust storm taking place at the time, which would also explain the poor image lighting. (It has also been suggested that the 20 second transmission never occurred and was simply propaganda to allow the Soviets to claim the first Mars soft landing.)

This image shows a cut-away view of the Mars 3 Lander at the NPO Lavochkin Museum. The image at the top of the page shows a Mars 3 Lander model at the Memorial Museum of Cosmonautics in Russia



Mars 4 (failed)

Mars 4	**NSSDC ID:**1973-047A
Other Name(s)	
Launch Date/Time:	1973-07-21 at 19:30:59 UTC
On-orbit dry mass:	2270 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start/End Date(s)/Time(s)	Periapsis	Apoapsis	Period	Inclination(°)	Eccentricity
Orbiter	Earth	1973.202:19:30:59 (21 Jul)	147 km	179 km	87.5 m	51.5	.00245
Interplanetary cruise	Sun	1973.202:00:00:00 (21 Jul) - 1974.041:00:00:00 (10 Feb)	1.02 AU	1.63 AU	556 d	2.2	.23
Flyby	Mars	1974.041:00:00:00 (10 Feb)	2200 km				

Key:

Code	Meaning
km	kilometers
AU	Astronomical units (1 AU = 1.495979E8 km)

Reference:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B49359-000A
Perminov, V. G., The difficult road to Mars - A brief history of Mars exploration in the Soviet Union, NASA, No. 15, Wash, DC, July 1999.

Description

Mars 4, 5, 6, and 7 comprised an associated group of Soviet spacecraft launched towards Mars in July and August of 1973. The Mars 4 automatic station was intended to be a Mars orbiter mission. It was presumably very similar in design and intended mission to the Mars 5 orbiter launched 4 days later. The orbiter had a fully fueled launch mass of 3440 kg. It was put into Earth orbit by a Proton SL-12/D-1-e booster and launched from

its orbital platform roughly an hour and a half later on a Mars trajectory. A mid-course correction burn was made on 30 July 1973. It reached Mars on 10 February 1974. **Due to a flaw in the computer chip which resulted in degradation of the chip during the voyage to Mars, the retro-rockets never fired to slow the craft into Mars orbit, and Mars 4 flew by the planet at a range of 2200 km.** It returned one swath of pictures and some radio occultation data, which constituted the first detection of the nightside ionosphere on Mars. It continued to return interplanetary data from solar orbit after the flyby.

Scientific Instrumentation

Mars 4 was equipped with a television imaging system consisting of two cameras. One, called Vega, was f/2.8 with a focal length of 52 mm, a 23 x 22.5 mm frame, and a 35.7 degree look angle. The other camera, Zufar, was f/4.5 with a 350 mm focal length, 23 x 22.5 mm frame, and a 5.67 degree look angle. The images were taken through red filters and could be facsimile scanned at 1000 x 1000 or 2000 x 2000 pixels and transmitted to Earth. The cameras provided pictures with resolutions of 100 m to 1 km. In addition, there was a single-line scanning device with a 30 degree field of view to provide panoramic images in the visible and near-infrared.

The spacecraft was also equipped with a Lyman-Alpha photometer to search for hydrogen in the upper atmosphere, a magnetometer, plasma ion traps and a narrow angle electrostatic plasma sensor to study the solar wind, an infrared radiometer (8-40 microns) to measure surface temperature, a radio telescope polarimeter (3.5 cm) to probe the subsurface dielectric constant, two polarimeters (0.32-0.70 microns) to characterize surface texture, and a spectrometer (0.3 - 0.8 microns) to study emissions in the upper atmosphere.

There were four photometers on board: one for 2 carbon dioxide bands to obtain altitude profiles, one at 0.35 - 0.7 microns for albedo and color studies, one in the water vapor band (1.38 microns) to study water in the atmosphere, and a UV photometer (0.26 and 0.28 microns) to measure ozone. The probe was equipped with a radio-occultation experiment to profile atmospheric density and a dual-frequency radio occultation experiment to profile ionospheric density. The spacecraft also carried French experiments, one called Zhemo to study the distribution and intensity of fluxes of solar protons and electrons and one known as Stereo-2 to study solar radio emissions.

Mars 6

Mars 6	**NSSDC ID:**1973-052A
Other Name(s)	
Launch Date/Time:	1973-08-05 at 17:45:48 UTC
On-orbit dry mass:	635 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start/End Date(s)/Time(s)	Periapsis	Apoapsis	Period	Inclination(°)	Eccentricity
Orbiter	Earth	1973.186:17:45:48 (05 Jul)	154 km	193 km	87.9 m	51.5	.003
Interplanetary cruise	Sun	1973.186:00:00:00 (05 Jul) - 1974.071:09:11:05 (12 Mar)	1.01 AU	1.67 AU	567 d	2.2	.246
Lander	Mars	1974.071:09:11:05 (12 Mar)					

Reference:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

B48401-000A
Istomin, V. G. and K. V. Grechnev, Argon in the Martian atmosphere: Evidence from the Mars 6 descent module, *Icarus*, 28, No. 2, 155-158, 1976.

B49359-000A

Perminov, V. G., The difficult road to Mars - A brief history of Mars exploration in the Soviet Union, NASA, No. 15, Wash, DC, July 1999.

McDowell, Jonathan, *The United Nations Registry of Space Objects*, Harvard University, 1997. Web Address when accessed: http://hea-www.harvard.edu/QEDT/jcm/space/un/un.html.

JPL Mission and Spacecraft Library, Jet Propulsion Laboratory, 1997. Web Address when accessed: http://msl.jpl.nasa.gov/home.html.

Kaesmann, Ferdinand, et. al., *Journal of the British Interplanetary Society*, "Proton - Development of A Russian Launch Vehicle", 1998, Volume 51, page 3.

Novosti Kosmonavtiki, "Na Mars!", 1996, Issue 20, page 53.

National Space Science Center Planetary Page, As of 19 February 1999.. Web Address when accessed: http://nssdc.gsfc.nasa.gov/planetary/planetary_home.html.

Description

Mars 4, 5, 6, and 7 comprised an associated group of Soviet spacecraft launched towards Mars in July and August of 1973. The Mars 6 interplanetary station consisted of a flyby bus and an attached descent module. The descent module separated from the bus on reaching Mars and was designed to enter the martian atmosphere and make in-situ studies of the Mars atmosphere and surface.

Mission Profile

Mars 6 successfully lifted off into an intermediate Earth orbit on a Proton SL-12/D-1-e booster and then launched into a Mars transfer trajectory. Total fueled launch mass of the lander and bus was 3260 kg. After one course correction burn on 13 August 1973, it reached Mars on 12 March 1974. The descent module separated from the bus at a distance of 48,000 km from Mars. The bus continued on into a heliocentric orbit after passing within 1600 km of Mars. The descent module entered the atmosphere at 09:05:53 UT at a speed of 5.6 km/s. The parachute opened at 09:08:32 UT after the module had slowed its speed to 600 m/s by aerobraking. During this time the craft was collecting data and transmitting it directly to the bus for immediate relay to Earth. Contact with the descent module was lost at 09:11:05 UT in "direct proximity to the surface", probably either when the retrorockets fired or when it hit the surface at an estimated 61 m/s. Mars 6 landed at 23.90 S, 19.42 W in the Margaritifer Sinus region of Mars. The landed mass was 635 kg. The descent module transmitted 224 seconds of data before transmissions ceased, the first data returned from the atmosphere of Mars. Unfortunately, much of the data were unreadable due to a flaw in a computer chip which led to degradation of the system during its journey to Mars.

Scientific Instrumentation

The Mars 6 Descent Module carried a panoramic telephotometer to image the martian surface around the lander, atmospheric temperature, pressure, density, and wind sensors, an accelerometer to measure atmospheric density during the descent, a mass spectrometer to estimate atmospheric composition, a radio altimeter, an activation analysis experiment to study soil composition, and mechanical properties soil sensors. The flyby module contained a telephotometer to image Mars, a Lyman alpha sensor to search for hydrogen in the upper atmosphere, a magnetometer, an ion trap and narrow angle electrostatic plasma sensor to study the solar wind and its interaction with Mars, solar cosmic ray sensors, micrometeorite sensors, and a French-supplied solar radiometer to measure solar long-wavelength radio emissions. It was also equipped to perform a radio occultation experiment to profile the atmosphere and ionosphere.

Scientific Results

Data returned by the Mars 6 descent module allowed a profile of tropospheric structure from the base of the stratosphere at 25 km altitude at 150 K to the surface at 230 K and atmospheric density from 82 km to 12 km. A surface pressure of 6 mb and temperature of (230 K) -43 C were measured. Instruments also indicated "several times" more atmospheric water vapor than previously reported. The mass spectrometer data were stored on-board during the descent and scheduled to be transmitted after landing and were therefore lost. The current to the vacuum pump was transmitted as an engineering parameter, however, and a steep increase in current was found. It was hypothesized to indicate an inert gas which could not be removed by the pump, leading to an estimate of argon abundance in the atmosphere of 25% to 45%. (The actual value is now known to be about 1.6%.) The Mars 6 flyby bus performed a radio occultation experiment and the results, in concert with results from Mars 4 and 5 occultation measurements, showed the existence of a nightside ionosphere with a maximum electron density of 4600 per cubic cm at an altitude of 110 km and a near surface atmospheric pressure of 6.7 mbar.

Mars 7 (failed)

Mars 7	**NSSDC ID:**1973-053A
Other Name(s)	
Launch Date/Time:	1973-08-09 at 17:00:17 UTC
On-orbit dry mass:	1200 kg
Launch Site/Country:	Tyuratam (Baikonur Cosmodrome), U.S.S.R
Vehicle:	Proton Booster Plus Upper Stage and Escape Stages
Discipline(s)	Planetary Science, Space Physics
Sponsoring Agencies/ Countries	Unknown/U.S.S.R
NSSDC Contact	Dr. David R. Williams, Raytheon ITSS david.r.williams@gsfc.nasa.gov

Orbital Information:

Orbit	Central Body	Epoch Start/End Date(s)/Time(s)	Periapsis	Apoapsis	Period	Inclination(°)	Eccentricity
Orbiter	Earth	1973.221:17:00:17 (09 Aug)	154 km	193 km	87.9 m	51.5	.003
Interplanetary cruise	Sun	1973.221:00:00:00 (09 Aug) - 1974.068:00:00:00 (09 Mar)	1.01 AU	1.69 AU	574 d	2.2	.252
Flyby	Mars	1974.068:00:00:00 (09 Mar)	1300 km				

Key:

Code	Meaning
Km	kilometers
AU	Astronomical units (1 AU = 1.495979E8 km)

Reference:

B13500-000A
Shelton, W., Soviet space exploration - the first decade, Arthur Barker Ltd., Unnumbered, London, England, 1969.

B45942-000A
Harvey, B., The new Russian space programme from competition to collaboration, John Wiley & Sons, Chichester, England, 1996.

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Perminov, V. G., The difficult road to Mars - A brief history of Mars exploration in the Soviet Union, NASA, No. 15, Wash, DC, July 1999.

Description

Mars 4, 5, 6, and 7 comprised an associated group of Soviet spacecraft launched towards Mars in July and August of 1973. The Mars 7 interplanetary station was intended to be a Mars lander. It consisted of a flyby bus and a descent module. The descent module was designed to enter the martian atmosphere and make in-situ studies of the atmosphere and surface, but **a malfunction on board caused the lander to miss the planet.**

Mission Profile
Mars 7 successfully lifted off into an intermediate Earth orbit on a Proton SL-12/D-1-e booster and then launched into a Mars transfer trajectory. Total fueled launch mass of the lander and bus was 3260 kg. After one course correction burn on 16 August 1973, it 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 (4 hours before encounter) and missed the planet by 1300 km. The early separation was probably due to a computer chip error, which resulted in degradation of the systems during the trip to Mars. The intended landing site was 50 S, 28 W and landed mass would have been 635 kg. The lander and bus continued on into heliocentric orbits.

Scientific Instrumentation
The Mars 7 Descent Module carried a panoramic telephotometer to image the martian surface around the lander, atmospheric temperature, pressure, density, and wind sensors, an accelerometer to measure atmospheric density during the descent, a mass spectrometer to estimate atmospheric composition, a radio altimeter, an activation analysis experiment to study soil composition, and mechanical properties soil sensors. The flyby module contained a telephotometer to image Mars, a Lyman alpha sensor to search for hydrogen in the upper atmosphere, a magnetometer, an ion trap and narrow angle electrostatic plasma sensor to study the solar wind and its interaction with Mars, solar cosmic ray sensors, micrometeorite sensors, and a French-supplied solar radiometer to measure solar long-wavelength radio emissions. It was also equipped to perform a radio occultation experiment to profile the atmosphere and ionosphere.