**Soviet Space Program**

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Soviet Soyuz rockets like the one pictured above were the first reliable means to transport objects into Earth orbit.

Launch of a Proton K/D

The **Soviet space program** refers to the rocketry and space exploration programs conducted by the Soviet Union (USSR) from the 1930s until its dissolution in 1991. Over its sixty-year history, this primarily classified military program was responsible for a number of notable accomplishments in space flight, including mankind's first intercontinental ballistic missile (1957), first satellite (Sputnik 1), first animal in space (the dog Laika on Sputnik 2), first human in space and Earth orbit (cosmonaut Yuri Gagarin on Vostok 1), first Moon impact (1959) and unmanned landing, first space station, and first interplanetary probe.

The rocket and space program of the USSR, initially boosted by the assistance of captured scientists from the advanced Nazi German rocket program, was performed mainly by Soviet engineers and scientists after 1955, and was based on some unique Soviet and Imperial Russian theoretical developments, many derived by Konstantin Eduardovich Tsiolkovskii, sometimes known as the father of theoretical astronautics. Sergey Korolyov (also transliterated as Korolev) was the head of the principal design group; his official title was "chief designer" (a standard title for similar positions in the USSR). Unlike its American competitor in the "space race," which had NASA as a single coordinating agency, the USSR's program was split among several competing design groups led by Korolyov, Mikhail Yangel, Valentin Glushko, and Vladimir Chelomei.

Because of the program's classified status, and for propaganda value, announcements of the outcomes of missions were delayed until success was certain, and failures were sometimes kept secret. Ultimately, as a result of Mikhail Gorbachev's policy of *glasnost* in the 1980s, many facts about the space program were declassified. Notable setbacks included the deaths of Korolyov, Vladimir Komarov (in the Soyuz 1 crash), and Yuri Gagarin (on a routine fighter jet mission) between 1966 and 1968, and disastrous experiences with the huge N-1 rocket intended to power a manned lunar landing, and which exploded shortly after launch on each of four unmanned tests.

The Soviet Space Program was dissolved with the fall of the Soviet Union, with Russia and Ukraine becoming its immediate heirs. Russia created the Russian Aviation and Space Agency, now known as the Russian Federal Space Agency (RKA), while Ukraine created the National Space Agency of Ukraine (NSAU).

**Origins**

Konstantin Tsiolkovsky, a pioneer of space exploration science.

The theory of space exploration was well established in the Russian Empire before the First World War from the writings of Konstantin Tsiolkovsky, who published pioneering papers in the late 19th and early 20th centuries and in 1929 even introduced the concept of the multi-staged rocket. Similarly the practical aspects were established by early experiments carried out by the reactive propulsion study group, GIRD in the 1920s and 1930s, where such pioneers as German engineer Friedrich Zander and Sergey Korolyov worked.

On August 18, 1933, GIRD launched the first Soviet liquid-fueled rocket Gird-09, and on November 25, 1933, the first hybrid-fueled rocket GIRD-X. In 1940-41 another advance in the reactive propulsion field was made: the development and serial production of the Katyusha multiple rocket launcher, which was feared by the Nazis. Further advances were made through reverse engineering of artifacts seized at the end of the Second World War, in particular drawings obtained from the V-2 production sites (after the Americans secretly moved most German scientists to the US - see Operation Paperclip along with several V-2 rockets). Under the direction of Dimitri Ustinov, designer and engineer Sergey Korolyov inspected the drawings. Helped by German scientists, especially rocket scientist Helmut Gröttrup, they built a replica of the V-2 called the R-1, although the weight of Soviet nuclear warheads required a more powerful booster. Korolyov was dedicated to the liquid-fueled cryogenic rockets he had been experimenting with in the late 1930s. Ultimately, this work resulted in the design of the R-7 Semyorka intercontinental ballistic missile (ICBM) which was successfully tested in August 1957. Because of its global range and large payload (approximately 5 tons), the reliable R7 was not only effective as a strategic delivery system for nuclear warheads, but also as an excellent basis for a space vehicle.

The Soviet space program was tied to the USSR's Five-Year Plans and from the start was reliant on support from the Soviet military. In January 1956, plans were approved for Earth-orbiting satellites to gain knowledge of space, (Sputnik), and four unmanned military reconnaissance satellites, (Zenit). Further planned developments called for a manned Earth orbit flight by 1964 and an unmanned lunar mission at an earlier date. After the first Sputnik proved to be a successful propaganda coup, Korolyov was charged to accelerate the manned program, the design of which was combined with the Zenit program to produce the Vostok spacecraft.

Following the death of Korolyov in 1966, Kerim Kerimov, who was formerly an architect of Vostok 1, was appointed Chairman of the State Commission on Piloted Flights and headed it for the next 25 years (1966–1991). He supervised every stage of development and operation of both manned space complexes as well as unmanned interplanetary stations for the former Soviet Union. One of Kerimov's greatest achievements was the launch of Mir in 1986.

**Internal competition**

Sergey Korolyov

Stamps honouring Sigmund Jähn

Unlike the American Space program which had NASA as a single coordinating structure directed by its Administrator, James Webb through most of the 1960s, the USSR's program was split between several competing design groups led by Sergey Korolyov, Mikhail Yangel, Valentin Glushko and Vladimir Chelomei.

Following the remarkable successes of the Sputniks between 1957 and 1961 and Vostoks between 1961 and 1964, Korolyov's OKB-1 design bureau was gaining influence and planned to move forward with the Soyuz craft and N-1 heavy booster that would be the basis of a permanent manned space station and manned exploration of the Moon. However, Ustinov directed him to focus on near-Earth missions using the very reliable Voskhod spacecraft, a modified Vostok, as well as on interplanetary unmanned missions to nearby planets Venus and Mars.

Valentin Glushko

Yangel had been Korolyov's assistant but with the support of the military was given his own design bureau in 1954 to work primarily on the military space program. This had the stronger rocket engine design team including the use of hypergolic fuels but following the Nedelin catastrophe in 1960 Yangel was directed to concentrate on ICBM development. He also continued to develop his own heavy booster designs similar to Korolyov's N-1 both for military applications and for cargo flights into space to build future space stations.

**Glushko** was the chief rocket engine designer but had a personal friction with Korolyov and refused to develop the large single chamber cryogenic engines that Korolyov needed to build heavy boosters.

Chelomei benefited from the patronage of Khrushchev and in 1960 was given the plum jobs of developing a rocket to send a manned craft around the moon and a manned military space station - but with limited experience his development was slow.

At one stage in the early 1960s the Soviet space program was actively developing 30 projects for launchers and spacecraft. With the fall of Krushchev in 1964 Korolyov was given complete control of the manned space program.

**After Korolyov**

Korolyov died in January 1966 following a routine operation that uncovered colon cancer and from complications from heart disease and severe hemorrhaging. Leadership of the OKB-1 design bureau was given to Vasili Mishin, who had the task of sending a man around the moon in 1967 and landing a man on it in 1968.

Former Space Pavilion at the All-Soviet Exhibition Centre.

Mishin lacked Korolyov's political authority and still faced competition from other chief designers. Under pressure Mishin approved the launch of the Soyuz 1 flight in 1967, even though the craft had never been successfully tested on an unmanned flight. The mission launched with known design problems and ended with the vehicle crashing to the ground, killing Vladimir Komarov. This was the first in-flight fatality.

Following this disaster and under new pressures, Mishin developed a drinking problem. The Soviets were narrowly beaten in sending the first manned flight around the moon in 1968 by Apollo 8, but Mishin pressed ahead with development of the problematic N1 rocket in the hope that the Americans would have a setback, leaving enough time to make the N-1 workable and land a man on the moon first. There was a success with the joint flight of Soyuz 4 and Soyuz 5 in January 1969 that tested the rendezvous, docking and crew transfer techniques that would be used for the landing, and the LK Lander was tested successfully in earth orbit. But after four unmanned test launches of the N-1 ended in failure, the heavy booster was abandoned and with it any chance of the Soviets landing men on the moon in a single launch.

Following this setback, Chelomei convinced Ustinov to approve a program in 1970 to advance his Almaz military space station as a means of beating the US's announced Skylab. Mishin remained in control of the project that became Salyut but the decision backed by Mishin to fly a three-man crew without pressure suits rather than a two-man crew with suits to Salyut 1 in 1971 proved fatal when the re-entry capsule depressurized killing the crew on their return to Earth. Mishin was removed from many projects, with Chelomei regaining control of Salyut. After working with NASA on the Apollo Soyuz Test Project, the Soviet leadership decided a new management approach was needed and in 1974 the N-1 was cancelled and Mishin dismissed. A single design bureau was created NPO Energia with Glushko as chief designer.

**Failures**

The Soviet program suffered various incidents and setbacks.

The Soviet space program was tied to the central planning of the USSR's five-year plans. This made it difficult for the Chief Designers to respond in 1961 to the US launching a crash program for a manned lunar landing, as the next five-year plan would not start until 1964. Centralized planning and the concentration on production targets also made it difficult for middle management and engineers to highlight defects in equipment, leading to poor quality control.

The Soviet space program produced the first publicized cosmonaut fatality on March 23, 1961 when Valentin Bondarenko died in a fire within a low pressure, high oxygen atmosphere.

The Voskhod program was cancelled after two manned flights owing to the change of Soviet leadership and the near fatality of the second mission. Had the planned further flights gone ahead they could have given the Soviet space program further 'firsts' including a long duration flight of 20 days, a spacewalk by a woman and an untethered spacewalk.

The deaths of Korolyov, Komarov (in the Soyuz 1 crash) and Gagarin (on routine fighter jet mission) within two years of each other understandably had some negative impact on the Soviet program.

The Soviets continued striving for the first lunar mission with the huge N-1 rocket, which exploded on each of four unmanned tests shortly after launch. The Americans won the race to land men on the moon with Apollo 11 in July 20, 1969.

On April 5, 1975, the second stage of a Soyuz rocket carrying 2 cosmonauts to the Salyut 4 space station malfunctioned, resulting in the first manned launch abort. The cosmonauts were carried several thousand miles downrange and became worried that they would land in China, which the Soviet Union was then having difficult relations with. The capsule hit a mountain, sliding down a slope and almost slid off a cliff; fortunately the parachute lines snagged on trees and kept this from happening. As it was, the two suffered severe injuries and the commander, Lazerev, never flew again.

On March 18, 1980 a Vostok rocket exploded on its launch pad during a fueling operation, killing 48 people.

In August 1981, Kosmos 434, which had been launched in 1971, was about to re-enter. To allay fears that the spacecraft carried nuclear materials, a spokesperson from the USSR Ministry of Foreign Affairs assured the Australian government on August 26, 1981 that the satellite was "an experimental lunar cabin". This was one of the first admissions by the Soviet Union that it had ever engaged in a manned lunar spaceflight program.

In September 1983, a Soyuz rocket being launched to carry cosmonauts to the Salyut 7 space station exploded on the pad, causing the Soyuz capsule's abort system to engage, saving the two cosmonauts on board.

See also the complete list of space disasters.

**Untapped potential**

**Buran**

The Buran shuttle.

The Soviet space program produced the Space Shuttle Buran based on the Energia launcher. Energia would be used as the base for a manned Mars mission. Buran was intended to operate in support of large space based military platforms as a response first to the US Space Shuttle and then the Strategic Defense Initiative. By the time the system was operational, in 1988, strategic arms reduction treaties and the end of the Cold War made Buran redundant. On November 15, 1988, as snowy clouds and winds were swirling around Baikonur Cosmodrome in Kazakhstan, the Buran orbiter, attached to its giant Energia rocket, thundered into the gloomy early morning sky. Three hours and two orbits later, the 100-tonne craft glided back to a flawless landing just a few miles from its launch pad and just 3m off the runway centerline. Several vehicles were built, but only one flew an unmanned test flight; it was found too expensive to operate as a civilian launcher.

**Canceled projects: Vesta**

The Vesta mission would have consisted of two identical probes to be launched in 1991. It was intended to fly-by Mars and then study four small bodies, including asteroids belonging to different classes. At 4 Vesta a penetrator would be released.

**List of Projects and accomplishments**

**Completed**

The Soviet space program has undertaken a number of projects, including:

* [Almaz](http://en.wikipedia.org/wiki/Almaz) space stations
* [Buran program](http://en.wikipedia.org/wiki/Buran_program)
* [Cosmos](http://en.wikipedia.org/wiki/Cosmos_%28satellite%29) satellites
* [Energia](http://en.wikipedia.org/wiki/Energia)
* [Foton](http://en.wikipedia.org/wiki/Foton)
* [N1-L3](http://en.wikipedia.org/wiki/N1-L3) Manned Moon landing program
* [Luna](http://en.wikipedia.org/wiki/Luna_program) Moon flybys, orbiters, impacts, landers, rovers, sample returns
* [Mars probe program](http://en.wikipedia.org/wiki/Mars_probe_program)
* [Meteor meteorological satellites](http://en.wikipedia.org/wiki/Meteor_%28satellite%29)
* [Molniya](http://en.wikipedia.org/wiki/Molniya_%28satellite%29) communications satellites
* [Mir](http://en.wikipedia.org/wiki/Mir) space station
* [Proton satellite](http://en.wikipedia.org/wiki/Proton_satellite) satellites
* [Phobos](http://en.wikipedia.org/wiki/Phobos_program) Mars probes program
* [Salyut](http://en.wikipedia.org/wiki/Salyut) space stations
* [Soyuz program](http://en.wikipedia.org/wiki/Soyuz_program) spacecraft
* [Sputnik program](http://en.wikipedia.org/wiki/Sputnik_program) satellites
* [TKS spacecraft](http://en.wikipedia.org/wiki/TKS_spacecraft)
* [Venera](http://en.wikipedia.org/wiki/Venera) Venus probes program
* [Vega program](http://en.wikipedia.org/wiki/Vega_program) Venus and comet Halley probes program
* [Vostok program](http://en.wikipedia.org/wiki/Vostok_program) spacecraft
* [Voskhod program](http://en.wikipedia.org/wiki/Voskhod_program) spacecraft
* [Zond program](http://en.wikipedia.org/wiki/Zond_program)

**Notable firsts**

This image was recorded by astronauts as the Space Shuttle Atlantis approached the Russian space station before docking during the STS-76 mission. Sporting spindly appendages and solar panels, Mir was orbiting about 350 kilometers above New Zealand's South Island and the city of Nelson near Cook Strait.

Two days after the United States announced its intention to launch an artificial satellite, on July 31, 1956, the Soviet Union announced its intention to do the same. Sputnik 1 was launched on October 4, 1957, beating the United States and stunning people all over the world.

The Soviet space program pioneered many aspects of space exploration:

* 1957: First intercontinental ballistic missile, the [R-7 Semyorka](http://en.wikipedia.org/wiki/R-7_Semyorka)
* 1957: First satellite, [Sputnik 1](http://en.wikipedia.org/wiki/Sputnik_1)
* 1957: First animal to enter Earth orbit, the dog [Laika](http://en.wikipedia.org/wiki/Laika) on [Sputnik 2](http://en.wikipedia.org/wiki/Sputnik_2)
* 1959: First firing of a rocket in Earth orbit, first man-made object to escape Earth's orbit, [Luna 1](http://en.wikipedia.org/wiki/Luna_1)
* 1959: First data communications, or [telemetry](http://en.wikipedia.org/wiki/Telemetry), to and from [outer space](http://en.wikipedia.org/wiki/Outer_space), [Luna 1](http://en.wikipedia.org/wiki/Luna_1).
* 1959: First man-made object to pass near the [Moon](http://en.wikipedia.org/wiki/Moon), first man-made object in Solar orbit, [Luna 1](http://en.wikipedia.org/wiki/Luna_1)
* 1959: First probe to impact the Moon, [Luna 2](http://en.wikipedia.org/wiki/Luna_2)
* 1959: First images of the moon's [far side](http://en.wikipedia.org/wiki/Far_side_%28Moon%29), [Luna 3](http://en.wikipedia.org/wiki/Luna_3)
* 1960: First animals to safely return from Earth orbit, the dogs [Belka and Strelka](http://en.wikipedia.org/wiki/Belka_and_Strelka) on [Sputnik 5](http://en.wikipedia.org/wiki/Sputnik_5).
* 1960: First probe launched to Mars, [Marsnik 1](http://en.wikipedia.org/wiki/Marsnik_1)
* 1961: First probe launched to Venus, [Venera 1](http://en.wikipedia.org/wiki/Venera_1)
* 1961: First person in space (International definition) and in Earth orbit, [Yuri Gagarin](http://en.wikipedia.org/wiki/Yuri_Gagarin) on [Vostok 1](http://en.wikipedia.org/wiki/Vostok_1), [Vostok program](http://en.wikipedia.org/wiki/Vostok_programme)
* 1961: First person to spend over a day in space [Gherman Titov](http://en.wikipedia.org/wiki/Gherman_Titov), [Vostok 2](http://en.wikipedia.org/wiki/Vostok_2) (also first person to sleep in space).
* 1962: First dual manned spaceflight, [Vostok 3](http://en.wikipedia.org/wiki/Vostok_3) and [Vostok 4](http://en.wikipedia.org/wiki/Vostok_4)
* 1963: First woman in space, [Valentina Tereshkova](http://en.wikipedia.org/wiki/Valentina_Tereshkova), [Vostok 6](http://en.wikipedia.org/wiki/Vostok_6)
* 1964: First multi-man crew (3), [Voskhod 1](http://en.wikipedia.org/wiki/Voskhod_1)
* 1965: First [EVA](http://en.wikipedia.org/wiki/Extra-vehicular_activity), by [Aleksei Leonov](http://en.wikipedia.org/wiki/Aleksei_Leonov), [Voskhod 2](http://en.wikipedia.org/wiki/Voskhod_2)
* 1965: First probe to hit another planet ([Venus](http://en.wikipedia.org/wiki/Venus)), [Venera 3](http://en.wikipedia.org/wiki/Venera_3)
* 1966: First probe to make a soft landing on and transmit from the surface of the moon, [Luna 9](http://en.wikipedia.org/wiki/Luna_9)
* 1966: First probe in lunar orbit, [Luna 10](http://en.wikipedia.org/wiki/Luna_10)
* 1967: First unmanned rendezvous and docking, [Cosmos 186](http://en.wikipedia.org/wiki/Cosmos_186)/[Cosmos 188](http://en.wikipedia.org/wiki/Cosmos_188). (Until 2006, this had remained the only major space achievement that the US had not duplicated.)
* 1969: First docking between two manned craft in Earth orbit and exchange of crews, [Soyuz 4](http://en.wikipedia.org/wiki/Soyuz_4) and [Soyuz 5](http://en.wikipedia.org/wiki/Soyuz_5)
* 1970: First samples automatically returned to Earth from another body, [Luna 16](http://en.wikipedia.org/wiki/Luna_16)
* 1970: First robotic space rover, [Lunokhod 1](http://en.wikipedia.org/wiki/Lunokhod_1)
* 1970: First data received from the surface of another planet (Venus), [Venera 7](http://en.wikipedia.org/wiki/Venera_7)
* 1971: First space station, [Salyut 1](http://en.wikipedia.org/wiki/Salyut_1)
* 1971: First probe to orbit another planet (Mars), first probe to reach surface of Mars, [Mars 2](http://en.wikipedia.org/wiki/Mars_2)
* 1975: First probe to orbit Venus, first photos from surface of Venus, [Venera 9](http://en.wikipedia.org/wiki/Venera_9)
* 1984: First woman to [walk in space](http://en.wikipedia.org/wiki/Extra-vehicular_activity), [Svetlana Savitskaya](http://en.wikipedia.org/wiki/Svetlana_Savitskaya) ([Salyut 7](http://en.wikipedia.org/wiki/Salyut_7) space station)
* 1986: First crew to visit two separate space stations ([Mir](http://en.wikipedia.org/wiki/Mir) and [Salyut 7](http://en.wikipedia.org/wiki/Salyut_7))
* 1986: First permanently manned space station, [Mir](http://en.wikipedia.org/wiki/Mir), which [orbited](http://en.wikipedia.org/wiki/Orbit) the [Earth](http://en.wikipedia.org/wiki/Earth) from 1986 until 2001
* 1987: First crew to spend over one year in space, [Vladimir Titov](http://en.wikipedia.org/wiki/Vladimir_Titov) and [Musa Manarov](http://en.wikipedia.org/wiki/Musa_Manarov) on board of [TM-4](http://en.wikipedia.org/w/index.php?title=TM-4&action=edit&redlink=1) - [Mir](http://en.wikipedia.org/wiki/Mir)

*Mir'*s Legacy - The core modules of the International Space Station, Phase Two of the ISS program.

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