



Sputnik 2: The First Animal in Orbit

by Andrew J. LePage
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The launching of Sputnik on the night of October 4, 1957 was virtually a total success. The only major malfunction was in the system that evenly empties the propellant tanks in the core and four boosters of the 8K71PS (also known as the SL-1 in the West) version of the R-7 ICBM (which was designated the SS-6 or Sapwood by NATO) that launched Sputnik. This system's failure caused the core's RD-107 engine to shut down a second earlier than intended because of excessive kerosene fuel consumption. This resulted in the apogee of Sputnik being 80 kilometers (50 miles) lower than originally planned but it still made it into a stable orbit nonetheless. The 83.6 kilogram (184 pound) satellite continued to transmit for the next three weeks before its batteries finally gave out. Due to the ever present atmospheric drag, the empty 7.5 metric ton (16,500 pound) Blok A core of the launch vehicle fell from orbit on December 1, 1957 followed by the now-silent Sputnik on January 4, 1958.

The night that Sputnik was launched, nobody could have predicted what impact it would have on the world. According to Nikita Khrushchev's own memoirs, he was informed of the successful launch by phone, congratulated the group of engineers and scientists involved and simply went to bed. The next morning's edition of Pravda published an exceptionally low-key TASS press release giving basic information about the launch and the satellite. In the West, however, the news of the launch had an incredible impact. Despite years of largely ignored public statements by Soviet authorities of their intent to launch an Earth satellite, the West was caught totally off guard. Between the radio transmissions and visual sightings of the satellite and the spent Blok A core, people around the world had ample opportunity to personally witness this trailblazer of the Space Age. The fact that Sputnik weighed substantially more than the American's planned Vanguard satellite also was noted and added to the

West's fears. The Soviet propaganda machine immediately realized the true value of the Sputnik launch and quickly put it to good use. Unlike the initial news of the launch, news of the world's reaction to Sputnik made the headlines and dominated the front page of the October 6 issue of Pravda.

Sputnik 2 is Approved

Khrushchev also quickly realized the immense propaganda value of Sputnik. Khrushchev totally bypassed the existing chain of command and consulted directly with Korolev to determine what other space spectaculars could be mounted by the OKB-1 design bureau. Additional satellite launches were immediately authorized and detailed studies of lunar probes and manned satellites began in earnest. It was also decided that the next launch, which would be timed to coincide with the fortieth anniversary of the Revolution on November 6, 1957, would carry a dog into earth orbit. This decision set the stage for the Soviet's long standing practice of tying major space missions to important political events to enhance their propaganda value

Korolev's team had been seriously studying such a satellite proposal for at least the past year and work had progressed quite far. In 1951 and 1952 six Soviet copies of the German V-2 rocket, known as the R-1, had been launched to high altitudes with dogs on board in order to study the effects of rocket flight and weightlessness on their passengers. A second series of flights in 1955 and 1956 used the more advanced R-1D and R-1E geophysical rockets. A total of twelve dogs were lofted to the edge of space with some of the canine cosmonauts making two flights during the course of this program.

Starting in May of 1957 another three-year long program to launch dogs to altitudes of 200 to 212 kilometers (124 to 132 miles) had begun this time

using the much more powerful R-2A rocket. The next satellite, designated Object PS-2, would build on this experience and would compliment the existing ballistic rocket experiment program. Despite the advance state of preparation, an immense amount of work was still required to meet Khrushchev's mandate. On October 11 everyone involved with the satellite project was called back from the much deserved vacations they had taken after the Sputnik launch to quickly prepare for the next mission.

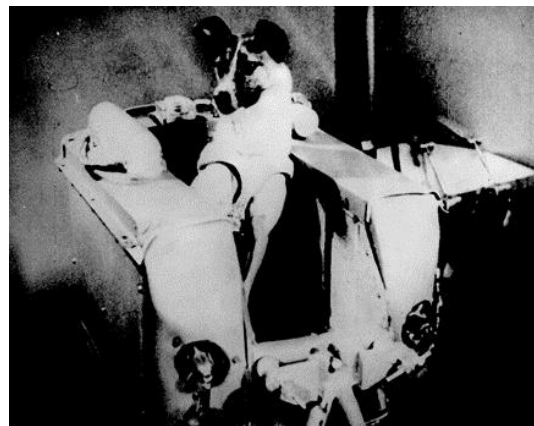
As Sputnik proved, the Soviets obviously had the means to launch a satellite but they still did not have the technology to successfully return a payload from Earth orbit. As a result, recovering the PS-2's canine passenger was not an option as it had been with the ballistic test flights. With this "engineering compromise", the dog could be carried in a relatively simple pressurized cabin similar to those used in the ballistic rocket flights. Like Object PS, the Object PS-2 would be an unstabilized satellite without any complicated attitude control system thus further simplifying the new satellite's development.

While canine cabin designs had been studied and flown on short ballistic flights, modifications to this hardware were required to extend the life of the onboard systems and keep the passenger alive for little over a week of flight instead of just for a few minutes. A food dispenser was included to supply the dog with a balanced diet of food and water in a gelatinized form. A much more advanced air regeneration system to maintain proper oxygen levels in the cabin was developed for the flight. The padded cabin interior was quite cramped but there was enough room for its canine passenger to lay down, sit, or stand.

Attached to this cabin was a modified version of the backup Object PS satellite. Instead of a rudimentary radio transmitter and telemetry system, this sphere carried the much more sophisticated Tral-D telemetry system that was being developed for Object D. This new system had to be pressed into service for this flight to handle the large volume of engineering and bio-telemetry. In order to conserve its batteries, Tral-D was programmed to transmit data for only 15 minutes during each orbit. A pair of spectrophotometers was also carried to study solar ultraviolet and cosmic soft X-ray emissions. Finally Object PS-2 was equipped with a slow-scan television camera to observe its passenger. This system was capable of transmitting ten 100-line video frames per second back to the ground. All together Object PS-2 was roughly conical in shape with a height of 4 meters (13 feet) and a base diameter of 2

meters (7 feet). With a total mass of 508.3 kilograms (1,119 pounds), it was six times more massive than the original Sputnik satellite, Object PS.

The dog chosen to ride Object PS-2 into orbit was a six kilogram (13 pound) part-Samoyed terrier mongrel female who, like many earlier space dogs, was "recruited" from the streets of Moscow. Named Kudryavka (Little Curly) by her trainers, she was officially renamed Laika (Barker) after her breed. Dogs of this breed were ideal for such flights due to their small size and even temperament. Strays from the Moscow streets were chosen since they were generally strong and could endure the hardships of hunger and extreme cold. In case Laika was not fit to make the flight, she had a backup named Albina. A third dog, named Mukha, was to serve as part of the ground test team but she was removed after she would not eat properly.



Laika as seen shortly before her launch on Sputnik 2. (NASA)

Since the 8A91 satellite launch vehicle (also known as the SL-2) version of the R-7 under development to launch Object D was still not available, Object PS-2 would be sent into orbit using the same stripped-down version of the R-7 ICBM that launched Sputnik designated 8K71PS. This would turn out to be the last flight of this interim satellite launch vehicle. The new satellite also required a new and larger conical shroud to protect it during its ascent into orbit. A separation system under development also had to be hastily finished so that Object PS-2 would be released from the R-7 core once in orbit. On October 18, 1957 8K71PS serial number M1-2PS arrived at Tashkent 50's NIIP-5 Test Range in Soviet Kazakhstan (which later became the Baikonur Cosmodrome) and final integration of the rocket stages and satellite payload began.

The Mission and Its Impact

Before launch, Laika was carefully groomed by attendants and electrodes were attached to her body to monitor her respiration and heartbeat. A rubber bag was also strapped to her hind quarters to collect waste. Finally she was fitted with a special harness and secured inside the cabin of Object PS-2. On the morning of November 3, 1957, just three days prior to the Revolution anniversary, Object PS-2 (now designated Sputnik 2) was successfully placed into a 225 by 1,671 kilometer (140 by 1039 mile) orbit inclined 65.3 degrees to the equator with a period of 103.75 minutes.

While Sputnik 2 successfully made it into Earth orbit, the flight was not without problems. The nose cone was jettisoned after reaching orbit as planned but Object PS-2 failed to cut itself loose from the spent Blok A core of its 8K71PS launch vehicle. As a result, the thermal regulation system could not operate properly. Because of this and some thermal insulation that was ripped away from the payload (presumably when the nosecone separated), the temperatures inside the cabin quickly soared to as high as 40 C (104 F). The dog's vital signs indicated that she was frightened but had survived the trip to orbit. Despite the problems, a successful launch was announced by Soviet authorities.

With the announcement of the launch of Sputnik 2 only a month after Sputnik 1, the concerns of the public in the West were heightened even further. While the design and capabilities of the launch vehicle were still unknown, the much greater mass of this new satellite indicated that the Soviet Union's rockets were much more powerful than their American counterparts. Soviet statements that they possessed an operational ICBM could no longer be ignored. Obviously the capabilities of the Soviet's new missiles were a grave threat to the security of the West. As time went on this perception led to the "Missile Gap" issue of the 1960 presidential election that John F. Kennedy won. The significance of the fact that this satellite carried an animal was not lost to those in the West. While there were animal rights activists who expressed concern about the well being and safe return of Laika, her launch into orbit demonstrated that the Soviet Union was quite serious about space exploration and, in the words of nervous American politicians, in seizing the high ground.

Originally the Sputnik 2 mission was to last for about ten days after which, contrary to past rumors, Laika would die from asphyxiation. The problems with controlling the cabin temperature, however,

shortened Laika's life significantly. Readings telemetered to the ground during the hours after launch indicated that she was eating but that she was agitated and barking. When exactly Laika perished has still not been revealed but she likely succumbed to heat exhaustion during the first couple of days of flight. Sputnik 2 itself continued to transmit until a week after its launch. The now-inert Sputnik 2 and the spent core of the R-7 launch vehicle remained in Earth orbit for a total of 162 days with reentry coming on April 14, 1958. While the historic flight of Sputnik 2 was not a total success, it did prove that extended periods of weightlessness were survivable and thus opened the way for the human exploration of space.

More Information

This article is the second in a series commemorating the 40th anniversary of the beginning of the Space Age. The first article, **Sputnik: The First Man Made Earth Satellite** can be found in the October 1997 issue of *SpaceViews*.

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