

N1, the moon rocket that failed, part 2

By Barry Davidoff

The race to the moon was a test of not only the technologies but also the ideologies of the Cold War powers. President Kennedy boldly had committed the United States to landing a man on the moon before the end of the decade. While the world watched the development of the Saturn V, especially through the pages of *Life* magazine, the intentions of the Soviet Union, were clouded in enigmas. The successes of the Soviet space program were trumpeted from the Kremlin, but failures remained within its walls.

Few people, even within the Soviet Union, knew anything about the existence of the N-1, in a project that ultimately would cost around \$11 billion. While the Americans forged through the Mercury and Gemini programs and into Apollo, the Soviet design bureaus created the N-1. Just as all the aspirations of medieval religions in reaching the heavens were placed in the construction of magnificent cathedral towers, all hopes of the Soviet Union beating the Americans in landing on the moon were dependent upon the towering Gothic spire called the N-1. The foundations of the Soviet Union's hope were fatally flawed, however, and all four flights exploded in spectacular tragedies over the Kazakstan desert.

Four Up and Four Down

The First N-1 Launch 3L

As Apollo 8 was orbiting the moon, on December 26, 1968, the first N-1 to be launched, number 3L, was rolled out to the launch pad. This N-1 was to carry an unmanned 7K-L1 spacecraft into lunar orbit. The L1 had been developed as part of the a rival program in which a manned L1 would carry two cosmonauts around the moon after being launched by a Proton rocket. Since the goals of the rival circum-lunar flight program had already been accomplished completely by Apollo 8, on this first flight of the N-1, the L-1 spacecraft would orbit the moon and photograph it for two days.

The first N-1 ran into trouble almost immediately as soon as its 30 engines began to roar. Parts of

engine 2 broke off from their mounts starting a fire in the first stage. All the engines were shut off by the automatic KORD engine control system 68.7 seconds after launch. At 70 seconds after the launch the N-1 was destroyed by the range safety officer.



The second N-1 exploded seconds after its launch on July 3, 1969.



Launch of 3-L on February 21, 1969.

The Second N-1 Launch 5L

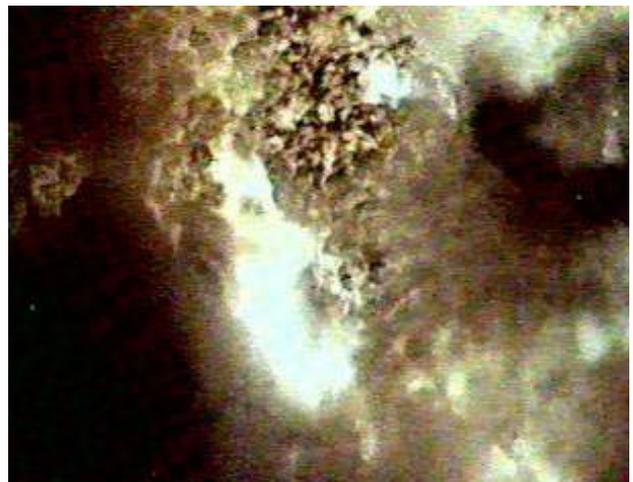
In July 1969 two giant moon rockets were being prepared for launch half a world away from each other; at Cape Kennedy and at Baikonur. News media from around the world gathered in Florida and every step in readying the Saturn V for Apollo 11 was reported eagerly. At Baikonur, N-1 number 5L had been rolled out to the pad in secrecy. Although the N-1 rocket would be unmanned, the goal was to fly the entire lunar rocket assembly including the LK and LOK on a lunar orbiting mission ahead of Apollo 11. The Soviets believed that the first American moon landing would be less of a victory, since it would have been preceded by the unmanned Soviet mission just two weeks before. The Soviets also hoped that in the event that Apollo 11 failed, there still would be time for a daring, but spectacular, manned N-1 mission in early September. Preparations continued on the N-1 5L rocket for a launch on July 3, 1969.

All hopes of the Soviets were dashed immediately upon ignition of the first stage. Within .25 seconds, the oxidizer pump on the number 8 engine ingested a metal fragment that negligently had been left in the liquid oxygen tank. The thrust of thirty engines carried the N-1 to the top of the launch tower before the engine control system shut off all the engines. The N-1 then fell slowly back onto its launch site as the nearly 2500 tons of propellants in all the stages exploded. The escape launch system, 105 meters above the engines, did function and carried the unmanned L-1 away from the explosion.

The N-1 explosion was cataclysmic. The launch tower was so badly damaged that it took 18 months to repair. The pad's six underground levels were seared from the flames of the explosion. The only other N-1 launch tower which was a half kilometers

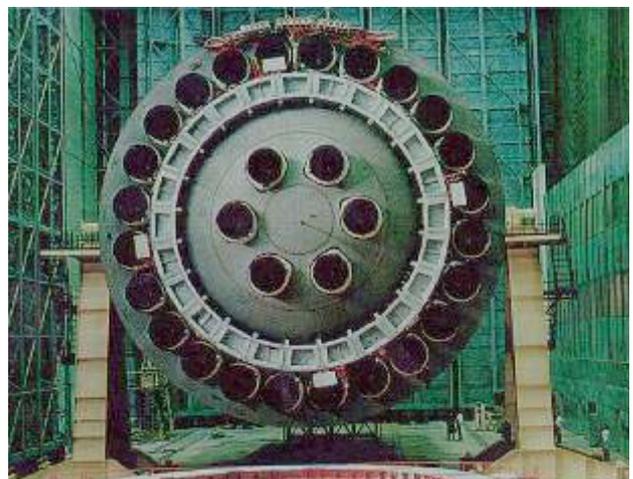
away also was significantly damaged. A photograph taken the following day by an American reconnaissance satellite shows the devastation. Less than two weeks later, half a world away, five F-1 engines flared into life launching Apollo 11 on the way to the moon.

The Soviets were not daunted by the fiery explosion of the N-1, and made one last gasp in the moon race. Although it was impossible to make a manned landing it still was hoped that an automated probe could return lunar samples before Apollo 11 splashed down. On July 10th the Soviets launched the unmanned Luna 15 which would obtain soil samples and launch a smaller satellite returning several hundred grams of moon rock to earth. The launch was successful and Luna 15 actually was orbiting the moon at the same time as Apollo 11. Luna 15 failed during its descent and crashed into the moon two days before Neil Armstrong placed the first foot steps on the moon.



Explosion resulting from the failure of the second N-1

The Third N-1 Launch 6L



The 30 engines on N-1's First stage.

It took the Soviets nearly two years to make another attempt to launch the N-1. During this interval, Apollos 12 and 14 landed on the moon and the world waited anxiously through the travails of Apollo 13. During these two years Mishin's design bureau significantly improved the N-1. Fuel filters were installed in the propellant lines to prevent a similar catastrophe. The entire rocket was painted white in order lower internal temperatures. Improved ventilation and refrigeration systems were installed in the first stage.

On June 26, 1971 the Soviets made their third try with the N-1, which this time did not carry a payload beneath the shroud of the upper stages. Within a few seconds of launch unexpected interaction from the exhaust gases of all thirty engines caused the N-1 to begin to rotate around its central axis. At 50.2 seconds after launch the rotation caused a loss of control of the rocket so it was destroyed by the range safety officer. For the third time the Baikonur desert was rocked by the explosion of the tons of propellant aboard the N-1.

Fourth and Final Attempt 7L



7L The last launch of the N-1.

In November 1972, the Soviets made one last attempt to launch the N-1. The space race had long since been decided and Apollo 17 would conclude the Apollo program one month later. The Soviets continued in their efforts largely due to the inertia and independent nature of the major space design bureaus. There were vague hopes that a successful launch could result in a moon landing by 1975 and a larger moon colony by 1980. There were even grandiose concepts that the N-1 would lead to an expedition to Mars.

There were further improvements in the N-1 based upon the failures of the three previous flights. The tail of the N-1 was redesigned to include small steering rockets that would prevent the N-1 from spinning out of control. The airilons on all three stages also were made longer and more pointed to improve aerodynamics. The last N-1 would carry an unmanned lunar rocket assembly including the LOK and LK.

The fourth time would be as disappointing as the other attempts. On November 23, 1972 the thirty engines ignited once again and the first stage performed better than on other occasions. The first stage was nearing its burnout and the second stage was almost scheduled to ignite. At 107 seconds into the flight excessive turbulence within the propellant lines lead to a rupture and then a fire in engine number 4. Again the N-1 was destroyed by the range safety officer. This failure was especially disappointing since the first stage was nearly empty. If the second stage had been capable of being ignited manually, it could have carried the rest of the N-1 away from the first stage and possibly to a successful flight. On its last flight the N-1 flew further and faster than its predecessors until it exploded 125 kilometers downrange.



7-L rises over apartment blocks at Baikonur prior to exploding.

The Legacy of the N-1

On December 14, 1972 Gene Cernan on Apollo 17 became the last man on the moon in the twentieth century. The Apollo program and the space race had been an astounding accomplishment for America. The Saturn V launched twenty-seven men that went around the moon, including twelve astronauts that had walked on it bringing back nearly 400 kilograms of moon rocks. The Saturn V had performed admirably and all thirteen launches (includ-

ing the later Skylab launch on May 14, 1973) had accomplished all mission objectives. Overall, there were 32 launches in the Saturn program including Saturn I, Saturn IB, and Saturn V vehicles and every one was successful.

After the fourth failed launch, work continued on the N-1 program, especially on the engines and the control system. Several more N-1's were under construction at the Baikonur Cosmodrome. A fifth N-1, 8L, was even rolled out to the launch pad, but never flew.

The program, however, was cancelled in December 1973. The N-1 design bureau was merged with the rocket engine design bureau to form Energia Corporation. The luckless Vladimir Mishin was removed from office and the combined bureau was headed by Valentin Glushko, who had been the arch rival of the esteemed Chief Designer Sergei Korolev.

Although the program had been cancelled, the engineers felt that they had solved the engine problem and that the fifth flight would have been successful. In the epic work, *Challenge to Apollo*, Asif Siddiqui asserts that the fifth flight and the N-1 were cancelled not because the fifth flight may have failed, but rather that the flight had a reasonable probability of being successful. If the fifth launch had worked then the Soviets would have been placed in the awkward position of having the N-1 moon rocket all dressed up and no where to go.

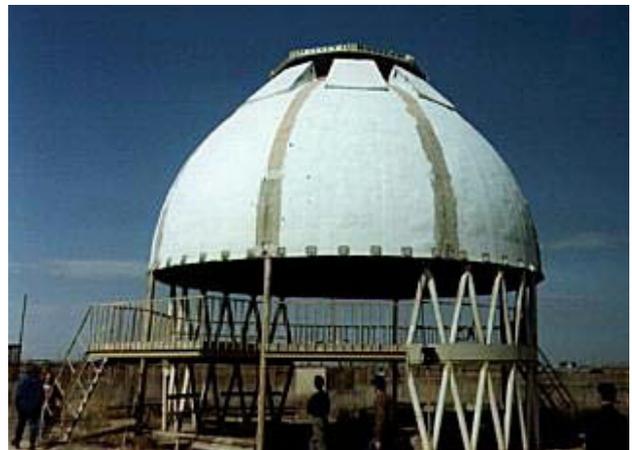
By December 1973 the Apollo program already had been concluded and the space race won. The N-1 was designed primarily as a moon rocket and was impractical to use as a launcher to lift heavy payloads into earth orbit. It would be embarrassing for the Soviets to land on the moon several years after the Americans. It would cost billions of more dollars for the Soviets to reach the same results as the Apollo program. It also was very risky since the N-1 lunar landing mission profile only allowed one cosmonaut to land on a very complex and exhausting journey at the very limits of Soviet manufacturing and engineering technology.

When the N-1 program was cancelled, Glushko ordered all blueprints, parts and manufacturing assemblies of the N-1 to be destroyed. The official party line was that the N-1 never existed and that the Soviets had never intended to go the moon. It is estimated that approximately \$11 billion was spent by the Soviets on the N-1 and the rest of the manned lunar program, as compared to the \$24 billion cost of the Apollo program. Even more astonishing is that due to the smaller size of the So-

viet economy, the \$11 billion spent on the N-1 program represents an even larger proportion of Gross Domestic Product. All this vast sum was spent in secrecy.

According to the edict of the Soviet leadership, the N-1 never existed. There had always been rumours of a Soviet moon rocket which NASA continued to fan. After the collapse of the Soviet Union details of the N-1 gradually came to the West. The first photo of the N-1 was published in the German magazine, *Flug Revue*, in March 1991. Stories about the N-1 and interviews with engineers and cosmonauts, such as Alexi Leonov, appeared in the Russian press, which had been freed from the burdens of censorship. Most of the remaining documents concerning the N-1 were declassified and Mishin's secret diaries were even sold at Sotheby's. Today the details of the N-1 and its mission to the moon are available as the results of research within the depths of the Russian archives.

Despite Glushko's orders some mammoth parts of the N-1 survived, though in most unusual ways. Part of a tank assembly became a gazebo and a third stage a storage shed. These few rusting parts still stand as a symbol of the N-1 program in the section of the Kazakstan desert composing the Baikonur Cosmodrome.



Part of N-1 propellant tank now used as a gazebo in Baikonur.

End of part 2.
