

# QUEST



THE HISTORY OF SPACEFLIGHT  
Q U A R T E R L Y

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## WHAT IF?

KEY MOMENTS IN THE RACE  
TO THE MOON REVISITED

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Celebrating the  
50th Anniversary of the  
First Moon Landing

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## WHAT IF KOROLEV HAD LIVED?

*A leading historian on the Soviet space program considers their space program if their leading chief designer, Sergei Korolev, the Soviet equivalent to the US space architect Wernher von Braun, had not passed away in the middle of the Space Race.*

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By Dr. Asif Siddiqi

Counterfactual meditations are by definition speculative. They are entirely a matter of interpretation rather than factual record. But there are two persuasive reasons one might do this sort of thing: First, it may shed light on pivot points in the historical record; and second, it's a fun thing to do. So, with that in mind, I thought it might be fun to revisit one of the most talked-about pivot points in the history of the Soviet space program, and indeed, the history of the 1960s Space Race: the death of famed Soviet Chief Designer Sergei Pavlovich Korolev in 1966.

First, let's examine the heart of this story: the nature of Korolev's death. Korolev had been in poor health throughout the last years of his life, some of it a remnant of his time doing hard labor in a Gulag camp. But in late 1965, doctors had identified some internal bleeding in the lower part of the large intestine. There was some sort of growth—initially assumed to be benign—that needed to be removed. In early January 1966, the doctor, inexplicably the actual

Minister of Health Boris Petrovskii, had done a histological analysis and found that there was a malignant tumor which had grown into the rectum and pelvic wall—basically an “angiosarcoma of the rectum,” a very rare affliction. In the event, the operation to remove this tumor, held on 14 January 1966, ran into all sorts of problems, including problems with administering anesthesia. Korolev's body was subjected to an enormous amount of stress. Although the operation was completed, Korolev died about thirty minutes later.

For our story, the more important part is what the operating surgeon found. This wasn't just a small tumor; it was, in the words of Petrovskii, “very big, like two of my fists.” When a journalist later asked Petrovskii how long Korolev would have lived without surgical intervention, Petrovskii replied “a few months.” But even with a successful surgery, Korolev's time was running out and it is likely that he would not have survived much longer, at most two or three years.

Let us, however, assume for our purposes that Korolev's surgery was “successful” and that he came back to work, determined to keep the Soviet space program on track. Korolev had a number of qualities that his successor, Vasilii Mishin, lacked: his ability to inspire his team, his bullish capacity to strong-arm opposing opinions, and simultaneously a capacity to form coalitions among dissenting partners. Finally and perhaps most importantly, he had immense authority in

the decision-making structure of the Soviet government and Communist Party. Could these qualities have changed anything in 1966 and 1967?

At the time of Korolev's death, the Soviet human space program had a number of short-term and long-term goals.

1. To carry out a couple of Voskhod missions (including most urgently a long-duration mission, and then possibly a flight with artificial gravity, and one all-women mission).
2. To introduce the new Soyuz spaceship with an ambitious docking mission involving two Soyuz spacecraft and the subsequent transfer of cosmonauts from one Soyuz to another via extravehicular activity (EVA).
3. To carry out a piloted circumlunar mission using a stripped-down Soyuz known as the L1.
4. To begin testing of the giant N1 heavy-lift rocket in support of human missions to the Moon.
5. And last, but not least, to land a Soviet cosmonaut on the Moon using a combination of a lunar orbiter (LOK) and a lunar lander (LK).

In looking at these five goals, one can imagine that Korolev would have probably carried out at least one if not two Voskhod missions in 1966. These were his pet projects and enjoyed lukewarm support at the level of the higher

leadership. Thus, we could imagine a flight of *Voskhod 3* in May 1966 with cosmonauts Boris Volynov and Georgii Shonin. Such a mission, lasting about eighteen days, would have regained the absolute duration record in space from *Gemini 7*. It's hard to imagine another *Voskhod* after that, given the limits of the *Voskhod* (essentially a souped-up *Vostok* without the capacity to change orbits) but there's a small likelihood that Korolev would have also pulled off a *Voskhod 4* mission, perhaps using artificial gravity or with an all-woman crew. Certainly, such flights would have been caused a sensation in Western media, a reminder that the Space Race was still on.

In terms of the *Soyuz*, there's no indication that it would have been sped up, and even with Korolev—in fact, especially with Korolev alive—we definitely see the same *Soyuz 1* and *2* mission that was planned for April 1967. The plan was to launch *Soyuz 1* first into space with cosmonaut Vladimir Komarov, then a day later, launch *Soyuz 2* with Valerii Bykovskii, Aleksei Eliseev, and Valerii Kubasov. After docking in Earth orbit, the two latter cosmonauts would climb out of *Soyuz 2* in their spacesuits, clamber over to *Soyuz 1* and enter that ship, joining Komarov. The two ships would undock, followed by separate landings of *Soyuz 1* and *Soyuz 2*. Such a mission would approximate the general plan for a lunar orbit docking necessary to carry out a future lunar landing. In the end, as we know, Komarov was launched on *Soyuz 1* and ran into a whole host of problems. *Soyuz 2* was canceled and all efforts were directed at bringing Komarov back to Earth.

Komarov's ship, of course, crashed. The same problem that killed Komarov—a faulty parachute system—would undoubtedly have killed the *Soyuz 2* crew had they been launched. With Korolev, would all this have happened? Probably. Given his prior record, it's hard to imagine Korolev exercising prudence when it came to launching Komarov into space in April 1967.

The third goal at the time of Korolev's death was piloted circumlunar flight. In reality, this was never accomplished. Instead, in December 1968, NASA launched *Apollo 8* on the first mission beyond Earth orbit. The crew, Frank Borman, Jim Lovell, and Bill Anders triumphantly entered lunar orbit on 24 December 1968, securing one of the great firsts of the race to the Moon.

As is well-known, the Soviets had a dedicated project, called the L1, to send two cosmonauts around the Moon on a stripped-down *Soyuz* spaceship, designed by Korolev's organization. These L1 spacecraft would use rival Vladimir Chelomei's three-stage Proton rocket combined with an upper stage known as the "Block D" to fire the small vehicle on a slingshot trajectory around the Moon. Beginning in early 1967, after Korolev's death, Mishin presided over a series of tests to human-rate this whole system.

If we look at the record of automated launches in the L1 program over the two-year period in 1967 and 1968, we find many failures: one of the Block D, three failures of the Proton, two failures in the actual L1 during reentry, a ground test failure that actually killed someone, one successful Earth orbit test, and one mostly

successful full-scale automated test flight around the Moon. This last one, publicly known as *Zond 5*, was carried out in September 1968. During the flight, the spacecraft successfully rounded the Moon and returned back to Earth. Instead of a guided reentry to bring the capsule back to Earth, *Zond 5* reentered along a ballistic trajectory that deposited the capsule in the Indian Ocean where it was recovered. It's certainly possible to imagine that if a crew had been onboard, they would have survived.

At that point, in the fall of 1968, it was really a "race" to the finish. It was well-known that NASA was aiming to launch the next *Apollo*, *Apollo 8*, directly to the Moon using the Saturn V. So, the Soviets had plenty of incentive to preempt that mission. They had the technology, they had the means, and they had the crews ready. They also had a launch window earlier in December 1968 than *Apollo 8*. Would they do it?

In November, Mishin decided to launch one more automated *Zond* to make sure all was OK. He also wanted to see if the L1 could carry out a guided reentry back to land on Soviet territory (instead of the Indian Ocean). This was the one thing that the L1 actually did. Publicly named *Zond 6*, it circled the Moon and successfully carried out a guided reentry and landed back in the Soviet Union. Unfortunately, everything *else* about the mission was a disaster. On the way home, the capsule was partially depressurized. Then the parachute was also prematurely jettisoned: The capsule plummeted to the ground and smashed into pieces. A crew onboard would undoubtedly have been killed. This failure basically killed the Soviet

Moon dream. There was no launch in December.

Would Korolev had tried to launch in December anyway? It's hard to know, but it's certainly possible. Korolev was driven by an obsession to be first. His approach was to take risks based on a combination of the results of accumulated automated tests and confidence expressed by designers (from other organizations) responsible for individual systems. In this case, it's possible to imagine Korolev asking those designers of the components that failed on *Zond 6* to implement a crash program to debug those systems on the ground in November and then guarantee to him that they would work in flight in December. He would consult his own engineers working for him on whether to trust these assurances from "outside" designers. Historically, designers within his organization often disagreed with Korolev, but if there were enough support for Korolev, the dissenting voices would be overruled. In this case, it's possible to imagine that happening, given the stakes of beating *Apollo 8*. In sum, under Korolev, I can see the launch in early December happening.

The launch probably would have taken place in the first week of December. We know that the crew would have been Aleksei Leonov and Oleg Makarov. Would they have been successful? Probably not. The exact rocket that they would have used, Chelomei's Proton, was actually launched in January 1969 on a robotic flight and on that launch, the second stage failed—the payload failed to reach Earth orbit. There's little chance that this problem would have been detected if Korolev had been alive, since the Proton was manufactured at the Khrunichev plant, effectively (although not formally) under the control of Chelomei.

The fourth goal—testing the N1 rocket—may have been sped up under Korolev but the fatal flaw that undermined the program—lack of static testing of the entire first stage, would not have been altered. Under Korolev, there might have been more pressure to test individual engines and maintain quality control in the 1966-1968 period leading to a successful launch in May 1968 (as was originally planned). But it's hard to imagine that repeated launches would not have failed due to the unpredictable nature of the first stage. At a maniacal pace of work, we could expect a first *successful* N1 launch by the end of 1969. But that leaves the goal of the landing, the fifth goal, as essentially unattained by the end of the decade.

In sum, if Korolev had lived long enough (and that is a big "if"), we might see an extra Voskhod mission or two in 1966 but nothing that fundamentally

alters the balance of the Space Race (although they would have been sensations in the West). Second, the seeds of the *Soyuz 1* accident were already laid and it's hard to imagine Korolev avoiding that. Third, Korolev would have tried to ensure a successful piloted circumlunar mission to beat *Apollo 8* in late 1968 but the mission probably would not have succeeded. Fourth and fifth, the N1 might have had a successful test flight by the end of 1969 but there's almost no chance that the Soviets would have landed a cosmonaut on the Moon before 1969.

In the end, the Soviet loss of the race to the Moon was not about the loss of a single person, Sergei Korolev, it was about a number of different systemic factors (late start in 1964, lack of sufficient money, lack of static testing of the first stage, political infighting, etc.) that were already deeply embedded in the Soviet space program long before Korolev's death.

### About the Author

Dr. Asif Siddiqi is a professor of history at Fordham University and author of several books on the history of space exploration. His *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974* is considered to be one of the best English-language histories of the Soviet space program.



The Soviet LK-3 engineering test unit was exhibited at the Science Museum, London, United Kingdom, in March 2016. Courtesy: Science Museum, London

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