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Episode 1: Space is Dangerous

This transcript is based on the first episode of *Moonstruck*, a podcast about humans in space, produced by *DraftHouse Media* and featuring analysis from the *Center for Strategic and International Studies' Aerospace Security Project*. Listen to the full episode on [iTunes](#), [Spotify](#), or on our [website](#).

BY Thomas González Roberts // PUBLISHED March 21, 2018

BY ALL ACCOUNTS, HUMANS BELONG ON EARTH. Our planet gives us food to eat, water to drink, and air to breathe. The sun is just close enough to keep us warm—not too hot, and not too cold. We are biologically bound to the ground beneath our feet.

Throughout history, humans have had a dangerous pattern of challenging these bounds, testing our limits, and expanding our world. So to me, it's natural that humans would be drawn to flight. That is, going beyond testing the limits of our bodies and tools on Earth's surface, and *leaving* it entirely. For pioneers around the world, flight remained a tantalizing mystery for thousands of years.

But unlike the first time someone climbed Mount Everest, crossed the Atlantic Ocean, or flew an airplane, the whole world could *watch* on their TV screens and listen on their radio as two countries publicly raced to not just get to space, but put a man on the Moon. Astronauts were launched into unimaginable situations and humankind was pushed to the edge of impossibility.

When the United States and the Soviet Union sent humans into outer space, the human environment grew.

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Our species was no longer confined to our home, neatly tucked under the blanket of our atmosphere. We overcame our biological bounds.

When we think about this era of history, we remember the epic magnitude of the achievement— a specific narrative drawn for us by broadcasts, speeches, teachers, and textbooks. A story of extremes: magnificent accomplishments at the cost of gut-wrenching failures; top secret yet painfully public. But what I find so interesting about this history of human spaceflight are the stories that come *between* these extremes; the most human moments of fear and embarrassment, surprise and relief.

These are the tiny connectors that reverberate through history and make spaceflight fathomable. These are the moments that captivate us decades later.

I'm Thomas González Roberts, a space policy analyst at the CSIS's Aerospace Security Project. I'm also a docent at the Smithsonian National Air and Space Museum. So I'm a professional space-nerd, and a volunteer space-nerd. Welcome to Moonstruck, a podcast about humans in space.

The first human space programs relied on missiles to get astronauts into space. Yes, missiles. Astronauts were hitching a ride on top of a ballistic missile on a trajectory to the edge of Earth's atmosphere. And once in orbit, things don't get much better.

Everything about the cold, dark vacuum of space is deadly. And then, an astronaut must undergo a high-speed atmospheric reentry, land safely on a remote corner of our planet, and be collected by a skilled recovery team. That's a lot of room for error.

But before a human can be launched into space, a safe launch system has to be developed. Let's start from there.

Todd Harrison: *I think what makes spaceflight so challenging is launch.*

That's Todd Harrison, a senior fellow at CSIS in Washington, D.C. and the director of the Aerospace Security Project. He's also my boss.

TH: *Getting things into orbit is so difficult. And the joke in aerospace engineering has always been that, you know, God is cruel to us because he made it possible to go to space, but the energy required—you can barely get that much energy by breaking chemical bonds. And all the propulsion systems that we use for launch are chemical-based propulsion. All the energy is coming from breaking chemical bonds. And it's just barely enough to be able to get something into space.*

Developing these highly combustible propulsion technologies can be dangerous. In 1960, before any humans were launched to space, the Soviet space program was developing its R-16 missile, a serious contender for carrying humans into space. While sitting on the launch pad, awaiting a series of tests, the missile unexpectedly fired, blanketing the entire test facility in fire. Hundreds of people were on site at the time.

According to a top secret report by the Center Committee State Commission, seventy four technicians and military officers were immediately incinerated, or later died from their injuries.¹ Other reports claim the death toll was even higher.

The Soviets were embarrassed. They didn't want the rest of the world to know that their space program was off to a rocky start, so they kept the story a secret.²

Those familiar with the accident were ordered to never speak of it.³ Families and friends of the victims were told that their loved ones were killed in unrelated accidents. Mitrofan Nedelin, a beloved WWII hero leading the missile program, was said to have died in a plane crash, not a missile test failure. The government was determined to not let this event color the public's perception of the state space program.

But less than a year after the catastrophe on the launchpad, the Soviets' luck turned.

On April 12, 1961, Yuri Gagarin, the first astronaut—or as they say in Russia, the first *cosmonaut*—launched into space, marking the first time a human being had explored the region just above our atmosphere, what we now call low Earth orbit. In his final moments on the launchpad, Gagarin muttered a phrase into his headset, to be relayed back to the command center from the first man in space: “Poyekhali!” or “Let’s go!” in Russian.

Really it’s sort of a grammatically awkward “let’s go.” In Russian the word ‘go’ can imply a lot of different things. Like if you’re going alone. If you’re going to come back, how you’re getting there. This one’s like, “Let’s go. Together. In a vehicle.” Not a clear sentiment to those listening at the time.

If Gagarin’s launch had failed, this phrase would have been his last mark on Earth. I think he chose wisely. To me, it lives up to the historical weight of the moment. Though Gagarin was flying alone on that rocket, he was cradled by a spacecraft carefully configured by a team of engineers, in a program ordered by an organized state, in a world driven by the immeasurable power of human curiosity. He wasn’t traveling alone in his spacecraft. He was taking all of us with him.

Yuri Gagarin’s flight ushered in a brief era of miraculous success in human space flight by both the Soviets and the Americans. Over the four years that followed, the Americans safely completed five launches, and the Soviets squeezed in six more.

Of these first twelve manned space missions none resulted in a serious malfunction or life-threatening incident—what NASA would describe as a “close call.”⁴ *Maybe* because the earliest space flights were *relatively* simple. Alan Shepard, the first American in space, only flew for fifteen and a half minutes.⁵ His mission was sub-orbital; just up to the edge of space, then back down. It reminds me of that moment in *Finding Nemo* when Nemo swims up and touches the boat.

These four years of spaceflight were so special because of the unlikelihood of all of those successes. Because there

are so, so many things that could go wrong during a spaceflight.

Ok, here we are. 1965. The Soviet Union and the United States are in the thick of the space race. And in terms of achieving “firsts,” it isn’t going too well for the Americans. The Soviets were the first to launch a satellite into space. They were the first to safely launch an animal into space. And of course, the first to send a human there, too.

NASA’s second space program, Project Gemini, was on track to pull the United States ahead in the competition by completing the world’s first “spacewalk.” That’s, allowing an astronaut to climb out of the spacecraft and “walk,” if you will, on their own. You may be familiar with the imagery: an astronaut floating away into the dark abyss of space, connected to safety by only a glowing, white umbilical cord.

Three months before the Gemini program was slated to attempt its first spacewalk, the Soviet Union rushed to launch Voskhod 2, a two-person spacecraft with a special hatch designed for a cosmonaut to climb out while it was in orbit, to beat the United States to the punch. But working quickly came with a cost: the Soviets would have to use a space suit that had never before been tested in the space environment. So their spacewalk *was* the test of the space suit.

As an American myself, I’d like to believe that the Americans wouldn’t try to pull something like this, that they wouldn’t ignore obvious risks like that. But, I don’t think we’ll ever know how or why the Soviets chose to move forward with the mission on the accelerated timeline. But on the surface, it looked like a rash attempt to defend their honor as the greatest space-faring nation on Earth.

The cosmonaut selected to complete the spacewalk was Alexey Leonov, a 31 year-old father and Soviet Air Force pilot. He was to travel with a co-pilot, who would stay aboard the spacecraft during his spacewalk and assist in operating the airlock to allow Leonov to exit and enter the capsule.

The spacecraft had a safe launch and reached its desired orbit as planned. When the moment came, Soviet mission control issued their command. Leonov climbed out of the spacecraft, through the airlock, and into open space. The scene was live recorded and broadcasted on Russian television. And really, it was incredible.

The Earth silently turned below Leonov, as he floated above the pale blue atmosphere covering northern Africa. Eastern Europe rotated into view. After 12 minutes, it was time for Leonov to return to the spacecraft. These missions operate on tight, precise timelines. But something was wrong. Leonov couldn't fit into through the entrance to the airlock. The live feed on television quickly cut away from the spacewalk. They played Mozart's Requiem instead.

Leonov's family, and really anyone tuning in to watch the world's first spacewalk, had no idea what would happen next. Unfortunately, they were probably used to the surprise. No one in the Soviet space agency had told Leonov's family precisely what his mission's goals were before they saw it happen live -- they were completely shocked to see him climb out of his spacecraft. As Leonov opened the hatch and emerged into open space, his father hopelessly shouted at the screen, begging him to return to the cockpit. Now they looked on at a blank Russian television feed.

And hundreds of miles above their heads, Leonov was in trouble. His space suit had ballooned. Compared to the vacuum of space, the inside of his suit was highly pressurized, causing it to expand, its fabric to tighten.

His feet and hands were suspended within his suit, pulled away from the lining of his pants and gloves. It was difficult for him to maneuver, but more critically, the space suit was too large to fit inside the airlock. The only way to shrink his space suit was to lower its internal pressure by twisting a valve on the suit's lining and decompressing his suit.

Just to be clear, humans do not handle decompression well. We need a lot of time to adjust to new

environments. Decompression sickness, when gases actually bubble in the body, can occur when changes in air pressure happen too fast. But Leonov didn't have much time. His suit's oxygen supply was rated for only 40 more minutes.

Invisible to the world, silently moving at 17,000 miles per hour, a cosmonaut was dying.

It was hot in his spacesuit. Leonov was sweating profusely. After a few more minutes of agonizing decompression, his space suit was small enough to fit within the hatch door. Finally, he wiggled into the airlock, repressurized, and slid back into his seat next to the co-pilot. He was disoriented, drenched in sweat, but alive.

But the trip was not over yet. When it was time to return to Earth, Leonov discovered an error in the spacecraft's computer system. He'd have to initiate re-entry by hand. Leonov gave it a shot, but he missed his mark, sending the spacecraft barreling towards an uninhabited corner of Siberia—a frozen, dense forest over 100 miles from the nearest city.

Their impact was measured at mission control, and the cosmonauts were confirmed to have survived the landing. So the Soviet space agency notified the families that their loved ones were well and resting after their mission.

So that's a bit of a stretch. They were stranded in Siberia. It would be two nights until a recovery crew could safely transport their spacecraft back to safety.

When Leonov returned to mission control, he was greeted with TV cameras and smiling reporters, eager to hear of the world's first spacewalk. He muttered these two sentences before turning away. "Provided with a special suit, man can survive and work in open space. Thank you for your attention."⁶

It was later revealed that Leonov experienced the first symptoms of rapid decompression, which include excruciating joint pain, swelling of the skin, and fatigue.

The sweat was up to his knees by the time he was back on Earth's surface.

Decades later after the fall of the Soviet Union, Leonov revealed that he carried a suicide pill inside his space suit, to be swallowed should he have failed to enter his spacecraft before his oxygen supply ran out.⁷ No American astronaut has ever reported carrying such a pill.

The first spacewalk abruptly ended the blissful, safe honeymoon period of humans in space. From then on, things that could go wrong, did.

As of today, the death rate for astronauts across the world since the beginning of the human space age is about 1 in 30. That's *really* high. Almost 25 times higher than the death rate for logging workers, the riskiest occupation in America.⁸

Despite the scary numbers, the American public's opinion of NASA is also *really* high. In fact, four times as many Americans view the agency favorably than unfavorably.⁹ For most Americans, the lasting legacy of NASA's early accomplishments in space seem to outweigh the inherent risk of human spaceflight.

Or maybe it's that risk that makes spaceflight so popular in the first place. Perhaps the danger that both NASA and the Soviet space agency deemed tolerable made the successes that much more special.

President John F. Kennedy: *We take an additional risk by making it in full view of the world, but as shown by the feat of astronaut Shepard, this very risk enhances our stature when we are successful.*

That's U.S. President John F. Kennedy in his special message to a joint session of Congress. It's 1961, less than a month after NASA launched its first astronaut, and the prelude to the Apollo Project, which put the first human on the Moon.

JFK: *But this is not merely a race. Space is open to us now; and our eagerness to share its meaning is not governed by the efforts of others. We go into space because whatever mankind must undertake, free men must fully share.*

Though failures in spaceflight are certainly visible, successes resonate around the world. Forever.

I asked Todd Harrison how he thinks contemporary NASA astronauts might feel about being placed in such danger in the name of their government.

Todd Harrison: Well, from a practical perspective, an astronaut sitting on the launchpad, one of things you've got to be thinking about is that there's a pretty good chance that your launch will be scrubbed, that you're actually going to be staying on the ground and sleeping in a hotel somewhere that night.

That's not quite the answer I was hoping for. I thought he'd talk about the rush of feelings surrounding that moment, or the crushing force of launch. A modern day "poyekhali" moment. But he's right, space launches are different now than they were in the age of Yuri Gagarin or Alan Shepard.

When Todd says a launch could be "scrubbed," he means postponed until further notice. That can happen sometimes. Even within the last few seconds before the main boosters are scheduled to fire. As you can imagine, it's a pretty big letdown for everyone involved.

A scrub comes with the sounds of lawn chairs creaking shut and family minivans' doors slamming closed. Launch goers watching from afar would have to come back another day.

TH: *Often what you'll see happen when a launch is scrubbed is that it'll be because a ship moved into an area of water that's the drop zone, or the potential drop zone in case there's an emergency or there's an abort on launch, or an aircraft flies into the airspace that's being protected.*

It's almost like the launch operators are *looking* for reasons to delay the launch. During the launch periods for Project Mercury, only weather would delay a mission. An hour delay here, a day-long scrub there.

When the US was operating the Space Shuttle from 1981 to 2011, a launch was more likely to be delayed than not. Some shuttles were scrubbed six times before they were launched. Safety and meticulousness are now at the forefront of human space activity, not the race for being first, or reaching for the most extreme mission goals.

The contemporary world of spaceflight is vastly different than the one of Yuri Gagarin or Alexei Leonov. While millions of people tuned in to watch space launches in the 1960s, only a few thousand watched the most recent launch to the International Space Station.

But the routineness with which we now approach spaceflight does not make the challenge at hand any any smaller. Space is still cold, still empty, still deadly. We are *not* experts at surviving in it. We have a long way to go.

The *way* we pioneer *has* changed. Stories like those of Alexei Leonov and Mitrofan Nedelin inform how we operate in humanity's newest unknown. The questions we ask, the paths we forge.

So with the full speed of freedom, let's go. Together. In a vehicle. 🚀

Notes

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