Audio file

ArtemisTotheMoonandBack.mp3

Transcript

Speaker 1

Four astronauts have just flown around the moon on Artemis 2. They traveled 1,000,000 kilometers, going deeper into space than any humans have gone before.

Speaker 2

Wow. It's indescribable. There's no adjectives I'm going to need to invent some new ones.

Speaker 1

They return to Earth at 32 times the speed of sound.

Speaker 3

Your Artemis II crew.

Speaker 1

For 3 1/2 years, we've been filming behind the scenes of Artemis II. NASA's most important mission in half a century.

Speaker 4

I call it the arrogance of humanity. The fact that we think we can assemble machinery like this and launch it successfully, it just leaves you with a sense of awe. Three, two.

Speaker 3

One, launch.

Speaker 1

Sending astronauts to the moon and back is expensive, complex, and dangerous.

Speaker 3

Space flight is risky, so what you try to do is minimize that risk.

Speaker 5

Everything has to happen perfectly. It's not about being hasty, it's about doing it right.

Speaker 6

The unexpected behavior of the heat shield poses a significant risk to the safety of future crewed missions.

Speaker 1

For the last decade, thousands of engineers have been working on the Artemis program, building a rocket powered by liquid hydrogen that won't blow up at launch.

Speaker 7

90% of the entire mass that we've got is chemical energy. And we continually accelerate.

Speaker 1

Perfecting A capsule that can get back from the moon safely.

Speaker 8

Ready to test? Yes.

Speaker 1

Paving the way for astronauts to inhabit a permanent moon base.

Speaker 9

We are actually making science fiction a reality, and it's happening as we speak.

Speaker 1

At the dawn of a new space age, the pressure is on. to go back to the moon.

Speaker 10

Five, four, three, two, one.

Speaker 1

Three and a half years before the launch of Artemis II, NASA launches Artemis I, a test flight to the moon and back. without astronauts on board.

Speaker 11

There are things that we've done many times in SIMS, and we've done them many times in the lab. But in a tanked configuration at the pad, it was the first time. It is incredibly quiet in the room. Everybody is focused on their system. They're focused on the data. I mean, there's not a sound.

Speaker 1

It's the first flight of the Space Launch System, SLS, the rocket specially built for the Artemis program. 2.2 million kilograms of fuel have to ignite on cue to lift the rocket into space.

Speaker 12

Rockets are insanely complex vehicles. Everything has to go right for it to succeed. And if a single important thing goes wrong, the rocket blows up. I mean, it is the ultimate kind of pass-fail test.

Speaker 9

At this time, I give you a go to resume count and launch Artemis I. A.

Speaker 1

Huge crowd has come to watch the launch. Among them, some of the hundreds of engineers that have worked on the Artemis hardware.

Speaker 9

Three minutes, less than 3 minutes from launching. In a few minutes, she's going to light up back there. She's one of these dots, right? There she is.

Speaker 13

Oh, my gosh. Pressure rising to the to flight level.

Speaker 9

I have been working with Artemis since 2012. So that is literally 10 years. A decade of my life has been dedicated to Artemis, waiting for this moment. I'm just so beyond excited.

Speaker 1

Watching on are members of NASA's 50-strong astronaut corps. None of them yet knows who'll be chosen to fly on Artemis II.

Speaker 14

Even when I finally got selected to be an astronaut, the moon seemed still incredibly far away. Now that we are actually starting to fly these missions, it started to become real.

Speaker 13

And here we go. Pen.

Speaker 11

I got a bit of a... the hair on my arm stood up just a little bit as those final 6 seconds ticked off the countdown clock.

Speaker 13

Six, 5... Four-stage engine start.

Speaker 11

And then the call, booster ignition and liftoff.

Speaker 13

Three, two, one.

Speaker 11

Liftoff of Artemis I. Oh, my God.

Speaker 13

We rise together, back to the moon and beyond.

Speaker 10

Wow, that is bright, and that is hauling off the path. can't even look at it. Yeah. We worked on that.

Speaker 11

It was, it was breathtaking.

Speaker 15

Good control on the roll from teams in Mission Control, Houston, all good calls so far. Now 30 seconds into the flight, Marquis 1.

Speaker 1

The SLS is a multi-stage rocket. Once each stage has done its job, it separates. The spacecraft becomes lighter, better able to accelerate away from Earth. Within 2 hours, all that remains are the crew and service modules, known as Orion, heading into deep space. It takes five days for Orion to reach the moon, where it settles into a distant lunar orbit, allowing mission controllers to test the flight systems of Artemis I.

Speaker 10

For me, one of the highlights was seeing the Earth pass behind the moon and disappear and then come out the other side. Eight billion people disappeared behind the only other place that humanity had ever been. I've had a different perspective every time I've looked at the moon since then.

Speaker 16

NASA's newest moon explorer is barreling its way back home after circumnavigating the moon and beyond.

Speaker 1

Returning from the moon, The capsule is traveling 7,000 miles per hour faster than if coming back from the International Space Station. As it hits the upper atmosphere, friction generates intense heat and super hot plasma, visible through the capsule window. The only protection from this inferno is a heat shield just 4 centimeters thick.

Speaker 10

Demonstrating the heat shield at lunar re-entry velocities was our number one priority, because temperatures outside got half as hot as the sun approaching 5,000 degrees Fahrenheit. When you come back from the moon, you're coming back at Mach 32 or 24,500 miles an hour. In fact, we came back at 24,581 miles an hour. We were 81 miles an hour over the speed limit.

Speaker 16

And there it is, 5,000 feet. Three good main shoots for Orion. Orion in the perfect orientation for splashdown.

Speaker 10

Splashdown.

Speaker 1

The idea for Artemis II is to go back to the moon. but this time with a crew of astronauts on board. They'll do a single wide loop, flying 7,000 kilometers beyond the moon, the furthest any humans have ever been into space, before returning back to Earth.

Speaker 6

Artemis I was about testing the hardware, making sure that everything would work going to the moon and back. Now they're putting people on board. And people, of course, there is a sense of danger, a sense of trepidation. We need to keep the people safe.

Speaker 12

It just amps up the safety factor, right? With Artemis I, a failure would be bad, right? But it wouldn't have been catastrophic if you lose the human crew on Artemis II. That is catastrophic. That calls into question the future of the whole Artemis program.

Speaker 3

It's a new era of pioneers star sailors and adventurers.

Speaker 1

With so much riding on the safety of the astronauts, NASA holds a stage-managed event to unveil the crew of Artemis II.

Speaker 3

She's no stranger to breaking records, logging the longest continuous spaceflight ever by a woman, your mission specialist, Christina Hammock-Coach.

Speaker 9

I am someone who has loved exploration since I was little. I used to be inspired by the night sky, and I loved things that made me ponder the size of the universe, my place in it, and everything that was out there to explore.

Speaker 3

He is an F-18 pilot and a Canadian astronaut. Jeremy Hansen.

Speaker 4

I was interested in aviation as a young child.

Speaker 5

And I specifically remember coming across a picture of a human standing on the moon, and it still burnt in my brain.

Speaker 4

And so this really is full circle for me, going to the moon.

Speaker 3

He's a naval aviator that's flown over 40 different aircraft. Victor Glover.

Speaker 5

I have fantasized about stepping on the moon. It's my dream. They call things moonshots when people accomplish something amazing. It's our generation's opportunity to have our own. literal moonshot.

Speaker 3

He's a decorated test pilot and leader of the highest character, Reed Wiseman.

Speaker 4

Our boss at the time set up a fake meeting over at the quarantine facility. I dial in, and as soon as I dialed in and I saw the director of flight operations, I was like, Oh, this is not any normal meeting. And then they went into, Would you like to fly on Artemis II? And

that's kind of the way they always do it, with a question. And no one's ever going to answer no.

Speaker 3

Your Artemis II crew. We know you can run, man.

Speaker 13

You went up those stairs, man.

Speaker 1

These will be the first humans to fly to the moon since December 1972. Apollo 17.

Speaker 2

**** can you read me? Yeah. Hello, Houston. Ah... 17 locker. Hippity-hoppity, hippity-hoppity, hippity-hopping over hill and dale...

Speaker 17

Artemis intrinsically builds on the legacy of Apollo. We stand on the shoulders of giants, and we've learned so much in human exploration. But of course, returning to the moon when we haven't done that for over 50 years, we are looking back to Apollo. We're making those comparisons.

Speaker 2

My golly, this time goes fast.

Speaker 12

Apollo was clearly a program designed to demonstrate U.S. superiority and technology compared to the Soviet Union. And it was successful in that. And then once they completed that task, they shut it down because it cost a lot of money. And every time they launched, there was a 10 or 15% chance that the crew would not come back safely.

Speaker 1

Over the course of 3 1/2 years, the Apollo program completed a total of 6 lunar landings, at a cost equivalent to $280 billion today.

Speaker 2

We leave as we came, and God willing, as we shall return with peace and hope for all mankind.

Speaker 12

If you look at NASA's budget in the 1960s, at its peak, it was drawing down 5% of the federal budget. NASA's budget today is .5%, so 10 times less, or one-tenth of what it was back in the 1960s, and NASA is sort of building the Artemis program within that budget.

Speaker 1

Despite having much less money, the long-term ambition for Artemis far exceeds that of Apollo. Rather than landing astronauts for a few days at a time, the goal is to establish a permanent moon base. A stepping stone to explore Mars and the rest of the solar system. Although Artemis II won't land on the moon, Victor Glover is part of the team prepping for future missions. when astronauts will set foot again on the lunar surface.

Speaker 2

All right, you guys ready to go in the water?

Speaker 15

AV-2 ready.

Speaker 2

Copy that.

Speaker 1

Today's task is to simulate a moonwalk underwater, testing the new spacesuit being developed for lunar exploration. Glover is familiar with the sensation of being weightless, having carried out four spacewalks at the International Space Station. But this is different. On the moon, there is gravity, but it's six times weaker than on Earth.

Speaker 15

Anything that, say, weighs 100 pounds on Earth would weigh one-sixth that on the moon's surface. Also, the suit itself is filled with air, and air is... buoyant. So you're inside of a balloon at the bottom of the pool, and you have to add weight to it in specific places such that you don't do a flip, for instance, as soon as you start to, you know, outstretch your arms or start to walk around. Hey, Victor. I'm just going to suggest you use this time to exercise the joints on the suit just to get a feel for how those move.

Speaker 5

As you kneel down, you're not only balancing and holding up your weight, You're also moving a big suit that only bends in certain places. And so that joint wants to move my leg a certain way. And so I had to take my time and let the suit move, let my body move. But it was good.

Speaker 2

Approaching the moon's surface.

Speaker 1

On the same day, India lands an uncrewed spacecraft on the moon. The first successful landing at the lunar South Pole.

Speaker 5

The Vikram is India's lander that they attempted to get on the surface of the moon today. And so I actually was going to jump out of the pool and go check my phone to see if they were successful. I'm hearing that they were, but I haven't read the news myself yet. They were. Awesome. Well, congratulations to India. That's a big accomplishment. Major.

Speaker 1

A rover rolls out of the Vikram lander and starts exploring the South Pole. This is the same area of the moon being targeted by NASA for future Artemis missions. During the Apollo program, each landing was at a different site, clustered around the lunar equator. The plan for all future Artemis missions is to land near the South Pole. This part of the moon has deep craters where the sun never shines. They're thought to contain huge deposits of water in the form of ice.

Speaker 17

Where you have ice, you have the ability to melt that and provide drinking water clearly for habitation modules, but also then the potential to split that water into hydrogen and oxygen gas, which can be used for atmosphere and it can also be used for potential rocket fuel.

Speaker 1

With other countries eyeing up the same real estate, NASA needs to get its astronauts to the moon as soon as possible. and stake its own claim to the lunar South Pole.

Speaker 5

Isn't it time to get a move on? We are getting a move on. Trust me, we are whipping the ponies. And you don't want to run too fast, right? It's not about being hasty, it's about doing it right. And like I said, I'm not in a rush. We had a saying in Navy test flying, if you want it bad, you get it bad. And in these spacecraft, everything has to happen perfectly. We got a lot of things that have to go perfectly to get us to the moon and back safety. So for Artemis 2, I want it to go at the pace that it needs to go. And that's going to be the best thing that we can do to ensure Artemis 3 is a success, or whatever mission we actually put humans on the surface of the moon.

Speaker 1

At over 3,000 sites across the US and in Europe, engineers are developing hardware for the Artemis 2 mission. They're building a rocket capable of sending astronauts to the moon for the first time since the Apollo era. That rocket is the Space Launch System, SLS. Its huge core stage contains the fuel tanks and main engines. Alongside are two solid fuel boosters to provide extra thrust at launch. Above is the upper stage, and then the service module, that power the vehicle in space. And finally, the Orion crew module, which will carry the astronauts to the moon. Since the 1960s, NASA rockets have been designed and engineered here, at Marshall Space Flight Center.

Speaker 2

Out of this center will come the vehicles that will carry the United States into outer space.

Speaker 1

The challenge for any rocket engineer is to balance the rocket equation, which determines the ratio of fuel to mass to thrust needed for a successful launch.

Speaker 7

Physics doesn't read PowerPoint. It doesn't read our reports. It doesn't care about any of that. So the rocket equation is simply a representation of the physical requirements to cheat gravity.

Speaker 1

The tyranny of the rocket equation is that heavy rockets require more fuel. But more fuel makes rockets heavier, requiring even more fuel. A fully loaded SLS weighs 2.6 million kilograms. of which 2.3 million is fuel.

Speaker 7

90% of the entire mass that we've got is chemical energy. And a good bit of the rest of that mass is actually structured to hold that chemical energy. We're going from zero velocity, sitting on the launch pad, to 32,000 feet per second. That's an incredible energy ride. So we continually accelerate. So this is like no other kind of atmospheric machine. It's not like airplanes. It's not like cars. We don't get to a cruising speed and stop. And so we design for every iteration that could occur between liftoff and orbit.

Speaker 1

The rocket's journey into space is another engineering challenge. At Marshall, they still test aerodynamics using a wind tunnel, built during the Apollo era. By inserting a scale model of the SLS into the tunnel and blowing air over it, it's possible to analyze the

forces acting on the rocket as it accelerates through Earth's atmosphere on its way into space.

Speaker 7

This is 25,000 to 50,000 feet, and air molecules pile up on each other, and they create a very dense layer of air, and so that's what we call a shockwave. And so once we get supersonic, We'll see these all over the vehicle. That dictates our stability and our control system, and this gives us all the data that we need in order to control the rocket.

Speaker 1

Such data can be used to plot every second of the journey, ensuring the smoothest and safest ride into orbit.

Speaker 7

There's a joke around Marshall Space Flight Center that in God we trust, everybody else bring data.

Speaker 1

On the outskirts of New Orleans, Artemis II has gone from its design phase into assembly. 65 meters long, the core stage of the SLS is the largest single rocket section NASA has ever built.

Speaker 4

When you see SLS, you think scale. You do not understand scale until you go see that thing in real life. I call it the arrogance of humanity. The fact that we think we can assemble machinery like this and launch it successfully, it just leaves you with a sense of awe. Three, two, one.

Speaker 1

The core stage contains 2 massive aluminium fuel tanks, which at launch will be filled with liquid hydrogen and oxygen. Liquid hydrogen generates more thrust than any other rocket fuel, but its molecules are so light and loosely packed together, they require more storage space than any other fuel. That's why the core stage is so large.

Speaker 6

Liquid hydrogen is the rocket fuel of choice, and you can see why. It packs a punch. It will get people to the moon. But it is incredibly hard to handle. It needs to be kept at temperatures of minus 250 Celsius. The fuel lines, the tank itself, everything has to be kept at that temperature. or the liquid hydrogen will start to evaporate, to expand. Now imagine if your liquid hydrogen starts expanding in the tank, the tank will explode, and

so everything has to be kept at that low, low temperature so that everything stays in its liquid form.

Speaker 1

The space shuttle also used liquid hydrogen as a fuel source, but encountered so many problems. that 60% of all its launches have to be postponed. The worry is the same thing will happen with Artemis.

Speaker 16

Liftoff of the 25th space.

Speaker 13

Shuttle mission and it has cleared the tower.

Speaker 1

NASA knows only too well how dangerous liquid hydrogen can be at launch.

Speaker 2

Normal throttles for most of the flight, 104%. Challenger, go and throttle up. Challenger, go and throttle up.

Speaker 1

With the Challenger space shuttle, a rupture of the fuel tank caused liquid hydrogen to ignite, catastrophically.

Speaker 2

Obviously a major malfunction.

Speaker 1

Taking the lives of seven astronauts. The core stage of the SLS is transported 1,500 kilometers by barge to Kennedy Space Center, from where it will eventually launch. On arrival, it's taken to the Vehicle Assembly Building, the largest single-story building in the world. The head of NASA, Bill Nelson, is taking a look for himself.

Speaker 3

That core stage packs a big punch. 8.8 million pounds of thrust at liftoff in those four engines right there. By the way, those engines were the same engines that were on the Space Shuttle. But instead of throwing them away, we're using them.

Speaker 1

Rather than inventing a new engine, NASA was mandated by Congress to recycle and update the RS-25 engines that had previously powered the Space Shuttle. Developed in the 1970s, To deliver maximum thrust from liquid hydrogen fuel, they were known as the Ferrari of rocket engines.

Speaker 12

The space shuttle main engines were great engines, really miraculous. But it turns out if you want an affordable space program, you don't want to be launching Ferraris in space, especially if like you drive it one time and the car goes away. You want a Toyota that you can drive again and again and again and again, and that's really kind of been the big change.

Speaker 1

While the shuttle was designed to be reusable, the SLS is a single-use rocket. Each RS-25 engine will be flown only once and then discarded. A disposable engine at a premium price.

Speaker 12

If you total up all the money that NASA's spending, the cost of the single RS-25 engine is between 100 and 140 million U.S. dollars. SpaceX is building a comparable Raptor engine for $500,000, half a million.

Speaker 1

Having committed to the RS-25 engines, NASA is unable to use new and cheaper options currently being developed by the commercial space sector.

Speaker 14

Congress basically told NASA that it's going to use contracts workforce systems from previous programs. It wanted to try and save some money, probably save some of that expertise. And so until Congress says NASA can move away from this, which isn't until at least Artemis V, NASA's going to keep flying SLS without reusable engines.

Speaker 1

At the top of the spacecraft sits the Orion capsule, which carries the crew. Inside, there's 9 cubic meters of space. the same as a medium-sized campervan. But before it can go to the moon, it needs to be certified ready to fly. To do this, engineers are running post-flight tests on the returned capsule from Artemis 1. They start by shaking the capsule. blasting it with extreme noise. 200 times more intense than a jet engine. Simulating the most extreme vibrations that might occur during a mission. The focus is on the forward bay cover, the yellow cap at the top of the capsule, which needs to eject

on re-entry, so the parachutes can deploy and the capsule can slow down and land safely. It's critical that this mechanism works properly on Artemis II.

Speaker 8

It takes less than a second for the pyros or explosives to separate that cover, but it takes months to plan, months to make sure that everything is set up. Like we're looking here at a catch system, so the forward bay cover will go into that net, the bungee cords then will keep attention so it stays in that, And then we have very high-speed photogrammetry cameras that are set up with extremely bright lights that are focused on the hardware so the engineers can analyze it and see if all the systems are performing as expected.

Speaker 1

If any wires or bolts have come loose from the shaking, the forward bay cover could malfunction, forcing engineers to rethink the design of the capsule.

Speaker 8

Ready to test? All right. Let's go test.

Speaker 10

Testing does end up requiring more time to be put into the design development process of spacecraft, but it's necessary at both the component level and all the way up to the entire system level. That's how we fly spacecraft safely. On my mark, I'll fire NPC fires.

Speaker 2

Three, two, one. Yes! Confirmation of NPC fires firing.

Speaker 1

Forward bay cover has detached cleanly. The capsule's design has passed its test. But all is not well with Orion. When Artemis 1 splashed down, the mission was hailed as a great success. But in reality, there were problems with the capsule. As it was hauled onto the recovery ship, it was quickly examined by engineers. Their biggest concern, the heat shield. How was it affected by the intense heat of re-entry? Fitted to the underside of the capsule, the heat shield is built from Avcoat, an epoxy resin developed in the 1960s for the Apollo program. Tiles are meant to melt and vaporize, taking heat away from the capsule. But it didn't work out like that. It takes 16 months for the state of the heat shield to become public knowledge.

Speaker 6

This report caused quite a stir when it came out. It makes some pretty sort of damning claims, really. What I'm looking at here especially is the pictures of the Orion heat

shield. What you can see is sort of cavities and some burn marks on these areas. And it is pretty scary, because this was a technology that's going to be used to get people to the moon, and yet there is this degradation. And the Inspector General actually says, in our judgment, the unexpected behaviour of the heat shield poses a significant risk to the safety of future crewed missions. And sort of having something like that written in a report means a response is needed. Something has to change because this sort of charring of the heat shield could risk human life.

Speaker 12

The material's ablative, so it sort of burns away slowly, and you expect that, but you didn't expect chunks of it to fall away like they did. When you see something that anomalous on a critical system like the heat shield, where there's no backup, then that really raises your concerns.

Speaker 8

It looks like you can see pieces of the shuttle coming off.

Speaker 2

Columbia, Houston, UHF comm check. Columbia, Houston, UHF comm check.

Speaker 1

The risk of an accident at reentry is well known to NASA. In 2003, damaged heat tiles led to the breakup of the space shuttle Columbia. As with Challenger, Seven astronauts lost their lives.

Speaker 14

The space shuttle had two major disasters and 14 astronauts died. That has weighed heavily on NASA, on America, and it's definitely something that has affected this mission and other human spaceflight missions.

Speaker 1

NASA launches a formal investigation into what went wrong with the heat shield and how best to proceed with the mission. Seven months later, the agency announces its conclusions.

Speaker 3

We've conducted expansive testing, including analyzing samples from the heat shield, and now we know the root cause.

Speaker 1

Blame is focused on the skip-entry maneuver. used for the first time on Artemis I, to slow the spacecraft down as it entered Earth's atmosphere.

Speaker 18

This is a technique we use coming back from the moon, because the velocity is much greater than coming back from low-Earth orbit.

Speaker 17

They were trying a different re-entry procedure, a skip entry. So that's where the spacecraft dips into the Earth's atmosphere Once, then it creates a small amount of lift. It exits the Earth's atmosphere, and then it comes back in a second time for the reentry. Doing that skip maneuver meant that layers of gas were trapped inside the heat shield. So when it came into the Earth's atmosphere for the second time, those gases had to escape, and that caused cracking and chunks of the heat shield to come off.

Speaker 1

NASA decides to keep the existing design of heat shield for Artemis II, but to ditch the double dip skip entry. Instead, Artemis II will make what engineers call a ballistic entry, with a single, steeper profile, as if the capsule has been fired like a bullet from a gun. But will it work?

Speaker 12

We don't know. I mean, engineering, the models, all the modeling suggests it will work, but all of that data suggested that with the skip re-entry on Artemis I, there wouldn't be heat shield loss, so.

Speaker 6

This is a compromise. They're keeping the existing heat shield because to design a new one would take an awful long time, but with all space missions, there is a risk. They've mitigated the risk as much as possible, but there is still always that risk that there could be a catastrophic failure and loss of life.

Speaker 4

We'll be nervous coming in. You can't be not nervous. But you trust the architecture, you trust the engineering, and it's going to work out.

Speaker 2

Go for stage 2 internal power.

Speaker 1

With the launch now scheduled for spring 2026, the astronauts spend time in the Orion simulator, practicing every step of the mission.

Speaker 5

Launch in 10 seconds if you're syncing your watches.

Speaker 1

Starting with launch.

Speaker 15

Five, 4.

Speaker 5

Three, two, one, launch.

Speaker 4

All right, we're in the air. There is a lot of training. If we were to boil it all down, we could probably get it done in under a year. But we are also flying this vehicle for the first time, so we do need to spend a lot more time than the next crew will have to spend on just all of the what-ifs.

Speaker 5

Six minutes, 30 seconds. So far, Niko's in 90 seconds.

Speaker 4

I would say 90% of the training we have done, we've provided feedback where we could cut it down. We could shorten this. We could focus on these important aspects.

Speaker 5

Shut down in three, two, one.

Speaker 4

We're road testing the training. We're road testing the preparation towards launch. We're road testing all of that. That's our job.

Speaker 17

There is no substitute for preparation. There's no substitute for having an intimate knowledge of what you're doing. And what that allows you to do is generate options when things go wrong. As we say in the military, you train hard, you fight easy.

Speaker 6

I often get asked, why put people in space? We have robotic missions, we have AI. Why have humans?

Speaker 4

What is the pressure that makes you worry we couldn't recharge the N2 ring?

Speaker 6

To me, they are critical, because they are literally the eyes and the ears of the mission.

Speaker 12

On the Artemis II mission, The astronauts aren't going to do much flying. They're going to do some demonstrations, but that's not essential. Orion could fly itself to around the moon. But in emergencies, you do want humans flying. That's what they trained for.

Speaker 1

A huge rocket that will carry NASA's first crewed moon mission in more than half a century has begun its journey to the launch pad in Florida. Artemis II may blast off as early as next month on a 10-day trip around the moon.

Speaker 5

Now, this is the start of a very long journey. We ended our last human exploration of the moon in Apollo 17, the 17th mission. Now, I hope someday my kids are going to be watching, maybe decades into the future, the Artemis 100 mission. We should be able to undertake Repeatable, affordable missions to and from the moon.

Speaker 1

The SLS rocket slowly rolls out to the launch pad. Top speed, 0.8 miles an hour.

Speaker 14

You four are about to fly farther into space than any humans have ever flown. But how are you training your families as you get ready to leave them behind on Earth?

Speaker 4

Trying to train them honestly and openly. With my kids, I told them, here's where the will is, here's where the trust documents are, and if anything happens to me, here's what's going to happen to you. It's our families that we think about the most on launch day.

Speaker 1

After 12 hours, the rocket arrives at its destination, launch pad 39B. But in February, it has to roll back again into the Vehicle Assembly Building. Engineers have discovered 2

problems, a hydrogen leak and a helium leak. By March, the rocket has been repaired and it rolls out again. NASA sets a new launch date, 1st of April, 2026.

Speaker 4

About 9 hours prior to liftoff, we'll wake up. They're going to take our temperature, our weight, our blood pressure. Once that's complete, it's time to go start getting dressed. And we'll go into the suit room. They'll leak check us, make sure our suit holds pressure. And then when that's complete, we wait until it's time to walk out. From the moment that you walk out to go out to the launch pad, you're on this extremely choreographed timeline.

Speaker 1

The spacecraft awaits its crew.

Speaker 4

As you get out to the pad, you can look all the way up and see the top of the rocket. It's full of fuel, so it'll be venting. It'll be cold. It'll be alive. And we are just teeny tiny specks amongst this 280-foot-tall rocket in front of us. We'll get in an elevator. We'll ride that elevator up to the 274 level. And we walk down the gantry to the white room, put on our helmet, put on our gloves, make sure we look good from head to toe, and then one at a time, we'll go into the Orion and start getting strapped in.

Speaker 1

The crew has given their capsule a nickname. Integrity. It'll be their home for the next 10 days of the mission.

Speaker 18

We are now under an hour from the opening of our two-hour launch window at 6.24 P.m.

Speaker 2

Eastern Time.

Speaker 14

Rocket science has hundreds or thousands of things that all have to go just right. It all has to be perfect. The rocket has to launch within this window. If it doesn't launch in this window, it can't go today.

Speaker 12

You get to T-minus 10 minutes. 10 minutes to go on the countdown. They'll pause it there for about 30 minutes. They'll go through and ask basically everyone if they're part of the rocket or the spacecraft is good to go.

Speaker 2

MCO. CO is go. Houston flight. Houston flight is go.

Speaker 12

If there's a reading out of bounds during that time, then the countdown will be stopped and the launch will be scrubbed for the day.

Speaker 2

Artemis II crew is go for launch. I copy that. Good luck. Godspeed, Artemis II. Let's go.

Speaker 13

Ten, nine, eight, seven, RS-25 engines, eight, four, three, two, one, boost your ignition, and lift off. The crew of Artemis II now bound for the moon. The community's next great voyage begins. Mission Control Houston seen good performance in four main.

Speaker 4

Engines, 3 miles in altitude, traveling more than 1,200 miles per hour.

Speaker 1

The rocket powers its way into orbit, as designed by the engineers at Marshall Space Flight Center.

Speaker 4

Confirmed separation. Now passing 5,000 miles per hour.

Speaker 2

Use and integrity, good last jettison, great view.

Speaker 3

Integrity and nominal Nikko, core stage separated.

Speaker 2

All right, it was really great to look out the window and see the full moon. off the front of the vehicle. There's no doubt where we're heading right now. All right, signing off. It is great to see you all waves, and we are really enjoying seeing you up there. Not as much as we're enjoying being here. That is true.

Speaker 1

The spacecraft is being monitored by Mission Control in Houston. It's now traveling into deep space. Heading for the moon?

Speaker 2

We know that there was some talk about some burnt smell from the heaters, so we just thought we'd check in with you. We're continuing to look at that.

Speaker 14

Jeremy Hanson is the only one who hasn't been to space before. The rest of them, they have an idea of how to move their bodies in space, but it's different for each person on how long it takes to get used to it and if they get motion sick or not. So there's just a lot that will be going on during this mission.

Speaker 17

Your body is being bombarded by galactic cosmic rays. And actually, we see that as astronauts. When we're falling asleep, you close your eyes, and before you actually drop off, you'll see several flashes, like bright streaks of light going across your eye. And you know that that's a high-energy particle striking the back of your retina. It's quite pretty to look at, but it's not when you realize the damage that that could be doing to your body. and that could cause some form of cancer.

Speaker 1

On day six, Integrity reaches the moon. The crew will do a seven-hour flyby, capturing high-quality images of the lunar surface, going further from Earth than any crew has gone before. But first, They want to name a crater located at the western edge of the moon's near side.

Speaker 2

A number of years ago, we started this journey in our close-knit astronaut family, and we lost a loved one. Her name was Carol, the spouse of Reed, the mother of Katie and Ellie. And we would like to call it Carol, and you spell that C-A, R-R-O-L-L.

Speaker 1

On the ground, the science team are receiving live reports as the astronauts fly by the moon, observing different geological features.

Speaker 2

I think Copernicus is the easternmost feature that we can see A very nice ring to the north and the south is with a lot of terrain, shadow features. We are getting a sneak preview from one of our SAW cameras at what you're looking at, and we see some of what you're describing.

Speaker 14

We love it. The Artemis II crew has been trained to observe the moon, to find significant features. As a spacecraft goes around the moon, an astronaut can look at a spot from different angles. It might take a spacecraft years to have that trajectory where they can see all those angles.

Speaker 2

Something I've never seen in photographs before, but it's very apparent, all the new craters, some of them are super tiny. There's a couple that really stand out, obviously, and they're so bright compared to the rest of the moon.

Speaker 1

The flyby ends with a final flourish. A total solar eclipse, seen for the first time from space.

Speaker 2

The sun has gone behind the moon, and the corona is still visible. And it creates a halo almost around the entire moon. But when you get to the Earth side, the Earth shine has already shown, and the moon is just hanging in front of us. this black orb out in front of us. Wow, it's amazing. No matter how long we look at this, our brains are not processing this image in front of us. There's no adjectives. I'm going to need to invent some new ones to describe what we are looking at out this window. This is so cool.

Speaker 1

After 9 days in space, Artemis II is coming home.

Speaker 12

Re-entry, I think, is probably the most critical part of the mission.

Speaker 16

You can see the reflection of one of the crew members in the window.

Speaker 12

You're testing the Orion heat shield, which had some failure during Artemis I. That's, I think, In terms of pucker factor, for me, that re-entry will be the highest part.

Speaker 6

With the heat shield, I am optimistic, but there's no getting rounded. It is a time of trepidation, and it is one of those moments where you wish them godspeed.

Speaker 16

And we have crossed the threshold now entering the Earth's atmosphere.

Speaker 11

And the final stretch here, the last 13 minutes. They're about to lose communications, too. There'll be a six-minute blackout. As.

Speaker 16

Predicted, we've had communications gone. Communications blackout. No voice, no data from the crew. This is a visualization of the plasma buildup around the spacecraft and the repelling of that heat on Integrity's heat shield. So that pinpoint of light shows the vehicle, the first tug of gravity being felt by Integrity's astronauts. We're getting intermittent views. Still waiting to establish voice communication.

Speaker 2

Integrity, Houston, com check post-blackout. Houston, Integrity, we have you loud and clear.

Speaker 16

Big cheers from the viewing room here in Mission Control as voice communication re-established with Commander Reid Wiseman.

Speaker 2

We see three good-looking parachutes. Integrity copies. Integrity splashdown sending post landing command now.

Speaker 16

Splashdown confirmed.

Speaker 2

Waiting on VLDM.

Speaker 16

Remember is out of integrity.

Speaker 12

So if we do this right, we'll look back on Artemis II and barely remember it. You know, we have celebrated the Apollo program for 50 years, and we've been constantly looking back. And so what we want to do is actually look forward. My hope is that this is just the beginning of not Artemis 3, 4, 5, but Artemis 30, 50, and then you have a growing community on the moon, potentially on Mars, throughout the solar system. That's what we're working toward. Now, will we get there? I'm hopeful, but I'm not certain.

Speaker 1

The next mission will be a test flight in low Earth orbit. But the plan for Artemis IV is to land on the moon. Sometime in 2028.

Speaker 17

Self-confessed charity shopaholic Joanna Page is perfectly placed to shift the thrift. Watch now on iPlayer. The moonwalking grinds to a halt for Michael Jackson, next on BBC Two, and American tragedy continues.