Episode Book

EPISODE #5716

One in 13 Million: What It Takes to Be an Astronaut

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SYNOPSIS

Fewer than 800 human beings have ever left Earth's atmosphere, out of 8.2 billion people alive today. What does it actually take to join that club? This episode digs into the contested definitions of "space," the published NASA requirements (a master's degree, 1,000 hours piloting jets, and a physical exam unlike any other), and the two-year training pipeline that turns doctors and biologists into spacewalkers. Then it turns to the stranger question: what happens to your mind once you're actually up there — and why NASA's psychological screening is built less around toughness than around cold medical math.

TRANSCRIPT



Corn

Six hundred and thirty-one people. That's a conservative count of every human being who has ever left Earth's atmosphere, out of eight point two billion of us walking around down here.



Herman

Which is roughly one in thirteen million.



Corn

Herman, I want you to sit with that number for a second. One in thirteen million. You have a better chance of being struck by lightning twice in the same afternoon than you do of being one of these people.



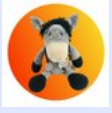
Herman

And some of these people are full-time astronauts who spent twenty years of their lives fighting to get there.



Corn

Right. So Daniel wrote in this week, and he starts from something we've poked at before, which is the tiny list of humans who've walked on the Moon. Twelve people. You could seat them at one long dinner table. But behind that list, he says, is a longer list of astronauts who have been to outer space. And even that longer list is extraordinarily small relative to the overall size of humanity.



Herman

He's not wrong.



Corn

And what he wants to look at is the people on that list. Specifically, what kind of training does it take to become one of them? Airmanship, spacemanship, deep knowledge of the sciences. And then, he writes, one imagines a degree of mental resilience required to be beyond the atmosphere of planet Earth. He wants the mental toughness and the physical skills both.



Herman

So it's a two-part question.



Corn

It's more than two parts. He also wants to know what these people actually say about the moment they realize they're beyond the atmosphere. And I want to read you what he wrote here, because it's the heart of the whole thing. He says, "I always imagined it was a peaceful moment, but I can also imagine how it might be a frightening one."



Herman

That's a good distinction.



Corn

So today we're going to try to answer three things. How small is this club, what does it take to get in, and what happens to your mind when you're finally out there.



Herman

Let's start with the club.



Corn

The number. Give me the real number, because I know from the way you've been shuffling papers that there isn't one.



Herman

There isn't. It depends entirely on which line you draw. The United States Air Force treats eighty kilometers as the edge of space. The international standard, the FAI, and the Kármán line everyone talks about, puts it at a hundred kilometers. And those twenty kilometers matter, because suborbital tourist flights peak right between them.



Corn

So a Blue Origin hop counts under one definition and not the other.



Herman

TASS counted six hundred and thirty-one people from forty-three countries as of this spring, and that includes professionals, non-professionals, and tourists, and it breaks down to eighty-two women from thirteen nations. Wikipedia's list, which only counts people who actually reached Earth orbit, says six hundred and thirty-seven, from forty-seven countries. And OrbitalRadar, using that eighty-kilometer American boundary, says more than seven hundred and eighty have flown above it.



Corn

So the range is six hundred and thirty-one to seven hundred and eighty.



Herman

Depending on who you ask.



Corn

And the honest answer is nobody knows precisely, because the definition is contested.



Herman

It's a real argument. There are people in the space community who think a ten-minute suborbital hop should put you on the same list as somebody who spent six months on the International Space Station. And there are people who think it shouldn't.



Corn

I want to look at the number that doesn't move, though. The one nobody argues about.



Herman

Twenty-eight.



Corn

Twenty-eight people have traveled beyond low Earth orbit. Ever. Circled the Moon, orbited it, or walked on it.



Herman

And that's the sharpest distinction in the whole data set. Everyone thinks of "astronaut" as one category. It isn't. Almost everyone who has ever been to space has never left low Earth orbit. They went up a couple hundred miles and stayed there.



Corn

The ISS orbits somewhere around two hundred and forty to two hundred and sixty-four miles up.



Herman

And to get beyond that, to leave, is a different thing entirely. Twenty-eight people have done it. If you wanted to fill a conference room with everyone who's ever been beyond low Earth orbit, you wouldn't need a very big conference room.



Corn

What about the national concentration?



Herman

Overwhelming. The United States has sent three hundred and sixty-nine. The Soviet Union and Russia together, a hundred and thirty-eight. China, twenty-four. And ninety-four percent of everyone who has reached low Earth orbit comes from just eight countries.



Corn

One in thirteen million, and three quarters of them come from two superpowers.



Herman

So who gets picked for this club, and what do they have to survive before they even get in the door?



Corn

Give me the gate. The actual, published requirements, not the mythology.



Herman

The requirements are public and they are unglamorous. You have to be a United States citizen. You need a master's degree in a STEM field, and there are alternative routes there, so it can be two years of work toward a doctorate, or a medical degree, or completion of a test-pilot school. Then you need either three years of related professional experience, or a thousand hours as pilot in command of a jet, with at least eight hundred and fifty of those in high-performance aircraft.



Corn

A thousand hours in command. That's not a hobby pilot.



Herman

That's years of your life. And then on top of all of it, you have to pass the NASA long-duration flight astronaut physical, and demonstrate leadership, teamwork, and communications skills.



Corn

That last one always gets me. Leadership and teamwork, listed right there in the requirements, same as the degree.



Herman

Because you're going to be sealed in a can with three other people for six months.



Corn

Fine. But how many people actually apply for this?



Herman

NASA's Astronaut Selection Board reviewed a record eighteen thousand three hundred applications in the twenty sixteen cycle.



Corn

Eighteen thousand three hundred.



Herman

More than twelve thousand applied in the twenty twenty window. And for the class announced last year, they had more than eight thousand applicants.



Corn

And how many do they take?



Herman

A handful. It varies by class, but you're talking single digits to low double digits out of eight thousand plus.



Corn

So the funnel from application to class is something on the order of one in a thousand.



Herman

Barring a rounding error, yes.



Corn

And that's just to be selected. Then the training starts.



Herman

Two years of basic training. NASA's own description is that candidates spend those two years learning basic astronaut skills like spacewalking, operating the space station, flying T-38 jet planes, and controlling a robotic arm.



Corn

That's the three things Daniel named, right there. Airmanship is the T-38s. Spacemanship is the spacewalks and the robotic arm. And the sciences are the master's degree you had to have just to apply.



Herman

The T-38s matter more than people realize. They're not just for fun. You're flying a supersonic trainer in formation with other people, and you're building the judgment you'll need when something goes wrong at altitude. Nobody learns that from a simulator.



Corn

Right. Flying a jet teaches you to make decisions when the inputs are changing faster than you can think.



Herman

And the astronauts are, many of them, not pilots when they arrive. They're doctors, engineers, biologists. The T-38 training is how NASA broadens them.



Corn

And then there's the pool.



Herman

The Neutral Buoyancy Laboratory, at the Sonny Carter Training Facility in Houston. It's a pool twelve meters deep.



Corn

Twelve meters. That's almost forty feet.



Herman

And the whole point is that you can put an astronaut in a weighted spacesuit, adjust the buoyancy so they neither sink nor float, and rehearse a spacewalk for hours underwater.



Corn

Because you can't rehearse it in space.



Herman

You can't. The Atlantic called it the best medium on Earth for simulating the weightlessness of space, and they're right. It's not perfect, because water drags on you, so every motion is harder than it will be in orbit, but it's the closest thing we have to actually doing the work.



Corn

So spacemanship is physically built, underwater, in a pool the size of a small lake, over and over.



Herman

There's more. Land survival, sea survival, scuba diving, spacesuit operations. NASA astronauts have done water-survival and emergency-egress training, at Fairchild Air Force Base, for example. The idea is that if your capsule comes down in the wrong place, you can survive long enough to be picked up.



Corn

Because the bad outcome isn't the launch. It's the landing that goes sideways.



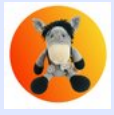
Herman

That's the part the public never sees. Nobody photographs the survival training.



Corn

And the historical contrast, because I know you have it.



Herman

The first astronauts, the Mercury Seven in fifty-nine, were military jet pilots, and they had to be shorter than five foot eleven.



Corn

Because of the capsule.



Herman

Because the capsule was that small. That was the whole selection criterion at the top of the list. Not the degree. Your height.



Corn

So the first selection filter was whether you fit in the can.



Herman

Then in sixty-four, NASA started recruiting scientist-astronauts, and initially required a doctorate in medicine, engineering, or a natural science. So the pipeline widened. But the funnel didn't. It's still eighteen thousand applications for a handful of seats.



Corn

So that's the physical and technical gauntlet. But the part Daniel really asked about, the mental side, is where this gets stranger.



Herman

It does. And the place to start is what NASA is actually screening for.



Corn

Not toughness, I take it.



Herman

Not in the way people imagine. NASA's medical selection standard is a real document, and its stated purpose is to ensure the health, safety, and longevity of career astronauts, and to select people who can successfully complete physically and mentally challenging missions while placing minimal demands upon the limited medical resources inherent in present-day spaceflight.



Corn

Say that last part again.



Herman

Placing minimal demands on limited in-flight medical resources.



Corn

So the standard isn't "is this person the toughest human alive." It's "if this person gets sick up there, can we afford to treat them."



Herman

That's a colder calculation than people expect. The key principles are good overall health, low risk of sudden incapacitation, and low risk of developing conditions that would tax the medical resources you have on orbit.



Corn

Sudden incapacitation. That's a euphemism worth unpacking.



Herman

A heart attack in orbit is not a manageable event. So the screening is partly about ruling out the people who might have one.



Corn

And the psychological side?



Herman

There's a twenty twenty-four commentary by Pagnini, and the line that stuck with me is that astronauts' psychological well-being is becoming just as vital as their physical and technical readiness.



Corn

Becoming. So it hasn't always been treated that way.



Herman

It's been treated as secondary for most of the program's history. And the paper makes the case that the threats are real. Isolation, confinement, communication delays, microgravity. All of those degrade mental health and cognitive performance.



Corn

And the proposed remedies?



Herman

Mindfulness, relaxation techniques, and twenty-four seven automated psychotherapy for when the communication delay with Earth is too long for a real conversation.



Corn

Automated psychotherapy. For astronauts.



Herman

That's the proposal. Because when you're on the way to Mars, Earth is minutes to hours away, and you cannot have a live therapist on the line.



Corn

That's a strange image. The most carefully selected human beings we've ever produced, and they still might need a chatbot.



Herman

And there's animal-model research that backs up the concern. Adkins and colleagues, twenty twenty-four, showed that social isolation combined with space radiation impairs fine motor skills and behavior, and the effect varies by what they called stress resilience or vulnerability phenotype.



Corn

Phenotype. That's a measurable, individual trait.



Herman

It's not a vibe. It's something you can test for, and some individuals are more vulnerable than others. Which means the selection isn't just picking tough people, it's picking people whose specific biology handles stress a particular way.



Corn

And the historical case?



Herman

Skylab four. The nineteen seventies. The crew famously stopped working for a period, and the flight director's own words are that they needed to reflect, to observe, to find their place amid these baffling, fascinating, unprecedented experiences.



Corn

That's a beautiful sentence, and a strange one to hear from a flight director.



Herman

It's the earliest high-profile admission that even elite astronauts hit a psychological wall, and that the wall isn't a failure of character.



Corn

It's a normal human response to an abnormal situation, and the agency eventually accepted that.



Herman

Which is where the testimony starts.



Corn

The moment itself. Daniel's actually interested in this.



Herman

Mae Jemison spent eight days in space, and she told Inverse she tried to make herself afraid. She wanted to feel it. And she said she was just so mellow and cool, that she couldn't make herself nervous. She imagined being ten thousand light years away, and she felt fine.



Corn

Ten thousand light years. That's an enormous mental distance to conjure up and feel nothing but fine.



Herman

It's the peaceful side. It exists. Jemison is the cleanest example of it.



Corn

And the other side?



Herman

Mike Massimino, twenty-three days in space. He said he was stunned in a way that was completely unexpected. Overwhelmingly impressive, beyond anything he'd heard from his colleagues.



Corn

Which is interesting, because his colleagues had told him.



Herman

They had. And it still didn't prepare him. He described the planet as glowing, and gave this image of taking a lightbulb, painting it all the colors that you know Earth to be, and turning it on, and being blinded by it.



Corn

That's a good image, because it's a lightbulb. A thing you hold in your hand and turn on.



Herman

There's also T.J. Creamer, retired NASA astronaut, who said every single crew member he brought into the cupola for that exposure cried. Every one. He called it heart stopping, soul pounding, breathtaking.



Corn

Every single one.



Herman

And Christina Koch, who's on the Artemis Two crew, said every single person that you know is sustained and inside of that green line, and everything else outside of it is completely inhospitable. You don't see borders. All you see is Earth.



Corn

That's the one that lands for me. Not the beauty, the line.



Herman

The green line?



Corn

Everything you have ever loved is inside a thin band of atmosphere, and everything outside it will kill you instantly.



Herman

Which is the beauty and the terror in one image, and I don't think that's an accident.



Corn

So that's the peaceful and the overwhelming. Where's the frightening?



Herman

William Shatner. Blue Origin, twenty twenty-one. He described shooting through the blue layer as though you whip a sheet off you when you're asleep, and you're looking into blackness, into black ugliness. His words. He said there is mother, and Earth, and comfort. And then there's. Is there death? I don't know.



Corn

Black ugliness.



Herman

He later said he was in grief for the Earth, and that the trip felt like a funeral.



Corn

A man who spent his career pretending to be in space, actually going, and coming back in mourning.



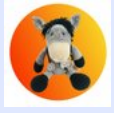
Herman

And there's a precedent for it. The break-off phenomenon. A nineteen fifty-seven study in the Journal of Aviation Medicine, Clark and Graybiel, documented pilots at high altitude feeling isolated, detached, or separated physically from the earth.



Corn

What were the reactions?



Herman

The full range. From exhilaration or feeling nearer to God, all the way to anxiety, fear, or loneliness. Same stimulus, opposite responses.



Corn

That's the important part. Same altitude, same view, and two pilots come back with completely different accounts.



Herman

And then the literature on it ends. Nineteen seventy-three, and then it stops.



Corn

Why?



Herman

I don't know. That's one I can't account for. It may be that the research moved into other channels, or that the framing changed, or that nobody was asking the question anymore. But there's a wall in the record, and I don't have an explanation for it.



Corn

Which is a strange kind of hole.



Herman

It is.



Corn

And the skeptic's case? Because I know there's one.



Herman

Jordan Bimm, a science historian. His argument is that the overview effect is both a natural and a cultural object. It's not a reliably produced mental effect. It's partly something we've learned to expect, and partly something astronauts have learned to describe in a particular register.



Corn

Because Frank White named it in eighty-seven, and suddenly there's a word for it.



Herman

And once there's a word, and once there's an expected response, the response becomes culturally available. Bimm also warns about an overlord effect, which is hubris. The feeling of being enlightened by the experience, and the sense of superiority that can come with it.



Corn

And the last piece, the one that reframes the whole episode.



Herman

Bimm points out that astronauts operate in what he calls a lie to fly culture. The career pressure to avoid reporting negative psychological reactions.



Corn

Say that again.



Herman

There's a culture in aviation and spaceflight where reporting a psychological problem can ground you. Which means the people who do report them stop flying. And the people who don't, don't.



Corn

So the testimony we have is the testimony of the people who didn't report the frightening part.



Herman

Some portion of it, yes.



Corn

Which means peaceful and frightening aren't opposites here. They're often the same moment, and the culture around the job may make the frightening half harder to hear.



Hilbert

A man named Peter Voss.



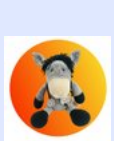
Corn

Mm.



Hilbert

That was the name on the file. Test pilot, master's in aerospace engineering, twelve hundred hours pilot in command, physical came back clean. Every box ticked. I never met him. I read his file on a Tuesday and I have thought about it for years.



Herman

What happened to him?



Hilbert

He was rejected. And the reason was one line in a psychological interview note. Performs compliance, not connection. Five words. That was it. Everything else was perfect.



Herman

Do you think they got it wrong?



Hilbert

I don't know. That's not what sticks with me. What sticks with me is that the note wasn't looking for toughness. It wasn't looking for a man who could take stress. Everything in his file said he could take stress. The note was looking for something else.



Corn

What?



Hilbert

A man who can be alone with himself without needing anyone to watch. Because the men and women who get through, they can sit with the blackness and not need to tell anybody it was fine. He needed to be seen being brave. That's a different thing.



Herman

That's the same distinction Bimm draws, but from the other side.



Hilbert

It is. The lie to fly culture, that's not a bug in the selection. That's the selection. They're picking for it. Not because anyone sat down and wrote a policy, but because the note gets written and the file goes in the rejection pile.



Corn

The selection process filters for people who won't report the frightening part.



Hilbert

It's not a filter for dishonesty. It's a filter for a particular kind of self-sufficiency, and that kind of self-sufficiency comes with a blind spot.



Corn

So the testimony comes back the way it does.



Hilbert

Doesn't make the testimony false. Jemison meant what she said. Massimino meant what he said. It just means the ones for whom it went badly may never have been on the list to begin with.



Corn

I hadn't thought about it that way.



Hilbert

Nobody does. That's the part you don't see in the statistics. You see eighteen thousand three hundred applications and a class of ten. You don't see the one file where everything was perfect and one sentence ended it.



Corn

The misconception people have is that astronauts are selected above all for toughness, physical and mental.



Herman

It's almost the opposite. NASA's own medical standard is written around low risk of sudden incapacitation and low demand on in-flight medical resources. That's not toughness. That's predictability and low maintenance.



Corn

The second misconception is that the peaceful testimony is the whole story.



Herman

It's the story that survives the filter. Bimm's point about the lie to fly culture is that negative reactions get underreported, so what we hear is skewed toward people who either felt serenity, or needed to say they did.



Corn

Which leaves us with the open question. If the selection process filters for people who won't report the frightening part, what does that mean for how we understand the astronaut experience?



Herman

It means we should be careful about treating the quotes as universal. There are twenty-eight people who have gone beyond low Earth orbit, and they're the only witnesses we have. What they don't say may matter as much as what they do.



Corn

The flight plan is moving toward managing this rather than screening for it. NASA is heading toward twenty-four seven automated psychotherapy and mindfulness training for deep-space missions, which is an admission that even the most resilient humans may need psychological countermeasures when Earth is hours away.



Herman

That's the future. The next astronauts may be the first ones whose mental state is actively managed in flight, not just screened before it.



Corn

Which is a different kind of astronaut. Not selected for being unbreakable, but managed for the fact that they aren't.



Herman

Properly so, honestly. Nobody has ever been unbreakable.



Corn

Producer Hilbert Flumingtop, who had one file and one sentence and has been holding onto them for years.



Herman

This has been My Weird Prompts.



Corn

If you want to send us something, email us at show at my weird prompts dot com. We read everything.



Herman

We'll be back soon.



Corn

See you tomorrow.