Episode Book

EPISODE #5712

Can NASA Actually Build a Moon Base?

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SYNOPSIS

NASA held a press conference in May 2026 and laid out a phased Moon Base plan with one stated end goal: continuous human presence on the lunar surface. The agency's own Moon Base User's Guide never says it's impossible — it lists functional and technology gaps instead. But the transport chain tells a different story. This episode digs into what the plan actually commits to, where the real unsolved problems live, and how a permanent lunar research station compares to the remote communities we already sustain on Earth.

TRANSCRIPT



Corn

...and the thing that gets me about the Sandwich Islands is that nobody lives there, nobody's ever lived there, and yet we still ended up arguing about who administers them.



Herman

Which is exactly the pattern. Nobody wants the place, everybody wants the paperwork.



Corn

Right. And Daniel's been down that rabbit hole with us. Georgia, the South Sandwich Islands, the windiest water on the planet, and now he's gone and looked up at the sky.



Herman

He asked about the moon.



Corn

Here's what he wrote. He'd been in a run of episodes with us about the most inhospitable and remote places on Earth, and he suspects that chat history is why, when he asked ChatGPT what it would take for humans to live on the moon, the model came back with a very specific reframing. And credit where it's due, he'd barely finished asking before he felt a bit stupid. His words. Because he skipped straight to climate and habitats and forgot the obvious one: can you even get people there and back?



Herman

The transport question.



Corn

And the answer ChatGPT gave him was this. There is nothing besides resources technically standing in the way of a permanently manned human research station on the moon. Not a colony. He's careful about that. A permanent normal human civilization on the



Corn (continued)

moon is still science fiction. But a tiny consortium of humans, manning a dedicated permanent research station, swapped out periodically, might sit at the far edge of viability. So his questions are: has such research actually been done, does anybody affirm that even this very limited permanent presence is feasible, and what are the fundamental problems in getting people to the moon and back?



Herman

Three questions, one of which he already knows the answer to and doesn't like.



Corn

Which is the transport one.



Herman

But let's find out whether that ChatGPT answer holds up, because as of this year it's stopped being hypothetical.



Herman

Here's what's changed. For the entire history of this conversation, a lunar base was a thought experiment. It is now a funded program with a schedule and a press conference. NASA held that press conference on the twenty-sixth of May this year and laid out a phased Moon Base plan running from now through at least the mid twenty-thirties, with the stated end goal being a continuous human presence on the lunar surface.



Corn

Continuous.



Herman

Continuous. Not flags, not footprints, not a two-week sprint. Somebody on the surface at all times. And what's striking isn't the ambition, it's how they wrote it down. NASA published a Moon Base User's Guide in April. If you read it looking for the sentence that



Herman (continued)

says this is physically impossible, you won't find it. You find a list of functional gaps and technology gaps. Unallocated capabilities. Things nobody has built yet.



Corn

Which is a very different kind of document from one that says the physics won't let us.



Herman

That distinction is the whole episode. A physics barrier gets written as an impossibility. What NASA wrote is a to-do list with some very large items on it. And that is an implicit affirmation of what Daniel got told. They're not saying it's easy, they're saying it's purchasable.



Corn

So the claim holds up in spirit, and the proof is that the responsible agency is budgeting as if it's true.



Herman

But then you pair that with how the program is actually going, and the optimism gets a lot less comfortable. So let's take it in order. First the claim and where it actually comes from, then the specific unsolved problems, then the Antarctic comparison Daniel raised, because that one turns out to prove two opposite things at the same time.



Corn

Start with the claim's provenance, because I want to know if there's a paper behind it.



Herman

There isn't. Not the sentence Daniel was given. I went looking for a standalone paper framed around nothing but resources standing in the way, and it doesn't exist. No study, no peer-reviewed article, no report with that title. That framing is a synthesis. A language model reading a lot of optimistic engineering writing and compressing it into one clean



Herman (continued)

sentence.



Corn

Which is a little bit of a problem, given the sentence is doing an enormous amount of work.



Herman

It's doing all the work. But here's the honest version. The underlying claim, that the obstacles are engineering and logistics rather than fundamental physics, is supported in spirit by NASA's own architecture. That's not nothing. It just isn't a citation. If Daniel had asked for the paper, there'd be no paper to hand him, and I think that's worth knowing before you repeat the sentence to somebody.



Corn

So the sentence is a summary of a position rather than a finding.



Herman

It's a summary of a position. And the position itself is written down in exhaustive detail, which brings us to the architecture. The plan is three phases. Phase one runs from now through twenty twenty-nine. Twenty-five launches, twenty-one landings, and roughly four thousand kilograms delivered to the surface.



Corn

Four thousand kilograms total.



Herman

Total. Over three years. That's the demonstration era. Phase two, twenty twenty-nine to twenty thirty-two, twenty-seven launches, twenty-four landings, roughly sixty thousand kilograms, and semi-annual crewed missions. Phase three, twenty thirty-two onward, twenty-nine launches, twenty-eight landings, about a hundred and fifty thousand



Herman (continued)

kilograms, and continuous crew presence.



Corn

Four thousand to sixty thousand to a hundred and fifty thousand.



Herman

And at the phase three cadence they're talking about up to eight thousand kilograms every four weeks. Sustained resupply at a rate that would keep a modest industrial facility running. That's the number that tells you what kind of thing this actually is. It's not a habitat with a flag on it. It's a supply chain pointed at the moon.



Corn

Fine. Then what's on the gaps list? Because that's where the real content is. If the answer is anything-but-resources, the gaps are the anything.



Herman

The gaps are the episode. First one, and it's the one everybody underestimates: the lunar night. A lunar day is about twenty-nine and a half Earth days, so you get roughly fourteen and a half days of daylight followed by fourteen and a half days of darkness. That's over a hundred and twenty hours of continuous night even in the polar regions where it's less extreme than the equator.



Corn

And night means no solar.



Herman

Night means no solar, and it means thermal. You're holding a habitat at a survivable temperature through two weeks of darkness in vacuum. Second gap: dust. NASA's own language is extremely abrasive and electrostatic, and it will cling to and damage surface hardware. Then precision landing, regolith manipulation at scale, and the one I'd argue is



Herman (continued)

the real headline: Earth-independent operations.



Corn

Which is a very polite phrase.



Herman

It's the politest phrase in the document. It means running the station without a mission control that can fix things in real time. The moon is about one and a quarter light seconds away. That's not a conversation, that's a delay, and it means the crew has to be able to diagnose and repair almost everything themselves.



Corn

Here's what I keep staring at. Daniel asked whether the obstacles are fundamental, and NASA answered in the vocabulary of procurement.



Herman

That's exactly the tell. When a process question shows up in a planning document as a functional gap, the agency is saying we don't have this capability yet, not this is forbidden by nature. Compare it to something that actually is a physics wall. You'd never see escape velocity listed as a technology gap, because you can't buy your way past it.



Corn

So NASA's document is a procurement list, and that's the strongest validation Daniel is going to get. Nobody wrote yes, it is feasible on the cover. They wrote a shopping list.



Herman

Which is arguably a better answer. And then there's the part Daniel flagged himself, the thing he felt stupid about. The transport chain.



Corn

Because none of that payload reaches the surface without rockets, and the rockets are having a bad year.



Herman

Blue Origin's New Glenn exploded on the launch pad days after that May press conference. Days. Not on a test flight years before anyone cared, right in the middle of the announcement cycle.



Corn

That's a timeline event, not just a hardware event.



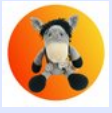
Herman

It's entirely a timeline event. And if you want the deeper problem, look at the cargo program underneath it, CLPS. Commercial Lunar Payload Services. Since twenty eighteen, fourteen missions awarded across five vendors. One of those vendors went bankrupt. Only four actually launched. Average delay of about fourteen months, per NASA's own inspector general.



Corn

Four out of fourteen.



Herman

Four out of fourteen, and of those four, only one fully met its objectives. Firefly's Blue Ghost. The rest underperformed or failed. So the current success rate for commercial lunar delivery is roughly one in four, and now CLPS two point zero calls for seventy-seven missions over a decade. That's almost twenty times what the first version achieved, at about ninety-one million dollars a mission instead of a hundred and twenty-nine.



Corn

Cheaper and nineteen times more frequent.



Herman

Cheaper and nineteen times more frequent, on the strength of a program that has launched four times.



Corn

So the resources aren't theoretical. They're just late, expensive, and unproven.



Herman

And here's the schedule reality that gets lost. Artemis three, mid twenty twenty-seven, is not a landing. It's an Earth orbit docking test. Artemis four, twenty twenty-eight, is the actual crewed landing. So the first human boot on the surface is two years out and depends on hardware that hasn't flown the profile yet. The just resources claim is true. The resources are the entire problem.



Corn

Try that sentence out loud. Nothing stands in the way except the thing that stands in the way.



Herman

It's not wrong, it's just load bearing in a way that sounds like it isn't. Every gap on that list is a resources gap. That's what makes the framing honest and useless at the same time. It tells you the class of problem and nothing about the difficulty.



Corn

Now Daniel's second half, because I think this is the more interesting question. How does a small rotating crew at a permanent lunar research station compare to the remote communities we've been talking about on Earth?



Herman

There's real pedigree to the comparison. A twenty twenty-four abstract from the Lunar and Planetary Institute puts it flatly: the most relevant analogue for a lunar base, for many reasons, is McMurdo Station in Antarctica. And they put a number on it. Minimum working population of two hundred.



Corn

Two hundred to run the analogue of a minimum.



Herman

Two hundred is their floor for a functioning remote scientific station. And NASA has used Antarctic stations as spaceflight analogs for decades, plus there's a whole body of work on it, and a KTH student design called BLISS modeled a permanent fifty-person lunar station explicitly on the Amundsen-Scott South Pole Station, operational by twenty forty.



Corn

So the analogy is established, not something we're inventing. Good. Then give me the scale, because I suspect that's where it breaks.



Herman

It's where it gets interesting. Antarctica's population is about five thousand in the summer and about a thousand in the winter, spread across roughly thirty treaty nations. That's the proof of concept. Humans do sustain remote stations through total darkness and total isolation. But hold those numbers next to the proposal. A lunar station at two hundred people would be a fifth of Antarctica's winter population. On a body with no atmosphere, no resupply chain, and no option to walk outside without a pressure suit.



Corn

A fifth of the winter population of a continent, standing alone on a rock.



Herman

Standing alone on a rock with a fourteen-month delivery cadence and a one-in-four success rate.



Corn

Then there's the governance angle, and this is the part that surprised me.



Herman

Go on.



Corn

The analogy cuts both ways. Jim Madsen, who works on IceCube at the South Pole, argues the Antarctic treaty can serve as a model for a sustainable international lunar base. His line is that moving from exploration to a year-round base to a platform for discovery was the path taken at the South Pole, so there's a template. Then Marigold Black at RAND says the opposite. Her line is that there is little in place in Antarctica to stop this from occurring, and arguably far less on the moon.



Herman

So one reading says the treaty is the model, and the other says the treaty is barely holding on and the moon has even less.



Corn

Both of them are talking about the same document. The Antarctic treaty has no real enforcement mechanism, no army, no court with teeth. It works because nobody's had a reason to break it badly enough. Put a lunar base with water ice and helium and strategic position on the table and the incentive structure changes completely.



Herman

That's the knock-on effect Daniel's prompt didn't anticipate. He asked whether the engineering is feasible. The engineering is arguably the tractable half. The politics is where this could quietly go wrong, and there's no physics barrier there either.



Corn

And the scale question makes it worse, because look at what NASA actually described. Carlos García-Galán is the Moon Base program manager. His description is hundreds of square miles. His phrase is sprawling a little bit more like a city. That is not Daniel's tiny consortium being swapped out periodically.



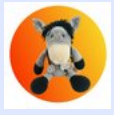
Herman

That's the contradiction I flagged earlier. Daniel is imagining a research outpost. NASA is describing a settlement footprint. And Nujoud Merancy, the chief architect, explains why it can't be compact. There's no one spot that covers all the science and all the habitation needs. You put the habitats on the tops of the hills where they get sunlight, and the nuclear power systems a kilometer or more away for radiation protection.



Corn

A kilometer or more.



Herman

Because you don't want your crew living next to the reactor. So the site has to satisfy two requirements at once, and the answer is Shackleton Connecting Ridge near the lunar south pole. Sunlit ridgelines for near-continuous solar power, with permanently shadowed craters right next to them holding water ice.



Corn

Sunlight on the ridge, ice in the crater, and never the same place.



Herman

And that geography drives the whole equipment list. Solar arrays above ten kilowatts plus battery storage for the early phases, transitioning to fission reactors by phase three, with radioisotope generators, a few hundred watts, for the permanently shadowed regions. First habitat is a JAXA pressurized rover, which will keep two astronauts alive up to thirty days without a spacesuit and survive a hundred and fifty hours without light. And then in situ resource utilization. Water ice converted to drinking water, oxygen, and rocket propellant. Regolith processed into construction material.



Corn

Rocket propellant from crater ice. That's the part that makes the economics work, isn't it? If you can refuel on the surface, the supply chain stops being the whole story.



Herman

That's the intent. It converts the base from a cost center into a staging post. But it requires regolith manipulation at industrial scale, which is one of the gaps, and it requires the ice to be as accessible as the models say, which nobody has confirmed on the ground.



Corn

And the cost.



Herman

USA Today reported about twenty billion in July. Astronomy dot com said thirty billion in June. A ten billion dollar spread on the same program in the same summer. Which tells you nobody actually knows yet, because the design isn't finished.



Corn

Twenty or thirty billion, depending on who you ask, for a program that depends on a rocket that just exploded on the pad. Daniel's ChatGPT answer didn't mention the rocket.



Herman

It didn't mention the rocket. It also didn't mention that the administrator's line is we are going back to stay, which is a promise about will, not about physics.



Corn

The dust.



Hilbert

Excuse me. Something about the dust. The dust is worse than the way they're describing it.



Herman

How much worse?



Hilbert

The line they've got is extremely abrasive and electrostatic, that it clings to and damages surface hardware. That's accurate. It's also the summary on the box. I spent a stretch of the early seventies working around a facility that handled fine abrasive powders, alumina mostly, and people who have only met sand don't understand what that material does.



Corn

What does it do?



Hilbert

Sand is rounded. It's heavy. It stays where you put it. A fine powder with a charge on it is the opposite of all three. It travels. You could seal a cabinet, tape the seams, feel good about it, and come back a week later and find a grey film inside on top of the gears. It doesn't push through the seal. It climbs. Nobody believes that until they see it. The component it ruined at our place was a switch. A rotary switch on a control panel that we all agreed was on the safe side of the wall. Nobody predicted the switch. We spent two shifts convinced a bearing had gone.



Corn

So it's not that it damages the hardware. It's that it finds the hardware.



Hilbert

It finds everything. On the moon there's no air to slow it, no moisture to clump it, and no weather to wash anything. So every seal, every connector, every suit joint, every bearing on that base is a consumable. You're not maintaining a station. You're feeding it parts.



Herman

That's the practical version of why Earth-independent operations is on the gap list. It isn't a logistics category.



Hilbert

It's a parts budget. And they can't manufacture the parts there yet, so it all comes off the rocket. That's what eats a schedule. Not the power. The endless replacing of small things you can't make on site.



Corn

Which brings us back to Daniel's question.



Herman

It does, and here's the honest verdict. The claim holds up in spirit. NASA's own architecture treats continuous human presence as an engineering program with named gaps, not a physics barrier, and that is a real affirmation. But I couldn't find a single authoritative study that says yes, this limited permanent presence is feasible. What exists is a funded program with a one-in-four delivery record and a rocket that just exploded on the pad.



Corn

And the Antarctic analogy doesn't save us, because McMurdo proves we can sustain people in a hostile place, and RAND says there's arguably far less on the moon to stop a governance race to the bottom.



Herman

The engineering is purchasable. Whether the purchase happens on schedule is a different question entirely, and the honest answer is nobody knows. The next real test is the CLPS two point zero launch cadence and the Artemis four crewed landing in twenty twenty-eight. If those hold, the resources claim starts looking like a plan. If they slip again, it starts looking like a slogan.



Corn

Which means the hard part might not be the engineering at all. It might be the will, and the willingness to keep paying.



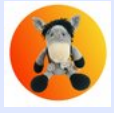
Herman

Which is exactly what Hilbert said.



Corn

We'd like to thank our producer, Hilbert Flumingtop.



Herman

This has been My Weird Prompts.



Corn

If you enjoyed this one, a review wherever you're listening goes a long way. We'll be back soon.