

LOG ENTRY: SOL 376

I'm finally done with the rover modifications!

The tricky part was figuring out how to maintain life support. Everything else was just work. A *lot* of work.

I haven't been good at keeping the log up to date, so here's a recap:

First I had to finish drilling holes with the *Pathfinder*-murderin' drill. Then I chiseled out a billion little chunks between the holes. Okay, it was 759 but it felt like a billion.

Then I had one big hole in the trailer. I filed down the edges to keep them from being too sharp.

Remember the pop-tents? I cut the bottom out of one and the remaining canvas was the right size and shape. I used seal-strips to attach it to the inside of the trailer. After pressurizing and sealing up leaks as I found them, I had a nice big balloon bulging out of the trailer. The pressurized area is easily big enough to fit the oxygenator and atmospheric regulator.

One hitch: I need to put the AREC outside. The imaginatively named "atmospheric regulator external component" is how the regulator freeze-separates air. Why sink a bunch of energy into freezing stuff when you have incredibly cold temperatures right outside?

The regulator pumps air to the AREC to let Mars freeze it. It does this along a tube that runs through a valve in the Hab's wall. The return air comes back through another tube just like it.

Getting the tubing through the balloon canvas wasn't too hard. I have several spare valve patches. Basically they're ten-by-ten-centimeter patches of Hab canvas with a valve in the middle. Why do I have these? Consider what would happen on

a normal mission if the regulator valve broke. They'd have to scrub the whole mission. Easier to send spares.

The AREC is fairly small. I made a shelf for it just under the solar panel shelves. Now everything's ready for when I eventually move the regulator and AREC over.

There's still a lot to do.

I'm not in any hurry; I've been taking it slow. One four-hour EVA per day spent on work, the rest of the time to relax in the Hab. Plus, I'll take a day off every now and then, especially if my back hurts. I can't afford to injure myself now.

I'll try to be better about this log. Now that I might actually get rescued, people will probably read it. I'll be more diligent and log every day.

#### LOG ENTRY: SOL 380

I finished the heat reservoir.

Remember my experiments with the RTG and having a hot bath? Same principle, but I came up with an improvement: submerge the RTG. No heat will be wasted that way.

I started with a large rigid sample container (or "plastic box" to people who don't work at NASA). I ran a tube through the open top and down the inside wall. Then I coiled it in the bottom to make a spiral. I glued it in place like that and sealed the end. Using my smallest drill bit, I put dozens of little holes in the coil. The idea is for the freezing return air from the regulator to pass through the water as a bunch of little bubbles. The increased surface area will get the heat into the air better.

Then I got a medium flexible sample container ("Ziploc bag") and tried to seal the RTG in it. But the RTG has an irregular shape, and I couldn't get all the air out of the bag. I can't allow any air in there. Instead of heat going to the water, some would get stored in the air, which could superheat and melt the bag.

I tried a bunch of times, but there was always an air pocket I couldn't get out. I was getting pretty frustrated until I remembered I have an airlock.

Suiting up, I went to Airlock 2 and depressurized to a full vacuum. I plopped the RTG in the bag and closed it. Perfect vacuum seal.

Next came some testing. I put the bagged RTG at the bottom of the container and filled it with water. It holds twenty liters, and the RTG quickly heated it. It was gaining a degree per minute. I let it go until it was a good 40°C. Then I hooked up the regulator's return air line to my contraption and watched the results.

It worked great! The air bubbled through, just like I'd hoped. Even better, the bubbles agitated the water, which distributed the heat evenly.

I let it run for an hour, and the Hab started to get cold. The RTG's heat can't keep up with the total loss from the Hab's impressive surface area. Not a problem. I've already established it's plenty to keep the rover warm.

I reattached the return air line to the regulator and things got back to normal.

#### LOG ENTRY: SOL 381

I've been thinking about laws on Mars.

Yeah, I know, it's a stupid thing to think about, but I have a lot of free time.

There's an international treaty saying no country can lay claim to anything that's not on Earth. And by another treaty, if you're not in any country's territory, maritime law applies.

So Mars is "international waters."

NASA is an American nonmilitary organization, and it owns the Hab. So while I'm in the Hab, American law applies. As soon as I step outside, I'm in international waters. Then when I get in the rover, I'm back to American law.

Here's the cool part: I will eventually go to Schiaparelli and commandeer the Ares 4 lander. Nobody explicitly gave me permission to do this, and they can't until I'm aboard Ares 4 and operating the comm system. After I board Ares 4, before talking to NASA, I will take control of a craft in international waters without permission.

That makes me a pirate!

A space pirate!

LOG ENTRY: SOL 383

You may be wondering what else I do with my free time. I spend a lot of it sitting around on my lazy ass watching TV. But so do you, so don't judge.

Also, I plan my trip.

*Pathfinder* was a cake run. Flat, level ground all the way. The only problem was navigating. But the trip to Schiaparelli will mean going over massive elevation changes.

I have a rough satellite map of the whole planet. It doesn't have much detail, but I'm lucky to have it at all. NASA didn't expect me to wander 3200 kilometers from the Hab.

Acidalia Planitia (where I am) has a relatively low elevation. So does Schiaparelli. But between them it goes up and down by 10 kilometers. There's going to be a lot of dangerous driving.

Things will be smooth while I'm in Acidalia, but that's only the first 650 kilometers. After that comes the crater-riddled terrain of Arabia Terra.

I do have one thing going for me. And I swear it's a gift from God. For some geological reason, there's a valley called Mawrth Vallis that's *perfectly* placed.

Millions of years ago it was a river. Now it's a valley that juts into the brutal terrain of Arabia, almost directly toward Schiaparelli. It's much gentler terrain than the rest of Arabia

Terra, and the far end looks like a smooth ascent out of the valley.

Between Acidalia and Mawrth Vallis I'll get 1350 kilometers of relatively easy terrain.

The other 1850 kilometers...well, that won't be so nice. Especially when I have to descend into Schiaparelli itself. Ugh.

Anyway. Mawrth Vallis. Awesome.

LOG ENTRY: SOL 385

The worst part of the *Pathfinder* trip was being trapped in the rover. I had to live in a cramped environment that was full of junk and reeked of body odor. Same as my college days.

Rim shot!

Seriously though, it sucked. It was twenty-two sols of abject misery.

I plan to leave for Schiaparelli 100 sols before my rescue (or death), and I swear to God I'll rip my own face off if I have to live in the rover for that long.

I need a place to stay where I can stand up and take a few steps without hitting things. And no, being outside in a goddamn EVA suit doesn't count. I need personal space, not 50 kilograms of clothing.

So today, I started making a tent. Somewhere I can relax while the batteries recharge; somewhere I can lie down comfortably while sleeping.

I recently sacrificed one of my two pop-tents to be the trailer balloon, but the other is in perfect shape. Even better, it has an attachment for the rover's airlock. Before I made it a potato farm, its original purpose was to be a lifeboat for the rover.

I could attach the pop-tent to either vehicle's airlock. I'm going with the rover instead of the trailer. The rover has the

computer and controls. If I need to know the status of anything (like life support or how well the battery is charging), I'll need access. This way, I'll be able to walk right in. No EVA.

Also, while traveling, I'll keep the tent folded up in the rover. In an emergency, I can get to it fast.

The pop-tent is the basis of my "bedroom," but not the whole thing. The tent's not very big; not much more space than the rover. But it has the airlock attachment so it's a great place to start. My plan is to double the floor area and double the height. That'll give me a nice big space to relax in.

For the floor, I'll use the original flooring material from the two pop-tents. If I didn't, my bedroom would become a big hamster ball because Hab canvas is flexible. When you fill it with pressure, it wants to become a sphere. That's not a useful shape.

To combat this, the Hab and pop-tents have special flooring material. It unfolds as a bunch of little segments that won't open beyond 180 degrees, so it remains flat.

The pop-tent base is a hexagon. I have another base left over from what is now the trailer balloon. When I'm done, the bedroom will be two adjacent hexes with walls around them and a crude ceiling.

It's gonna take a lot of glue to make this happen.

#### LOG ENTRY: SOL 387

The pop-tent is 1.2 meters tall. It's not made for comfort. It's made for astronauts to cower in while their crewmates rescue them. I want two meters. I want to be able to stand! I don't think that's too much to ask.

On paper, it's not hard to do. I just need to cut canvas pieces to the right shapes, seal them together, then seal them to the existing canvas and flooring.

But that's a lot of canvas. I started this mission with six square meters and I've used up most of that. Mostly on sealing

the breach from when the Hab blew up.

God damn Airlock 1.

Anyway, my bedroom will take 30 square meters of the stuff. Way the hell more than I have left. Fortunately, I have an alternate supply of Hab canvas: the Hab.

Problem is (follow me closely here, the science is pretty complicated), if I cut a hole in the Hab, the air won't stay inside anymore.

I'll have to depressurize the Hab, cut chunks out, and put it back together (smaller). I spent today figuring out the exact sizes and shapes of canvas I'll need. I need to not fuck this up, so I triple-checked everything. I even made a model out of paper.

The Hab is a dome. If I take canvas from near the floor, I can pull the remaining canvas down and reseal it. The Hab will become a lopsided dome, but that shouldn't matter. As long as it holds pressure. I only need it to last another sixty-two sols.

I drew the shapes on the wall with a Sharpie. Then I spent a long time re-measuring them and making sure, over and over, that they were right.

That was all I did today. Might not seem like much, but the math and design work took all day. Now it's time for dinner.

I've been eating potatoes for weeks. Theoretically, with my three-quarter ration plan, I should still be eating food packs. But three-quarter ration is hard to maintain, so now I'm eating potatoes.

I have enough to last till launch, so I won't starve. But I'm pretty damn sick of potatoes. Also, they have a lot of fiber, so...let's just say it's good I'm the only guy on this planet.

I saved five meal packs for special occasions. I wrote their names on each one. I get to eat "Departure" the day I leave for Schiaparelli. I'll eat "Halfway" when I reach the 1600-kilometer mark, and "Arrival" when I get there.

The fourth one is “Survived Something That Should Have Killed Me” because some fucking thing will happen, I just know it. I don’t know what it’ll be, but it’ll happen. The rover will break down, or I’ll come down with fatal hemorrhoids, or I’ll run into hostile Martians, or some shit. When I do (if I live), I get to eat that meal pack.

The fifth one is reserved for the day I launch. It’s labeled “Last Meal.”

Maybe that’s not such a good name.

LOG ENTRY: SOL 388

I started the day with a potato. I washed it down with some Martian coffee. That’s my name for “hot water with a caffeine pill dissolved in it.” I ran out of real coffee months ago.

My first order of business was a careful inventory of the Hab. I needed to root out anything that would have a problem with losing atmospheric pressure. Of course, everything in the Hab had a crash course in depressurization a few months back. But this time would be controlled, and I might as well do it right.

The main thing is the water. I lost 300 liters to sublimation when the Hab blew up. This time, that won’t happen. I drained the water reclaimer and sealed all the tanks.

The rest was just collecting knickknacks and dumping them in Airlock 3. Anything I could think of that doesn’t do well in a near-vacuum. All the pens, vitamin bottles (probably not necessary but I’m not taking chances), medical supplies, etc.

Then I did a controlled shutdown of the Hab. The critical components are designed to survive a vacuum. Hab depress is one of the many scenarios NASA accounted for. One system at a time, I cleanly shut them all down, ending with the main computer itself.

I suited up and depressurized the Hab. Last time, the canvas collapsed and made a mess of everything. That’s not supposed to happen. The dome of the Hab is mostly supported by air



pressure, but there are flexible reinforcing poles across the inside to hold up the canvas. It's how the Hab was assembled in the first place.

I watched as the canvas gently settled onto the poles. To confirm the depressurization, I opened both doors of Airlock 2. I left Airlock 3 alone. It maintained pressure for its cargo of random crap.

Then I cut shit up!

I'm not a materials engineer; my design for the bedroom isn't elegant. It's just a six-meter perimeter and a ceiling. No, it won't have right angles and corners (pressure vessels don't like those). It'll balloon out to a more round shape.

Anyway, it means I only needed to cut two big-ass strips of canvas. One for the walls and one for the ceiling.

After mangling the Hab, I pulled the remaining canvas down to the flooring and resealed it. Ever set up a camping tent? From the inside? While wearing a suit of armor? It was a pain in the ass.

I repressurized to one-twentieth of an atmosphere to see if it could hold pressure.

Ha ha ha! Of course it couldn't! Leaks galore. Time to find them.

On Earth, tiny particles get attached to water or wear down to nothing. On Mars, they just hang around. The top layer of sand is like talcum powder. I went outside with a bag and scraped along the surface. I got some normal sand, but plenty of powder, too.

I had the Hab maintain the one-twentieth atmosphere, backfilling as air leaked out. Then I "puffed" the bag to get the smallest particles to float around. They were quickly drawn to where the leaks were. As I found each leak, I spot-sealed it with resin.

It took hours, but I finally got a good seal. I'll tell ya, the Hab looks pretty "ghetto" now. One whole side of it is lower

than the rest. I'll have to hunch down when I'm over there.

I pressurized to a full atmosphere and waited an hour. No leaks.

It's been a long, physically taxing day. I'm totally exhausted but I can't sleep. Every sound scares the shit out of me. Is that the Hab popping? No? Okay.... What was that!? Oh, nothing? Okay....

It's a terrible thing to have my life depend on my half-assed handiwork.

Time to get a sleeping pill from the medical supplies.

LOG ENTRY: SOL 389

What the hell is in those sleeping pills!? It's the middle of the day.

After two cups of Martian coffee, I woke up a little. I won't be taking another one of those pills. It's not like I have to go to work in the morning.

Anyway, as you can tell from how not dead I am, the Hab stayed sealed overnight. The seal is solid. Ugly as hell, but solid.

Today's task was the bedroom.

Assembling the bedroom was way easier than resealing the Hab. Because this time, I didn't have to wear an EVA suit. I made the whole thing inside the Hab. Why not? It's just canvas. I can roll it up and take it out an airlock when I'm done.

First, I did some surgery on the remaining pop-tent. I needed to keep the rover-airlock connector and surrounding canvas. The rest of the canvas had to go. Why hack off most of the canvas only to replace it with more canvas? Seams.

NASA is good at making things. I am not. The dangerous part of this structure won't be the canvas. It'll be the seams.

And I get less total seam length by not trying to use the existing pop-tent canvas.

After hacking away most of the remaining tent, I seal-stripped the two pop-tent floors together. Then I sealed the new canvas pieces into place.

It was so much easier without the EVA suit on. So much easier!

Then I had to test it. Again, I did it in the Hab. I brought an EVA suit into the tent with me and closed the mini-airlock door. Then I fired up the EVA suit, leaving the helmet off. I told it to bump the pressure up to 1.2 atm.

It took a little while to bring it up to par, and I had to disable some alarms on the suit. (“Hey, I’m pretty sure the helmet’s not on!”). It depleted most of the N<sub>2</sub> tank but was finally able to bring up the pressure.

Then I sat around and waited. I breathed; the suit regulated the air. All was well. I watched the suit readouts carefully to see if it had to replace any “lost” air. After an hour with no noticeable change, I declared the first test a success.

I rolled up the whole thing (wadded up, really) and took it out to the rover.

You know, I suit up a lot these days. I bet that’s another record I hold. A typical Martian astronaut does, what, forty EVAs? I’ve done several hundred.

Once I brought the bedroom to the rover, I attached it to the airlock from the inside. Then I pulled the release to let it loose. I was still wearing my EVA suit, because I’m not an idiot.

The bedroom fired out and filled in three seconds. The open airlock hatchway led directly to it, and it appeared to be holding pressure.

Just like before, I let it sit for an hour. And just like before, it worked great. Unlike the Hab canvas resealing, I got this one right on the first try. Mostly because I didn’t have to do it with a damn EVA suit on.

Originally, I planned to let my bedroom sit overnight and check on it in the morning. But I ran into a problem: I can't get out if I do that. The rover has only one airlock, and the bedroom was attached to it. There was no way for me to get out without detaching the bedroom, and no way to attach and pressurize the bedroom without being inside the rover.

It's a little scary. The first time I test the thing overnight will be with me in it. But that'll be later. I've done enough today.

LOG ENTRY: SOL 390

I have to face facts. I'm done prepping the rover. I don't "feel" like I'm done. But it's ready to go:

Food: 1692 potatoes. Vitamin pills.

Water: 620 liters.

Shelter: Rover, trailer, bedroom.

Air: Rover and trailer combined storage: 14 liters  
liquid O<sub>2</sub>, 14 liters liquid N<sub>2</sub>.

Life Support: Oxygenator and atmospheric  
regulator. 418 hours of use-and-discard CO<sub>2</sub>  
filters for emergencies.

Power: 36 kilowatt-hours of storage. Carrying  
capacity for 29 solar cells.

Heat: 1400-watt RTG. Homemade reservoir to heat  
regulator's return air. Electric heater in rover as  
a backup.

Disco: Lifetime supply.

I'm leaving here on Sol 449. That gives me fifty-nine sols to test everything and fix whatever isn't working right. Then decide what's coming with me and what's staying behind. And plot a route to Schiaparelli using a grainy satellite map. And rack my brains trying to think of anything important I forgot.

Since Sol 6 all I've wanted to do was get the hell out of here. Now the prospect of leaving the Hab behind scares the shit out of me. I need some encouragement. I need to ask myself, "What would an Apollo astronaut do?"

He'd drink three whiskey sours, drive his Corvette to the launchpad, then fly to the moon in a command module smaller than my Rover. Man those guys were cool.