

The Martian: Lost Sols

FROM: Remote Data Analysis Department

TO: Venkat Kapoor

SUBJECT: Corrupted data in Mark Watney's logs from Ares 3

BODY:

Mr. Kapoor – As Mark Watney's laptop endured far more time on Mars than was expected, several chunks of data within his personal log were badly corrupted from radiation and other environmental factors. We have completed our repair of one of those corrupted chunks.

This data was not included in the original data provided as we considered it beyond repair. However, the NSA assisted us with software they declined to explain and we now have these additional log entries.

ATTACHMENT:

LOG ENTRY: SOL 488

Well. Fuck me raw.

I navigated my way around the dust storm, so I thought the “pain in the ass” portion of my journey was over. But no, no. Apparently, Mars isn't done handing me *bullshit*.

There I was, driving along in Meridiani Planum. Smooth sailing from here on out – or so I thought. The terrain was rough but nothing the rover couldn't handle. Navigating wasn't even hard anymore. Thanks to the dust storm, I was way the hell off my original route and ended up due west of Schiaparelli. All I had to do was follow the sun and I'd get there.

Oh sure, driving directly at the sun every morning was kind of annoying. Especially with the hazy atmosphere of the waning edge of the sandstorm making everything a glowy orange. But it was a small price to pay to get the hell off this rock. Still, like so many other seemingly trivial things here, it almost killed me.

Turns out when you're squinting into the sunrise, you don't see the giant chasm you're driving toward. And then you drive your rover right over the edge.

Yeah. I drove off a fucking cliff. How was your day?

The chasm is deep as hell. I don't even know how deep. Maybe fifty meters or more? And it's a sheer drop into the void below.

So how am I not dead? Because, while I did drive the rover off the cliff, the *trailer* was still on terra firma (martis firma?). By some absurd luck, it had enough friction with the ground to keep me from plummeting to my doom.

The rover dangled like an improperly-pinned turd while I scraped myself off the front window and thought about how to not die.

Okay, well the first step was to get out of the rover. I mean – if I didn't save the rover I wouldn't be able to get to Schiaparelli and I'd be left behind forever and die here. But even that was better than dying right now.

Fortunately, the airlock is in the back, which was now straight up. I climbed up the seats, got into the airlock, and closed the door. It was a little awkward getting the EVA suit on while lying on the wall but I got it done. I cycled the airlock and headed out.

From there, I climbed up the umbilical cabling to the trailer and pulled myself to level ground. I stood with my hands on my hips, looked over the edge, then back to the trailer. Then I unleashed a string of profanities for three solid minutes without a break and without repeating myself.

That task complete, I sat on a nearby rock and considered my options. It was a pretty narrow ravine in the grand scheme of things. I'd estimate about 20 meters across. But that's 20 meters more than I can magically levitate so I'll have to find a way across. Also, there's the minor detail of getting the rover out of its predicament.

I'd gutted the trailer long ago, turning it into nothing but a cargo vessel. But it still had the wheels, and the wheels still had independent motors. However it didn't have power. And the batteries were on the rover.

The umbilical cable wasn't thick enough to carry that kind of juice. It was just for powering cameras and bringing their data back to the main rover. If I tried to run motor power along that little wire it would burn out in no time.

Well, it wouldn't burn. No oxygen. But it would sure as hell melt. Point is it wouldn't work. I needed thicker cabling. Luckily, there was plenty of that right on the trailer. The trailer's whole job was to carry the solar farm. All those solar panels connected to high power cables when set up. The cabling was coiled up right in the back. So all I had to do was climb down to the rover with one end of a cable, attach it to the exposed battery, and go back up top. Then I'd have juice to run the trailer's wheel motors and I could pull the rover up.

Easier said than done.

I uncoiled the cable and gave it a few tugs. It was good and thick. It would hold my weight. So that was convenient. I'd use the cabling itself as mountain climbing equipment. I tied it around my waist and tied off a big loop of it to the boulder nearby.

I didn't rappel down the cliff face or anything exciting like that. Just a very slow, very deliberate pace downward. One foot after the other. One hand after the other. The cliff face had a few places to grab but the rover was even better. Lots of bars, steps, wheels, etc. to grab onto.

The external battery is stored below the rover's undercarriage in a special Hab-canvass sling I made for it. But now the undercarriage was facing the rocky wall. The only way to get at it was to get between the rover and the wall, plant my feet on the rover, and try to straighten my legs.

That was the plan, anyway, but instead what happened was the rover slipped a full fucking meter downward, and then I lost my grip and fell.

Anyone watching would have heard "FUUUuuuuuuuuuuuuuu..." as I feel for what seemed like an eternity. Then the cable knocked the wind out of me with a sudden stop. I bounced up and down for a while and then finally came to rest, swinging slightly like a pendulum.

After I regained my composure, I used the cable to climb back up. I laid on my back at the top of the cliff and wheezed for a bit. The starvation-potato diet had taken a toll on my endurance and general health. Just that physical exertion was enough to lay me out for a few minutes.

Okay, the whole situation was too unstable. I was lucky to get out of the rover in the first place. There's just no way I could safely move the rover away from the cliff face to get at the battery. The slightest perturbation could send it to the bottom.

So that's where I'm at. I have motors on the trailer wheels, but no power for them. I have power in the rover, but no way to get at it. Even in Mars's gravity, my own muscle power isn't nearly enough to pull the rover back up.

Hmm.

LOG ENTRY: SOL 488 (2)

Okay, so I had an idea.

I don't have access to the batteries, but I do have access to half the solar panels on the trailer. (The other half are attached to the rover). Fourteen panels at about 1000 watts each is (lemme get a calculator) 14,000 watts. In terms of pure oomph that's about eighteen horsepower. Not going to impress anyone at a drag race, but it might be enough to pull the rover back up.

I spent the morning setting up the panels and wiring them directly to the trailer. Back when I was prepping the trailer, I gutted it of everything I could. But I kept the control computer because it's small, light, and it might come in handy as a backup if the rover's computer takes a shit. Well, that decision turned out to be very handy. Because without that computer I would have a hell of a time powering the motors.

I sat in the trailer with the computer sitting on the floor (the control panel was long gone). I'd used the trailer as a bedroom for so long I kind of forgot it was actually a standalone vehicle.

So now, my bed was a pressurized space car on Mars. I think I did this when I was 10 years old, too. Anyway, it was time to fire up the motors.

For all the set-up and stress, the actual execution of the plan was straightforward. Not boring, mind you. But straightforward.

The trailer went into reverse but immediately slid *toward* the ravine. The weight of the rover pulling it forward was more than the wheels could overcome.

I punched the throttle to full reverse and finally got good purchase. The trailer slowed its forward motion, spun its wheels in place for a few seconds, and finally started to inch backwards. Bit by stress-inducing bit, it pulled the rover up toward safety. By the time the rover was firmly on the ground, I had prayed to every deity I'd ever heard of. I exhausted the major religions in the first few seconds and was working my way through the ancient Greek pantheon by the end. I think it was the prayer to Hephaestus that did the trick.

I laid down on the ground and said a gentle “wo-hoo.”

Now I have to figure out how to get across that fucking ravine.

Why is there a Fucking Ravine here, anyway? That’s its name I’ve given it, by the way. The Fucking Ravine.

A bunch of angry thoughts grumbled in my head. Things like “Why isn’t this on the map?”; “Why didn’t NASA warn me there’s a ravine in the way?”; and “How does Mars even have ravines!?”

Each one has a sensible – if unsatisfying – answer.

It’s not on the map because I’m using a grainy planet-wide map from the MDV landing computer, which was intended to identify major landmarks from space. There’s no way a 20-meter-wide ravine shows up at that scale. I have plenty of high-detail maps of the area around Ares 3 but they’re useless. The mission plan had rover sorties no more than 20km from the Hab. I’m 2,000km from the Hab now, so yeah.

NASA didn’t warn me about it because they didn’t know I’d be here. They scrutinized my planned route to Schiaparelli and approved it. But then I fucked up the Pathfinder radio and later diverted south to avoid the dust storm. So I’m way the hell off track from where NASA expected me to be and they had no chance to tell me I was headed for disaster.

As for ravines on Mars: they’re all over the place. Mainly because when the planet cooled cracks appeared like a pie left on a windowsill. Some large – like Valles Marineris, the largest canyon in the solar system – others small, like Fucking Ravine.

Okay, so I have a rover, trailer, and a bunch of cargo that all needs to get across the ravine.

LOG ENTRY: SOL 489

I have a plan. It's not a good plan. But I have a plan.

Of sorts.

I might die.

First, I collected all the cabling I could from the solar array. I had about 100 meters total. Not a huge amount but better than nothing.

I tied off one end of the cabling to the boulder and the other end around my waist. Then I started my descent into the ravine. Turns out Mars makes much more climbable rock walls than Earth does. The craggy, sharp, protruding rocks didn't have a billion years of weather to smooth them out. Lots of handholds. And if I slipped I'd just grab the cable to keep from falling.

The ravine didn't have a "bottom", per se. It wasn't formed by a river so there was no basin. It just tapered more and more narrow as it went down. And that's fine with me, because once I could reach the other wall I started my ascent up the other side.

Lewis would have loved this. I think of her as my commander so much I occasionally forget she's mainly a geology nerd who got put in charge of a Mars mission.

The climb back up was harder, of course. But not as hard as it would have been on Earth. For once, being on Mars was an advantage. 0.39 g's of gravity, baby.

Once I got to the top, I dusted myself off and looked across the 20 meter gap to my ad-hoc base camp. I had to get all that over to where I was.

I looked around until I found a suitable boulder. There were many to choose from, but I needed one that was jagged enough to keep the line from slipping up over the top when tension was put on it. I looped the cable around it a few times and made sure I couldn't pull it loose.

I didn't need to climb down Fucking Ravine to get back to the rover. I just used my new rope bridge. I crossed it going hand-over-hand. Another feat I wouldn't have been able to do in normal Earth's gravity.

I looped the cable around the boulder on the rover's side, then did one more trip across the ravine. Finally, I tied that end off to the boulder on the other side. Now I had three lines of cable crossing the ravine. While it may be a bit awkward, three lines makes a rope bridge. Obviously that's not enough to get the rover or trailer across, but one thing at a time.

I spent the rest of the morning taking as much shit out of the rover and trailer as I could. Everything that wasn't bolted down and a few things that were. After a while, the site looked like Mars's first rummage sale.

Then I had lunch (raw potato, yum).

After that, I hauled the equipment across the bridge one or two pieces at a time. It wasn't as perilous as I worried it might be. For each item, I secured it to my back with straps, which left my hands free to hold two cables while I walked on the third. It was more an exercise in patience and concentration than anything else.

The hardest pieces to move were the Oxygenator and Atmospheric Regulator. Each was big and clunky. But I got each one across, one at a time. In both cases I had to put it on the wires in front of me, then crawl and nudge it along. Still, it worked.

Now, at the end of the sol, I have everything moved over to the other side except the stripped down rover and trailer. I'm in the rover now – even the bedroom tent is over on the other side. The oxygenator and atmospheric regulator are both inside of it – mainly to keep them safe from the elements. I'll be sleeping in the rover tonight, using chemical CO₂ absorption and tanks of oxygen for breathing air. Kind of roughing it, but I don't have a choice. I can't run the

oxygenator or atmospheric regulator without the rover batteries and they're on this side of the ravine. And the only cabling long enough to get power from one side to the other is acting as a rope bridge and tied off to rocks and the rover. And I'm not willing to risk the integrity of those knots to get the ends of the cable to the battery and equipment.

The last thing I did was arrange smaller rocks in a message for NASA: "FUCKING RAVINE. WILL CROSS TOMORROW"

Time for sleepy Mark. Night-night.

LOG ENTRY: SOL 490

Now for the unpleasant part: I have to jump the ravine.

Yes, I'll be channeling my inner Evel Knievel because I have no choice. I got everything I could across the Fucking Ravine with the rope bridge, but the rover and trailer are too big. And I can't disassemble them, either. I could take tires and batteries off, etc. But in the end I'd be left with a big-assed pressure vessel on each one that can't be made any smaller.

So I'm going to have to make a flat stretch of road, make a ramp, and take my chances with what I like to call a "brief suborbital rover maneuver".

Thing is, the landing – if I make it across at all – is going to be rough. I don't want the equipment that's responsible for keeping me alive to break. Mainly because I like being alive. So I carried it all across yesterday.

Plus, the weight reduction should help increase the rover's top speed.

And yeah... about that. If you absolutely floor it in the rover, going as fast as it can go, it will shoot off at a blistering three meters per second. That's about as fast as a brisk walk. It's not

made for speed. It's made for durability. And, this may be a surprise to whomever reads this, but three meters per second is not fast enough to clear a 20-meter Fucking Ravine.

My high school algebra teacher Mr. Pavia would be proud of me for doing the following math problem: Presuming I make a 45-degree ramp, how fast does my rover have to go to get over the 20-meter ravine?

Turns out: not as fast as you might think. Thanks to Mars's gravity which will give me epic hang time I only need to go about 8.6 meters per second. I'll shoot for 9 meters per second to be safe. That works out to be just over 20 miles per hour in freedom units.

I detached the rover from the trailer and went back inside to dick with the computer. I'm not exactly a hacker, but everything in a NASA craft is made to have overrides. In this case, I disabled the speed governor for the wheel motors.

If I remember the classes we took about the rovers, the wheel motors can handle a hell of a lot more juice than they ever receive. The speed governors are there to make sure no mistake by the crew causes the rover to crash into something hard enough to break the pressure seal.

I drove the rover to a flat-looking stretch of land without any rocks on it, settled into my seat, and threw the throttle to full. I *think* the wheel motors have breakers on them in case the power is too much. Right? Right?

Well it turned out not to matter, because the wheel motors just hummed and nothing else happened. Did I just destroy the rover?

No, the problem was I told the motors to go really fast, which meant they had to sacrifice torque. I made it so extreme they couldn't start the rover moving at all.

Next experiment: Use a more modest throttle power to get the rover moving, then accelerate more and more toward top speed. I tried that and got much better results.

It took several seconds to get up to speed, but once I did, the speedometer read 34 kilometers per hour. That's about 9.4 meters per second. That'd do nicely with some velocity to spare!

I got out of the rover and paced off the distance from where I started to where I hit max speed. It was about 28 meters. I drove back to the ravine and looked for a suitable spot to make my road and ramp. I found an area about 100 meters from my original site that had reasonably sparse rocks and a slight natural ledge at the ravine I could build from.

I spent the next three hours moving rocks to make a clean, straight path to the ravine. It wasn't difficult but it wasn't fun. After all that backbreaking labor I had about 35 meters of road ready for my death-defying stunt. Next up was the ramp.

Theoretically, I could have made the ramp out of rocks and dirt. But theoretically that would take for-fucking-ever, would ruin my theoretical back, and would make me theoretically miss my theoretical rescue.

So I came up with a different plan that had added risk and the potential for permanent equipment damage!

I piled up a bunch of rocks at the edge of the ravine. I had plenty to work with – I'd just cleared approximately one metric infinity of them from the road. Then I took several solar panels and laid them on the rocks to make a ramp. If this worked, I will have finished the ramp in a fraction of the time it would have taken to do all with dirt. If it didn't work, I would break a couple of solar panels. And also end up dead at the bottom of a ravine.

I still had a lot of dirt moving to do, though. I didn't want to hit the ramp at 45 degrees head-on. So I shoveled dirt up against the base of the panels and made a somewhat sloping approach to them. Hopefully it would be enough.

I tested things out by slowly driving the rover up to the panels, then giving it a little throttle with max torque and the damned thing actually started rolling up the panels. The panels didn't break, either. Bonus!

All that's left is to try it out. I'm not sure what's going to happen, but in my mind, I'm going to reach the apex of my jump, time will stop, and Waylon Jennings will say "Them Duke boys was in a heap o' trouble."

LOG ENTRY: SOL 490 (2)

Kind of workked. Cabn't type welll. Am upsidge-down. Let record showq idea workedd. Poorly.

LOG ENTRY: SOL 490 (3)

Okay, so here's what happened.

Things went great on the road to the ramp. Smoothest ride I've ever had on this rocky shithole of a planet. Speedometer read 35 kilometers per hour – more than enough to make the jump. Now, you might think something went wrong when I hit those solar panels at speed. But you'd be wrong! Remember, these panels were the only power generation system for the whole surface mission. NASA made damn sure they were durable.

No, the problem came *after* the ramp. See, in movies and TV, cars just kind of yee-haw their way across ravines when they jump. But I guess those stunts are pretty carefully set-up. Because things went awry for me.

I cleared the ravine. No problem. And I was only in the air for about three seconds. But it turns out that if you don't do something to make the car pitch forward in the air, it won't. In other words: I left the ramp with the rover angled 45 degrees toward the sky. So I landed on the other side... with the rover still angled 45 degrees toward the sky.

The rear wheels hit into the ground first, slamming the front wheels down like a whip. That caused the whole rover to bounce up and catch some air before coming down on the wheels again. I think this process repeated itself three or four times.

In the end, the rover miraculously came to rest right-side up. I wasn't so lucky. Remember how I removed as much as I could from the rover before I did this little adventure? Well that included the seat and the mounting points for the computer and everything else. So I was just hanging on to a strut with the laptop controlling the motors in hand.

I woke up wadded up in the rear corner of the pressure vessel with a head wound and the laptop on my face. I figured there was a chance I would die from the wound soon so I wanted to make sure everyone knew that I'd made a really sick jump before I died.

The head wound turned out to be one of those minor cuts that bleeds like hell but wasn't very dangerous. Why do heads bleed so badly? I'll make a note to ask Beck next time I see him.

Do I have a concussion? Maybe. Am I having any cognitive issues? None that I can tell. But do I have a concussion? Maybe.

I call this a win, though. I'm on the other side of the ravine with the rover.

Sigh... now I have to go back and do the same thing with the trailer. Be right back.

LOG ENTRY: SOL 491

The trailer went a lot more smoothly than the rover did. Maybe because it was lighter? Or maybe because I literally tied myself to the frame and strapped the laptop to my chest before making the jump. Because I have the ability to learn.

It was a bouncy-bouncy landing to be sure, but again I ended up on my wheels and this time with fewer head wounds.

Then I used the rope bridge to recover the solar panels that had served as the ramp – hey I only have twenty-one of those, I can't spare any. Then I loosed the cabling and packed everything back up.

All told it only cost me three sols to get past that twenty meters.

But you know what? I was kind of waiting for the inevitable bad luck sometime during this cross-planet trek. I'm travelling 3200 kilometers, after all. Now I can breathe a little. I got that bullshit out of the way and I finally have a clear path to Schiaparelli and the Ares 4 landing site.