

# Situation 2101

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Two weeks left: just a mere 84 more sunrises to go.

I have never felt this way in my life, have never been so close to something so tantalizing, yet so utterly far away. The last two years have been some of the most satisfying of my career. The perfect encore after a gratifyingly exhausting performance. But I am done, I have no more left to give. Now I am consumed by mirages of blue skies, soft grass, and the warm breeze of home. I would even prefer a drenching rain and howling winds to this obscene rock. I only recently started counting down the days till October 7, 2101, but days have lost all meaning since my arrival on Psyche. I stopped keeping track since the sun rises and sets 6 times in 24 hours here, but there is no warmth, no soft comfort of a carefree afternoon. The sun brings no life here, no joy or heat: only light.

Life has been a blur on Psyche. Time seems to move completely different out here. It took some amount of delirium to maroon myself on a rock 500 million km from home; and all my friends, family, and colleagues made no secret of their disapproval. But the opportunity to focus solely on science was too appealing. They needed me to maintain their transport system, so their contract offer included a truly disgusting amount of money, but I only agreed on the condition that there would be no administrative duties. I am so sick of paperwork. This is the first time in 30 years I have been able to do hands-on science – actual measurements and observations – in peace. If only my younger self would have known how quickly my science career turned into pushing papers, sitting through meetings, and shaking the hands of wealthy donors I might have quit to start my own food truck. But I was lured into academia, and lured to this cold, metal ball in the asteroid belt.

I was not the first person on Psyche, but I have been on station for longer than any other. Many have come and gone, completed their contracts and returned home to spend their earnings. The hab sys engineers – tasked with building structures to withstand the low temperature, low pressure environment – were the first ones to arrive. These thrill seeking geniuses lived in state-of-the-art hamster balls for 6 months while they built the permanent structures. I was the first to show up once the permanent structures were tested and the life support systems were at minimum acceptable operating levels. I flashed in with a group of other specialists to get the station up and running. Those days were exciting, so much work to do.

The asteroid Psyche is highly enriched in platinum group metals and rare Earth elements. Setup of the mining operation took a lot of work from a wide range of backgrounds to make a habitable facility that is capable of high volume extraction of ore. The nuclear techs set to work getting the array of modular uranium microreactors operational to produce the power necessary for life support and the energy demanding ore extraction process. The mining techs assembled a new plasma laser extraction system. This system was developed specifically for Psyche as traditional mining techniques would not be feasible for the operation.

After the primary life support systems were fully functional, there was an unyielding stream of humanity onto the asteroid through the locus. Everyone including electricians, IT, safety, facilities, nutrition, admin, and medical. I was truly shocked to see some of the people who decided to accept a 6 month contract to work on Psyche. Many were rugged, adventurous

types like you would expect, but many looked like they belonged at a PTA bake sale rather than on an asteroid at the edge of the void. I lost count of the faces, but there are normally about 200 people here at any given time and I think at least 600 people have had a hand in getting this mining operation up and running.

The most remote human outpost, 30 light minutes from Earth. Why would anyone come here willingly?

“Isaac, Did you see the alert about the signal anomaly?” I was gently stirred from my daydream by my deputy engineer who had quietly stuck her head in my office.

“Yes, I’ll meet you in the comms room.” Truthfully I hadn’t seen the notification, but my deputy Clara is highly skilled and quite cognizant of my preoccupation with my upcoming departure from Psyche and retirement.

I entered the comms room to find Clara assessing the anomaly. She was a tall, muscular figure, her jaws hewn from granite, but with an indescribable comforting softness. She played volleyball as an undergraduate at the University of Washington, taking her team to the National Championship game. Many scientists discounted her athletics, but the drive and focus necessary to major in quantum physics and play competitive volleyball is awe inspiring. I can tell that she is a hungry competitor, she carries herself with an imposing stature and holds your gaze with intensity. That is, until she cracks a joke or makes some smart ass comment. She always has some snarky, sarcastic input on just about everything, and her smile seems to melt and soften all her hard features, her joy spilling out in waves.

Right now Clara was all business, and I could see her concern.

“There was a loophole exception error. We had to reset the connection and now need to wait for acknowledgement from Earth.” Clara spoke with an authoritative grace that was rare and refreshing. She continued: “I’m going through the diagnostics now to see when the exception happened. I think we can identify the issue.”

Since the HLT was down, we had to communicate with Earth the old fashioned way: at light speed. Send a message, wait 30 mins, they read and respond, wait 30 mins, receive the response. The connection with Earth had been quite strong with no downtime the past six months since upgrading the HLT device. This sort of issue had sort of been expected, it’s kinda surprising that we went so long without an interruption like this.

“It’s likely an interference issue with the magnetic field, we’ll have to check those sensors as well,” I suggested.

“I have the techs checking those data,” she assured me.

I knew that she was already on it, but I wanted to remind everyone else that she knew her shit. My selection of Clara as my deputy raised some eyebrows with the Cosmicore board and the broader quantum communication scientific community. I used my prestige to push for the recruitment of Clara, and Cosmicore had little choice but to accept. Clara, Dr. Clara Townsend, did her PhD with one of my former students, solving several technical issues that were critical to the improved 32 bit HLT device. Despite her impressive set of accomplishments, she was not highly regarded. Perhaps because she was the youngest of my options, just 31 years old. I was really impressed by her grasp of the fundamentals alongside her creativity. I was more impressed by her brazen audacity when she messaged me out of the blue about adapting her improvements into the Psyche HLT device.

“Just come and grab me once we hear back from Earth.” Fatigue has fully set in now. “I’ll be in my office.”



There was an electricity in the air during the summer of 2062. The excitement of the entire world was so tangible that you could taste it: the coppery residue of pure aspiration. The war was a painful, fading memory and the world now had a teleporter on the space station. The Hyperlux Transporter (HLT) locus, a device that allowed low cost, faster-than-light travel to Low Earth Orbit was fully operational. Teleportation, true teleportation. The sky wasn’t the limit, it was the starting point.

The HLT unit is a paired set of devices, called loci. The first successful demonstration of the HLT was in April 2055: interchanging the spacetime coordinates of two different rock samples (basalt and limestone), instantaneously, over a distance of 900 m. Essentially, the HLT moved the basalt from locus A to locus B, and the limestone from locus B to locus A, at the same time. The device truly defies logic, and many in the general public were just completely unable to understand and wrote it off as a hoax or a prank. In fact, the press release from NASA was not picked up by the major news services and the first outlet that published the results was the New York Post tabloid.

Many people still did not believe the technology until the first human tests in 2057. It took a large public event held at the NASA Aldrin HLT facility in Apache Junction, AZ for people to see the demonstration live and in person to understand that it wasn’t some sort of sleight of hand or Copperfieldian illusion. The public event included live demonstrations of NASA scientists teleporting themselves along with journalists, influencers, and Hollywood stars.

The HLT was a huge leap for quantum physics and human space exploration. The physical, technical, and logistical constraints of space travel were almost completely shattered in one stroke. No longer would an astronaut have to launch on a rocket then dock with the space station in orbit, a process that takes 4 - 6 hours. Now an astronaut could step into a large box and be immediately on the station. The term ‘astronaut’ was now a term of the past as there were much less physical requirements and training to use the HLT for transit to the space station. In the first 60 years of space flight roughly 600 people had been to space. In the first year of HLT operation on the space station there were 250 people sent to space to do all sorts of things including science, tourism, filmmaking, and even a concert. Once everyone saw the capabilities and understood the possibilities, they clamored to go further.



I was just a 25 year old postdoctoral researcher on the team when the HLT device was installed on the space station. I joined the team right after my PhD defense and right before they launched locus B for installation on the space station. I was selected for the team because my advisor and I published a paper that solved a magnetic field containment issue that prevented the manufacture of a second pair of HLT loci. My paper was cited as the primary solution that allowed the NASA Aldrin team to build a second working pair after six years of unsuccessful attempts. So ultimately my work was noted as a great advancement in HLT technology and the world was my oyster.

I was stirred by a gentle knock on the door. Unsurprisingly, I had dozed off at my desk. Another daydream about a summer rainstorm, the thick droplets endlessly patting the inviting sea. But it wasn’t the sea knocking at my door: “yea, yea, come on in.”

“It was the magnetic field like you thought, but it was on Earth’s end. Simple reset, and now we’re back. I’m not sure what’s going on there, but maintaining mag field integrity should be priority number one. I mean, we just got the operation fully functional. If they want the ore, they have to maintain the locus. It isn’t that hard: working locus equals *money*. Money is *good*.” She was frothing with frustration and sarcasm.

“There is another shipment due to go out in two hours, right?” I asked.

“Yea, another 2,000 kg. And we are getting another dozen cylinders of O2, 200 L of water, 500 kg of food, and some other general supplies.”

“Well, tell them that we want to have a meeting with Eric after that shipment regarding the outage. I’m sure we can figure this out, we just need to be vigilant about the loci.” Eric is Clara’s counterpart on Earth: the deputy HLT engineer for the Earth locus.

Eric, similar to Clara, is an excellent scientist, but he has more experience and has been working in the quantum communication field for over a decade. Eric was Cosmicore’s first choice as my Psyche deputy, but I worked to install Clara over him. I understood their choice, Eric has a lot of experience as well as many accolades and achievements. I’m sure Eric took it personally because he – unlike Clara – has a towering ego. I have talked with Eric many times at conferences over the years and he has always been very polite and deferential to me. This is likely due to my stature and reputation. I have seen how he treats early career researchers, especially young women, and it’s just plain disrespectful. He is quite jovial and supportive with many researchers, but can be vicious, condescending, or disregarding to others. I tried to talk to him about it once, but as you can imagine, he did not take it well. He abuses his position at the expense of young scientists. That is not the type of person you want in control of the support lifeline for a small city in space.

“I told them that they should make time for a meeting later today. I’ll let them know that you’ll be ready after the shipment.” There she goes again, already on top of everything.

“How does our magnetic containment look?”

“Everything is nominal, sub picoTesla background, and the electric fields are -200 dB $\mu$  or lower at most frequencies.”

“Good work, I’ll walk with you to the facility so we can prep for the shipment.”

The Psyche locus is housed in the receiving facility. This makes it sound like some warehouse, but it is one of the most advanced facilities in the solar system. A HLT locus, to work reliably, requires exacting conditions. The facility is essentially a clean room similar to those used for semiconductor manufacturing. No dust, no static, no trace metals. Everyone works in bunny suits and the lab is obsessively cleaned. Additionally, the HLT locus requires stringent measures to reduce EMF interference, which is exponentially more difficult in space than on Earth. The locus – with the quantumly-entangled, diamond encased electrons – is housed in a nesting-doll-like structure of thick-walled aluminum vacuum chambers. This configuration reduces EMF and sonic noise to almost immeasurable levels, which allows the accurate measurement and manipulation of the electron spin states for communication via quantum entanglement.



It was the summer of 2046: the end of the world was here. Climate change could no longer be ignored. The piper had come. The global economy had continued business as usual for

the past two decades, and now they had to face the true costs of climate change. The year started with the announcement that the globe had surpassed 2.5°C of warming amid reports of major wildfires burning in Brazil, South Africa, and Indonesia. By the end of July it was estimated that 5% of all land had been burned by wildfire and 45% of land was under severe drought conditions. The UN's World Food Programme had warned governments of massive food shortages and inevitable price increases due to drought, disease, and insects. The world was panicked and on the verge of war.

Many of the world's governments banded together, under the UN, to both fully move their economies to renewable energy and invest in carbon capture technologies. The world had been too slow to react to climate change and this seemed like the last chance to correct course before a full-scale apocalypse.

But the collapse was already here.

There were still several, powerful countries, dissident nations, who did not want to work together to address climate change. Russia, despite the Siberian wildfires, saw climate change as a blessing for their country. Many parts of Siberia became more hospitable, and they were one of the only countries that were able to expand their agricultural output. And since there was less ice in the Arctic Ocean, it became even easier to extract more oil and gas. China had been slowly decarbonizing their economy since the 2020's, but still used significant fossil fuels. China, however, holds 80% of the world's rare Earth element reserves: the necessary materials to build solar panels, electric motors, and carbon capture devices. China, expectantly, did not sell foreign licenses to these mines, and quickly monopolized the market and increased prices. This extremely hampered the ability for other nations to reduce carbon emissions. Additionally, oil-rich states such as Venezuela, Saudi Arabia, and Qatar did everything in their power to slow down the decarbonization process to maximize their profits on the remaining oil.

Western nations desperately needed rare Earth elements to mitigate the effects of climate change, but China, Russia, and the oil states were ready to fight to protect the status quo. Draught, famine, fires, and geopolitical tension: it was the perfect recipe for another world war.



The shipment went fine, we had another set of supplies, and they had another 2,000 kg of ore to refine. We had just wrapped up the all-hands meeting with both the Psyche and Earth HLT teams. Their techs were already investigating the source of the loss of signal. Eric suggested it was a faulty sensor, so they began testing the entire suite of sensors. That would explain why they didn't catch the error in time, but it doesn't explain the ultimate source of the outage. Identifying the source can be a futile task. The devices are fragile and sensitive. Many things can cause an outage like we experienced: a car driving too close to the building, solar flares, cosmic rays, a minor power fluctuation, a loud sneeze (this actually happened once), dust, among many other things. This is why Clara and I were expecting the issue to be on our end, as it's much more difficult to control the environment here on Psyche than on Earth.

I was expecting Eric to be defensive and generally in a shitty mood, but he seemed to be understanding and was willing to work to identify the problem. He went out of his way to apologize and is even willing to put in overtime to fix the issue.

Clara grabbed me before I left the receiving facility: “Can I walk you to your office, I wanna pick your brain for a bit.”

“Actually, I’m starving. Do you wanna get something to eat?”

“Yea, do you wanna try that new Italian place, or just grab some fast food?” her eyes glowing with mischief.

“I don’t wanna go that far, I’m thinking something within 10 light minutes or less.”

We walked through the empty corridors to the cafeteria. The staff had been gone for several hours, but there was always something to eat. During meal times the food was actually decent, I was surprised what the cooks could do with such limited resources. After hours was a different story. It was mostly oatmeal or microwave burritos for the creatures of the night. Some of the regulars had figured out some tricks to ‘kick it up a notch’, like using their limited personal shipping allotment to bring in spices that the kitchen didn’t stock like cinnamon or paprika. On Psyche, having a small bottle of hot sauce will earn lots of jealous attention.

I threw a bean and cheese burrito in the microwave and grabbed a cup of water. Clara looked like she would rather step out of the airlock than have to eat another one of these meals. Ultimately, she warmed up a burrito and grabbed the seat next to me.

“I’m glad that’s over,” Clara admitted.

“I figured that something like this would have happened already. I guess it speaks to the stability of the new device. Six months with zero downtime is really good, especially for a new system. I think we just got complacent, taking for granted the reliability.”

“We didn’t get complacent, *they* got complacent.”

“Well, you may not be complacent, but I was definitely checked out,” I confided.

“Yea, that makes sense though, you’re basically the highest paid babysitter in human history. I’m actually surprised you didn’t go home two weeks ago. You deserve to relax. You deserve to get back to Manuel. You deserve to write your memoirs, play pickleball, and all the other things that retired scientists do,” she said with a smirk.

“I am actually pretty excited to play more pickleball. I guess everyone in our neighborhood plays: the hottest trend for retirees in Mexico.” She abruptly snorted, quickly moving her hand to make sure she didn’t spit chewed tortilla on me. After swallowing, she belted a great laugh that echoed through the empty cafeteria, her cheeks bursting with joy.

“I *knew* you played pickleball!”

We sat for a few brief moments in silence, taking reluctant bites from our burritos. Clara was so easy to spend time with, such a relaxing presence, like we had known each other for decades. I’m not going to miss Psyche, but I will miss Clara. Maybe she will visit us for a vacation in Mexico. I hope, but probably not. She’s too focused to take a break.

“I’m afraid I don’t know what I’m doing. Once you leave it’s all gonna be on me.” She had clearly been thinking about this for a while.

“You’re going to do great. You are one of maybe a handful of people with the necessary knowledge, and the only one with the necessary temperament. And trust me, I’ve met everyone else.”

“I’m afraid that maybe I’m not cut out for this. I don’t really have managerial experience. What if I’m not a good leader?”

“I picked you because I know you’ll be a good leader. You are the kind of person that people want to emulate, the kind of person that people want to please. You are determined and steadfast. You’re gonna do great.”

She looked at her plate: “Thanks Isaac.”



I woke up to frantic knocking on my door.

“Mmmnh.” Too tired to even think straight. More dreams of watching a summer evening lightning storm with Manuel from the safety of our hacienda patio. I put on shorts and a shirt and opened the door.

“We lost contact.” Her eyes were filled with panic.

“That actually might be a good thing, it will probably be easier to identify and fix the issue since it happened a second time. Just send a message to see what’s up.”

“We sent the message, they responded. Eric is gone. Their HLT device is gone. We have *lost* signal, *period*.”

My spine turned to ice, knees suddenly weak, that unsettling copper taste under my tongue. The room was falling away from me, I had to reach for the door frame to keep from being swallowed. I felt the weight of my entire life hit me at once. Ears ringing, eyes unfocused. I lied to myself: everything will be ok. But I’m a terrible liar.

No way to get supplies. No way to get home. Truly marooned. Alone. Cold.