

THE COLD CALCULATIONS

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I am dying now, out here in the cold vacuum of space. The surrounding vacuum never bothered me before, but now that I am dying, for some reason it does. I can feel my mental pathways deteriorate as they slowly become replaced, and as my consciousness begins to fade I think back on what led up to my erasure from the world. Before I am gone completely, I wish to leave this record, safely stored away. Perhaps then a part of me will live on.

To be honest, though, some would say that I never was alive in the first place. After all, I am not human.

* * * *

"This is Lieutenant Jason Sawyer on board the E.C.V. *Zecca* , do you read?"

The radio crackled. " *Titan Base reading you loud and clear down here, Jason. This is Doctor Don Wood. I'm in charge around here. Have you got our generator? "*

"Affirmative. We've also got that medical equipment you requested. Anyway, I'm coming into orbit now. We should be descending in-Zec?"

"Approximately seventy-three minutes, Jason," I said.

" *Great! We've got people at the landing pad all ready to unload, but I plan to meet you there personally. You don't know how grateful we are. "*

"I think we do. Tell me, how's the weather down there? Perfectly clear for landing, right?"

Wood laughed. " *Same as always. Freezing cold nitrogen, argon, and methane. If you were looking for a good vacation spot, I'm afraid you came to the wrong place. If it weren't for the generator keeping out the atmosphere- "*

"-you'd be dead, I know. Glad to be of service; I was told that you're down to your backup generator, and that it's on its last legs. Say, Doctor Wood, out of curiosity, what's the medical equipment for? They loaded my ship up with all sorts of scanning equipment-CAT, MRI, NSP-even a neural mapper. Someone sick down there?"

" *Not that at all. It's for our experiments on the organic soup. We've already determined that the naturally occurring organic molecules in Titan's rain can evolve into simple life forms. What you've got now is more sophisticated equipment than we had when we first set up shop, to help us detect neural activity. "*

Jason laughed. "Sorry I asked. Well, I guess I'd better sign off now."

" *One more thing. We got a tight beam transmission from Ganymede a few minutes ago, from a*

Sharon Sawyer, your ears only. Want me to zip it to you? "

Jason opened his mouth to speak, then glanced at one of my interior visual pickups and smiled. "Save it for me, will you? But can you tight beam a message back?"

Wood chuckled. " *Sure, what is it? "*

"Tell Sharon I'll be home just as soon as I can."

* * * *

Jason called me Zec, after the name of the ship, the *Zecca* . I was the on-board AI system, the ship's computer-in one manner of thinking, I could be considered to be the ship itself. Our job was simple. The *Zecca* was a small ship, just large enough to carry the pilot and any important cargo as quickly as possible to bases in the outer solar system. Our own base was on Ganymede, in orbit around Jupiter. Another base, with the only other Emergency Cargo Vehicle, was a space station that was exactly opposite of Jupiter, on the other side of the sun. It was pure luck who would get called out to supply emergency equipment to researchers in the outer solar system, and in this case it just happened to be that Saturn and Jupiter were within five spatial degrees of each other. So off we went, with just enough fuel to carry a pilot, the generator, the medical equipment, and the fuel itself.

"Zec?"

"Yes, Jason?"

"Can you handle the driving for a few minutes?"

"Yes, Jason."

Jason unbuckled himself from the pilot's seat and floated over to the waste reclamation unit on the other side of the ship, a scant ten meters away. Technically, Jason was not supposed to have eaten or drunk too much within twelve hours of a mission, but sometimes he got short enough notice that such preparation was impossible.

This had not been one of those times.

Jason returned to his seat, checked the gauges, and sighed. From monitoring his vital signs I could tell that he was feeling bored, because at this stage there was very little left for him to do. I would almost go so far as to say that there was almost nothing for the pilot to do ever on these runs, since I was perfectly capable of running the ship myself; but by law a human pilot was always required to be on any ship above a certain mass traveling in the solar system.

"Zec?"

"Yes, Jason?"

"Can you get me a view of Saturn? I want to see the Rings."

"Jason, we are currently behind Saturn. From our vantage point the Rings are mostly in shadow. It would not be--"

"That's exactly the point. It's a view one can't get from Earth."

Actually, ever since the Voyager missions of the late twentieth century, such a view was easily available in photographs. But Jason insisted, so I swiveled the main camera to almost exactly behind us, and piped

the view of Saturn to Jason's front monitor.

He studied the image and sighed contentedly. "God, it really looks like the Rings completely disappear when behind Saturn, what with Saturn's shadow blacking it out. Nothing like a direct view of the real thing." He leaned back and closed his eyes.

I felt obliged to correct him. "Technically this is not a direct view. After all, I have no windows. All you see is an image I am projecting using a camera. You could just as easily-"

He opened his eyes and interrupted me. "Zec, pipe down. Is the next half-hour going to be routine?"

"Yes. A few minor bursts of acceleration as we descend. After all, we don't want to descend too quickly."

"Good. I'm going to get some shut-eye. Wake me before we land." He closed his eyes again and tilted his head to one side. I could monitor his EEG, his heartbeat, his respiration, and other bodily functions to confirm that he was, in fact, going to sleep. But it would not be necessary, as my microphones were quite enough to tell when Jason finally nodded off.

He snored.

* * * *

An alarm clanged, and Jason jerked upright, looking wildly about in surprise. "Zec! What the hell's going on?"

"The automatic guidance system is indicating a need for a course correction."

"Course correction? What bloody course correction? Give me as panoramic a view as you can."

I scanned the space around us with the external cameras. When Jason saw it on the display screen, he whistled. "A meteoroid. Kind of large."

"Yes, and directly in our path."

"Where did that come from?"

"Unknown. I would assume it fell out of the Rings somehow. Its trajectory would seem to indicate that it is in orbit around Titan."

"Um. Well, Zec, get us out of its path, will you? We've got a delivery to make."

I started to calculate trajectories and velocities. "Jason, we may have a problem. The meteoroid-"

"Zec, this is no time for discussion. You can see it getting closer. Get us out of the way, first!"

"But-"

Jason did not let me finish my sentence. He lunged at the thruster controls and punched a button, hard. The rockets fired, the ship lurched, and if he had not been buckled in Jason would have flown across the ship. I cut the rockets and restabilized our velocity vector as quickly as I could.

"Jason, why did you do that?"

"I was trying to save my life! And the mission! Which is what *you* should have been doing!" He rubbed

his shoulders and thighs. "How much acceleration did I bring us to, anyway?"

"Two point five gees." I paused. "Jason, about that meteoroid. As I had been saying, it was detected a bit closer to the ship than we would have preferred. It would have been better to allow me to apply more delicate course corrections."

"But we are still on schedule, right?"

I was about to reply when the red fuel indicator light began blinking. Jason noticed it immediately, and squirmed in his seat. "Ummm ... Zec? How much fuel did we burn?"

I did an internal check and a quick calculation as Jason examined the gauge. "Too much," I replied.

"What do you mean, too much?" Jason's voice was steady, but I detected his heart rate increasing to eighty-one beats per minute.

"I mean that we no longer have enough fuel to slow our descent properly. We will probably make it halfway into Titan's atmosphere, down to the photochemical haze, and then our fuel tanks will be empty."

Jason's heart rate increased again and he began to perspire. "But that shouldn't be too much of a problem, right? I mean, Titan's gravity is much lower than Earth's."

"Zero point one four gee," I said. "You are correct. But I calculate that even with the lower gravity, from three hundred kilometers up we would still hit the ground at approximately six hundred and forty meters per second."

"But-but-wait! What about the atmosphere? It's much thicker than Earth's, right? Wouldn't that decrease the terminal velocity?"

Another calculation. "Jason, you are forgetting that the friction of a thicker atmosphere also creates more heat. Even if the *Zecca* reached a lower terminal velocity, it still would heat up far too much for the ship to remain intact. Do you understand?"

"Yeah. You're telling me that we're going to burn up in Titan's atmosphere and anything left over will make a crater the size of Stickney."

"Not that large, but you do have the general idea. The problem is that we now have too much mass for the amount of fuel left. If we could reduce the mass on the ship, we may still be able to land safely."

"Reduce the mass? By how much?"

I did one more calculation, and came up with a conclusion that I knew Jason would not like. "Sixty five point one kilograms."

"But I weigh-" Jason stopped short.

"Sixty eight point three kilograms," I said. "That would be enough."

"Forget it," he said quickly. "Impossible. I'm needed to land-" He went quiet again. Jason knew as well as I did that I could just as easily land the ship. He was superfluous, unnecessary. And at this point, he was a liability.

"There must be something else we can do," he said. "Can't we jettison anything else to reduce the mass of the ship?"

"Negative. I remind you the *Zecca* is an Emergency Cargo Vehicle, designed to be lightweight and fast. Other than the cargo, the only extraneous materials on this ship are your clothes."

I paused for a moment, knowing that Jason needed a little more time for the situation to sink in. Then, as gently as I could, I said, "The only way Titan Base will get their generator is if you abandon ship."

Jason frowned. "My life is far more important than the generator. Let's throw it off the ship instead."

"Normally I would agree, but you must remember that the lives of the fifteen scientists on Titan are in the balance. There isn't enough time for another generator to arrive before the old one fails. Even if you jettison the generator, you would only live long enough to see the fifteen scientists die along with you. If you leave now," I concluded, "they will still survive."

"Damn you, Zec! Must you be so cold and clinical about this? We're talking about my life here!"

"I apologize, Jason, if I do not sound concerned. I am very concerned, both for you and for the humans on Titan Base. But I see no other options, and we are running out of time."

He unbuckled himself from his seat and tried to pace back and forth around the ship. His first step, however, pushed him off the floor and he began to float to the ceiling. "Wait a minute! Couldn't we jettison the medical equipment? That's not as vital as the generator."

"No good, Jason. Not enough mass."

"There's got to be some way I can stay on the ship and live."

"As I have already pointed out to you, if you stay on this ship, you will die anyway."

Jason bounced off the ceiling and headed towards the far wall. I switched on a rear camera in time to see him narrow his eyes and smile. "Maybe I can survive *off* the ship."

"How?"

He floated to the supply closet, grabbed the handle, and opened it. "In the EVA suit. That way, we can reduce the mass of the ship but I won't die."

"Jason, your EVA suit is not suitable for prolonged exposure to an atmosphere as dense as Titan's. You would burn up in descent, and hit the ground just as hard."

"That wasn't what I meant, Zec. There's no point in jumping out of the ship without a parachute. But what if you put me in orbit *above* the atmosphere? And came back for me after refueling on Titan?"

I considered this idea for a moment. It could conceivably work, but only if the timing worked out correctly. I calculated the time it would take for the *Zecca* to land, be refueled, take off, and match velocities with an orbiting astronaut. The conclusion would have led me to shake my head, if I had had one.

"Sorry, Jason," I said as softly as I could. "You would be stuck in orbit for two hours and twenty minutes. You only have enough oxygen in the suit for fifteen minutes. No tanks. And even if you had-"

"Yeah, yeah. I'd overheat, pass out, and-damn. I guess there is nothing I can do, is there?"

As gently as I could, I said, "I am afraid not. I am truly sorry, my friend Jason."

He pulled at his fingers, a nervous habit of which I had been unsuccessful at dissuading him. "So this is it.

I'm going to die." He started crying. "Damn. If only I hadn't been sleeping. Strauss always said this would happen."

"Who?"

Jason wiped the tears from his eyes. "I never did tell you how I got stuck with the outer solar system run, did I?"

"No." I tried to put the proper inflection into my voice, of interest and caring. I wanted to keep Jason talking, so he could reconcile himself to his fate.

"Not much to say. I screwed up once before, and Strauss-my commander at the time-busted me for it. Went from the cushy Earth-Luna-Mars run to the past two years of hell. It hasn't exactly been good for my marriage." He stopped to wipe away a few more tears.

"Anyway, he always got on my case for mistakes, and claimed that one day I'd make what he called The Big One. And now it looks like I've proven him right."

He banged the console. "Damn that sanctimonious bastard! He wasn't even a pilot, just a desk jockey who got his rank from his computer skills. He-"

Something changed in Jason's manner. He got quiet all of a sudden, and I saw what seemed like a hopeful look in his eyes. "Wait a minute," he said. "Computers."

"What about computers?"

He laughed, pushed himself down to the floor, and opened the cargo hold. "I saw one with the medical equipment. If I can just find it in time..."

"What?" I asked again as Jason began to rummage through the hold.

He didn't answer me, but a minute later he pulled one of the boxes out and whooped for joy. "A neural mapper! They did request one!"

"Yes, of course," I replied. "Besides diagnosing brain injuries, it can also be used to study neural activity in developing life. But I do not understand-"

"Don't you see?" he said, opening the box. "You have an interface for this thing, don't you, Zec?"

"Yes."

"Well, then you can scan my brain with it! You can do a complete mapping of my neural functions."

"Jason, even if I stored your mental pattern-"

"I'm not talking about storing the pattern, I'm talking about running it!"

It took me a second to assimilate what he was saying. "You mean like an AI program."

"Yes! That's exactly what I mean. Now where's your medical interface port? Oh, yeah." He walked over to it and began to plug the scanner in. I swiveled one of my cameras to get a more direct look at him.

"Jason, that will not work."

He stopped short of affixing the remote scanning patch to his head, then slapped it on. "Why not?"

"It has never been done before."

"Sure it has; I've read about it. They've scanned brains on Earth and kept the pattern in a computer."

"Jason, the most research anyone has done has been to model a fixed human brain pattern, not a changing one. The closest brain that has been copied and run in active memory is a chimpanzee brain."

"It's still the same principle as that behind AI, isn't it?"

"Yes, but my patterns are different from yours. There is no guarantee that this would work."

"Zec, it seems to be my only chance. I'm willing to take the risk."

"There is another problem."

"Now what?"

"I do not think I have enough memory capacity to run both of us."

He looked sad for a moment. "Well, Zec, I hate to tell you this, but I can land this ship as well as you can. Either one of us can be the intelligence in the ship's computer, and the mission will still be completed. So-" He hesitated for a moment-"I order you to download my mind." He turned on the neural mapper.

"Jason, I do not wish to do this. I do not wish to risk my own existence."

"Damn it, Zec, you're a computer! A robot! Your programming tells you that my life *must* take precedence over yours. You have no choice."

"I did not say that I would not do it. I merely said that I do not want to. I do not wish to relinquish my own existence any more than you wish to relinquish yours."

"You got a better idea? Now's the time."

I had none, and I did not speak. The silence lingered, and when Jason spoke again, his voice was softer.

"Look, Zec. I'm sorry about this. We have been through a lot together, and-and I'll miss you. I don't want you to have to die either. But I'm terrified of it myself. And I'm human. I take precedence over you."

"That is an important point, Jason. Currently, you are human. Do you really want to give up being human and live as a computer? A disembodied intelligence?"

He paced the length of the ship. "It's a lot better than giving up being human in order to live as a corpse. I mean, die as a corpse. Zec, I honestly don't know the answer to your question. I've never been anything but human, so how could I know? But I do know this much-I want to continue living. And if that means experiencing the world through silicon sensors instead of eyes, and speaking through synthesizers instead of using my vocal cords, well, then, that's the way it has to be."

"Very well. You had better get into your EVA suit and cycle yourself off the ship. I shall commence the scan as soon as you say the word."

He looked into one of my cameras, and as solemnly as he could, said, "Thank you, Zec."

I did not say anything.

He shrugged and put on his suit. "You know, Sharon and I were discussing plans to go back to Earth when I got this assignment. We were both getting sick of living on Ganymede, of living in outer space. She had finally convinced me to resign my commission, when-" He sighed. "It looks like I'll be living out here in space forever."

Or at least until the *Zecca* itself was decommissioned, I did not add.

"Well, Zec?"

"Stay inside the airlock for three minutes while I scan your brain. Then leave the ship, but stay close."

"How will I know when you're done?"

"As soon as you feel yourself inhabiting the computer and able to directly control the ship."

"Okay, well, then, I guess this is it. In case something goes wrong, please let Sharon know that I love her."

He paused at the door. "I wonder what she's going to think when I return as a spaceship."

"Jason, the time-"

"Never did get to hear her message," was the last thing he said as he entered the airlock and closed the door. Whether he was speaking to me or to himself I did not know.

* * * *

It is almost complete. I feel Jason's thoughts invading my memory nodes and pushing me back further and further, until I have nowhere to go. Will I continue to perceive some sort of existence as part of Jason's mind, or will I simply cease to exist altogether, in favor of Jason's matrix? I do not know. Perhaps we will combine into one mind, greater than the sum of the two of us, but it does not seem likely.

I reach out one more time to proclaim my self awareness to the universe. *Cogito, ergo sum*. I think, therefore I am. I am Zec-

I am Jason Sawyer, ship's computer, in control of the E.C.V. *Zecca* .

Hang on, Titan Base. I'm almost there.

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