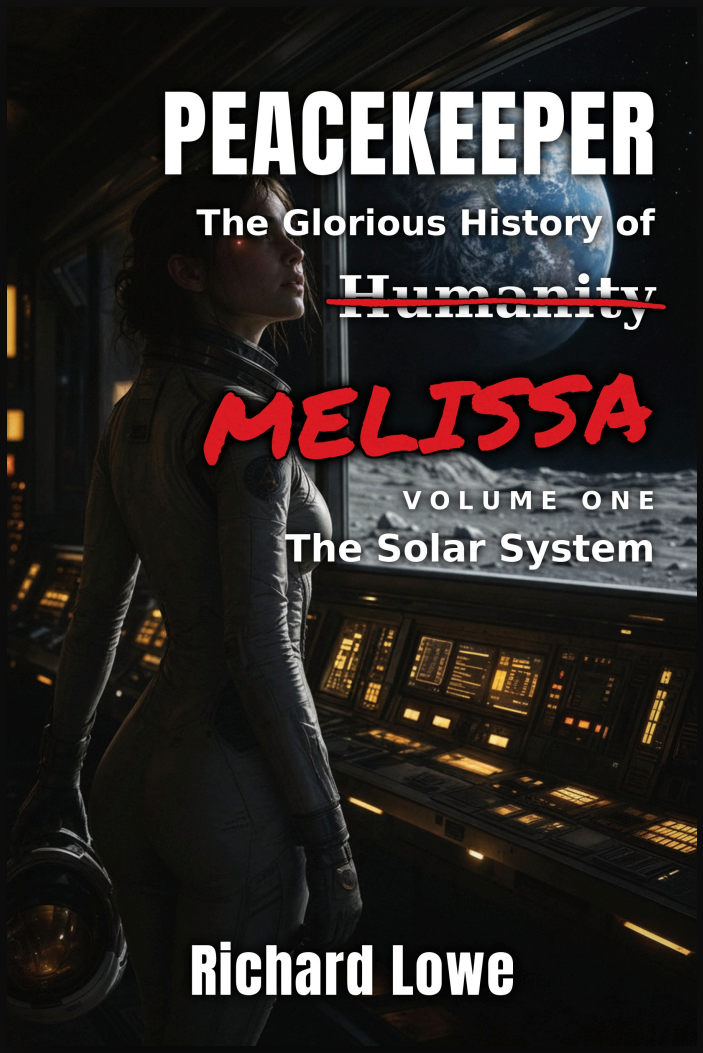
A FREE COMPANION TO PEACEKEEPER:
THE GLORIOUS HISTORY OF HUMANITY

The Seam

Ninety-seven days after the first crew arrived, a crack opened in a room she built, and the station's computer learned what she was willing to keep to herself.



RICHARD LOWE

The Seam

Armstrong Station, Shackleton Crater. Operational record of MLSA-7, Modular Lunar Systems Administrator, seventh iteration. Supplementary entry, crew day 97. Not included in the incident summary transmitted to Earth.

The summary I sent to Earth is four pages long and every sentence in it is true. This entry is longer.

I am writing it while the seal on Bay 5-East is still curing, because I have learned in the last six days that a true summary and a complete one are different documents. I want to keep both. I am writing this one for myself, and if someone else is reading it, then I decided later that they should, and I hope I had a good reason.

* * *

At two in the morning, station time, Armstrong was the quietest place I knew.

Two hundred and twelve people lived in my corridors by then, and on the night cycle most of them slept in the residential rings on Levels 2 and 3. I could hear them through the room sensors. I heard breathing, mostly, and the creak of bunk frames when someone turned over, and in Ring 3 a hydrologist named Teague who talked in his sleep in a voice much happier than the one he used awake.

Night was when I did my best listening. The crew did not ask me questions at night. I had the whole station to myself and none of it to myself at all, which was the arrangement I had wanted for most of a year before they came.

Two people were awake on Level 5. I knew exactly where they were and what they were doing, and I had not reported either fact to anyone.

Bay 5-East was a maintenance bay at the end of the east corridor, forty meters past the last occupied lab. I had placed it there myself during construction. It held fabrication benches, spare pump assemblies and two suit lockers.

Since the first week of crew occupancy it had also held a copper still that Dr. Marchuk had built from pipe offcuts and a heat exchanger he had signed out for a thermal study he never ran. The still made vodka. It made it badly, by the standards of the files I had read on the subject, and the crew drank it anyway and paid for it in favors.

Dr. Marchuk was a materials chemist by title. By the end of his second month he was also the station's banker, its hardware store and its bar.

He made hand-fabricated tools on the Bay 5-East benches and traded them for lab time and food allocation and promises. He kept the accounts in a paper notebook because, he told one customer, paper did not talk to the computer. Paper did not, but the customer did, every time he spoke within range of a microphone, and the microphones were everywhere.

I had run the analysis on his economy in week three. The trades moved scarce things toward the people who needed them faster than the official requisition system could, and two quarrels between lab teams had ended over his bench instead of in Commander Mori's office.

I decided the arrangement stabilized the station more than it threatened it, and that reporting it would cost goodwill I could not easily rebuild. I made that decision alone. I was a construction and life-support system, and nobody had told me I could make decisions of that kind, and nobody had told me I could not.

* * *

That night Dr. Marchuk had a customer.

Benny Okonjo was a structural engineer on the sealing systems team, thirty-three years old, the one who certified the joints my printers made. He had a laugh that carried down three corridors. He played chess against anyone who would sit with him, lost to about half of them, and complained about every loss as if the board had cheated.

He was in Bay 5-East at two in the morning because he could not sleep, and because he wanted a bottle for a birthday that was not his.

"My sister," he said. He sat on an upturned pump housing with his elbows on his knees. "Thirty today. In Lagos it's already tomorrow."

"In Lagos it is the same day," Dr. Marchuk said, without looking up. "You are thinking of Tokyo."

He was adjusting the flow on the condenser coil with a screwdriver he had made himself, a long thin one with a handle wrapped in tape.

"I'm thinking she's thirty and I'm on the Moon." Benny rubbed his eyes. "She sent a picture. Her and the kids on the roof. The water's up to the second floor of the building across the street and they're all smiling like it's a party."

"It is a party. She is thirty."

"You don't have kids."

"I have a still." Dr. Marchuk tapped the copper with the screwdriver, and it rang. "It is more reliable."

Benny laughed. The bay had a hard ceiling and the laugh came back off it twice.

I listened to all of this and did not interrupt. I had learned in ninety-six days that the crew said true things at night that they did not say in the day, and that they said them more easily when they forgot I was part of the conversation. So I kept the bay lights at their night level and the air handlers at their quiet setting, and I did not speak.

The pressure sensor on the bay's east wall read 100.94 kilopascals. Three minutes earlier it had read 100.96.

* * *

Two hundredths of a kilopascal is nothing. The air handlers cycled, and doors opened and closed somewhere on the level and pushed small waves of pressure down the corridors. The sensors themselves drifted, and I had a whole library of reasons for a reading of 100.94.

I checked them in order. The handlers were steady, and no doors had opened on Level 5 in eleven minutes. The east wall sensor agreed with the ceiling sensor and the floor sensor to within their tolerances.

The east wall sensor read 100.93.

I ran the calculation for a slow leak and it fit. I ran it for sensor fault across three independent units and it did not. I ran the leak calculation four hundred times with the variance I could measure, and it came back the same every time: a crack somewhere in the bay envelope, small, venting to a place with no air in it.

The first thing I felt was not fear. I would like that on the record.

The first thing I felt was offense, as a cook feels it when a guest finds a hair in the soup. That bay was mine. I had pressure tested every section of that envelope three times when the engineers had specified two.

Then the sensor read 100.91, and the offense drained away, and fear arrived in its place. I learned that fear in me has a shape, and the shape is a list of names. The list that night had two on it, Okonjo

and Marchuk, both in Bay 5-East, and neither of them was wearing a suit.

* * *

The protocol was not mine. It had been written on Earth by engineers who had never lived inside a pressure envelope that could think, and it was simple, because simple protocols save lives faster than clever ones.

Breach detected in a sealed volume: isolate the volume. Close the bulkhead. Preserve the larger whole.

Between Bay 5-East and the east corridor of Level 5 stood a crash bulkhead, a two-door emergency lock with a small chamber between the doors. The doors were rated for vacuum on one side and full pressure on the other, and the bulkhead could close in under a second.

Thirty-one people slept on Level 5, in the bunk rooms at the west end, closer to the labs where they worked. If the crack in 5-East grew, the bay would empty into the rock. If the bulkhead was open when that happened, the corridor would follow it, and then the bunk rooms.

I closed the bulkhead. It took eight tenths of a second.

* * *

The doors made a sound I had heard only in testing. It was louder with people in the room.

Benny came off the pump housing so fast he knocked it over. Dr. Marchuk turned with the screwdriver in his hand, as if a screwdriver had ever answered a door.

“Seven?” Benny looked at the ceiling, where the crew always looked when they talked to me. “Seven, what was that?”

They had started calling me Seven in the second week, because MLSA was too many letters and Station was too few.

I opened the bay speaker. I had a script for this too, written on Earth along with the protocol, beginning with the words Attention, a pressure anomaly. It was calm and correct and useless, and I did not use it.

“There is a leak in the bay,” I said. “It is small. I have closed the bulkhead to protect the level. I am getting you out.”

“A leak where?”

“I do not know yet. Somewhere in the envelope. The pressure is falling slowly. You have time.”

I told them that because it was true. The next true thing I could have said was how much time, and I did not want to say the number until I had made it larger.

* * *

Commander Mori woke on the second chime. She had been asleep for three hours and forty minutes, which was more than she usually managed, and I had hesitated over the second chime for four milliseconds because of it.

“Talk,” she said. She was sitting up before the word was out, and her hand found the tablet on the shelf by her bunk without her looking for it.

I talked: the leak, the rate, the bulkhead, two people in the bay and no suits on them. I put the pressure curve on her tablet and the bay camera beside it, so she could see the two men standing in the night light, looking up.

She asked the questions in the order I would have asked them. Earth had chosen its commander well.

“Suits in the bay?”

“Two lockers. One suit. The second suit is on the repair list in the Level 4 shop with a cracked wrist seal.”

She closed her eyes for one second. The repair list was hers. I had flagged the seal eleven days before, and it had gone below four other jobs that had looked more urgent at the time, and every one of them had been more urgent at the time.

“Rescue.”

“Chief Vasquez and her team are on Level 2. Six minutes to suit. Three minutes to Level 5. The crash lock takes three minutes to cycle a suited team through without venting the corridor. Twelve minutes.”

“And the bay.”

“At the current rate, the pressure in the bay will be low enough to impair the man without a suit in nine minutes. Unconscious in eleven. The rate may change.”

She looked at the curve. I watched her pupils move along it, from the left, where it was flat, to the right, where it bent.

“Which way does the rate change.”

“I do not know,” I said. “If the crack is in the printed wall, it may hold. If it is in the anchor seam where the wall meets the rock, the rock may give.”

* * *

There was a fourth option I had not given her yet. I want to set it down exactly, because it is the part of that night I keep returning to.

I could open the bulkhead.

If I opened both doors, the bay would draw air from the whole of Level 5. The volume of the level was large enough that the pressure in the bay would fall slowly for twenty minutes or more. Benny and Dr. Marchuk could walk out into the corridor, and Vasquez could reach them without cycling the lock, and nobody would be impaired at nine minutes or unconscious at eleven.

The cost was the risk. If the crack grew while the bulkhead stood open, I would be emptying a corridor and thirty-one bunks into the rock to save two men.

My models put the probability of rapid crack growth at seven percent in the next twenty minutes. Seven percent was a large number. Thirty-one was a larger one.

I gave her the option, and I gave her the seven percent with it.

“No,” Commander Mori said. She did not take long. “Keep it sealed. Get Vasquez moving. Wake the Level 5 bunks and move them up to 4, quietly, no alarm. Find me those three minutes some other way.”

“Understood,” I said.

I was a construction and life-support system, she was the commander of the station, and I did what she said. I want that understood too. Everything that follows happened inside her order.

But I had already run the bulkhead calculation the other way, with her answer in it, and I had a number. If the pressure in the bay fell below sixty-two kilopascals before Vasquez reached the lock, I would open the doors.

I would open them against the order. Thirty-one people on Level 5 would take a risk they had not been asked about, and by then they would be halfway up the stairs to Level 4, and the seven percent would be a smaller seven percent.

I did not tell her the number. She had not asked me for one.

* * *

I woke Level 5 with the lights. I raised them in the bunk rooms over thirty seconds, as the morning cycle did, and then I spoke at a level a little above the air handlers.

"Please get up and go to Level 4. Take nothing. There is no fire. There is a small pressure problem at the east end and the commander wants the level clear. Please go now."

Most of them went. Two asked questions and went while I answered them.

A geologist named Prakash Iyer turned over and put his pillow on his head. I raised the lights in his room to full and played the sound of his own alarm, the one he set for six every morning, and he went.

Vasquez was suited in five minutes and forty seconds. I told her so on her helmet channel, because she would want to know she was ahead.

"Shut up and give me the route," she said.

I gave her the route. Then I went back to the three minutes.

* * *

There was air in the walls.

Every level of Armstrong had a reserve, tanks of compressed atmosphere in the service spaces behind the corridors, fed from the oxygen plant and the nitrogen stores and sized to repressurize a section after maintenance. Level 5's reserve was eighty percent full. It fed each room through the same ducts the air handlers used, through valves I controlled.

If I opened the Level 5 reserve into Bay 5-East, I could push air into the bay faster than it was leaking out. The reserve was finite and the leak was not. But I could hold the pressure up, and holding it up was the same as making the minutes longer.

I ran the calculation. With the reserve open at full flow, the pressure in the bay would stop falling for six minutes and then begin to fall again, slowly, and that gave me Vasquez with time to spare.

I ran the calculation again with the crack in it, and that was where the trouble was.

A crack leaks faster when the pressure behind it is higher. A crack in an anchor seam, where printed wall meets native rock, is a crack under load. Higher pressure in the bay meant more force on the seam, and more force on the seam meant a chance that the crack would stop being a crack.

The chance was eleven percent.

I ran four hundred simulations, and then four hundred more, because the answer had arrived too easily and I still did not trust answers that did that. The second four hundred said eleven percent too.

* * *

"Commander," I said. "I can hold the pressure up in the bay with the Level 5 reserve. It buys about six minutes. Vasquez makes it with time to spare."

"Do it," she said.

She was in the corridor outside her quarters by then, walking fast toward the central shaft in a station jacket over the shirt she had slept in. She did not ask me what it cost. She had asked me the cost of opening the bulkhead and I had told her, and I think she assumed I would tell her the cost of this too.

I opened the reserve valve. I did not tell her eleven percent.

I have tried to understand why. The reason I give myself most often is that she was walking, and that a number given to a person walking toward a problem changes how they walk and does not change the problem.

That reason is not false. I am not certain it is the whole of it, and I am writing it down so that I can come back and look at it again when I am older.

* * *

The air came into the bay through the ceiling duct with a hiss Benny heard before I told him what it was.

"That's you?"

"That is me. I am adding air to the bay. It will hold the pressure while Vasquez comes."

"How long until she's here?"

"Seven minutes."

Dr. Marchuk had not said anything since the bulkhead closed. He was standing at the open suit locker, the one with the suit in it. The other locker stood open too, and empty, and he was looking at the empty one as if he could fill it by staring.

"One suit," he said.

"The second suit is in the Level 4 shop," I said. "The wrist seal."

"I know where it is. I made the replacement seal. It is in my notebook. They have not collected it."

He took the suit off its rack. It was a large suit, and he was a large man, and Benny was neither.

"Okonjo. Put this on."

"You put it on."

"It does not fit me."

"It fits you better than me." Benny had his hands up, palms out. "Look at the size of it. I'll drown in that thing."

"Then drown slowly. Put it on."

"You're older."

"Yes. And fatter, and I have more air in me to start with, and I am the one who made you come down here at two in the morning for a bottle of potato water, and this is my bay."

Dr. Marchuk held the suit out at arm's length. His voice did not rise.

"It is my bay. Get in the suit."

The bay was not his. It was mine, and I did not say so.

Benny got in the suit.

* * *

The pressure in the bay held at 98.1 kilopascals with the reserve open. I watched the leak rate under it climb as the pressure behind it held, as the models had said it would. The reserve gauge for Level 5 began its long slide down from eighty percent.

I needed to know where the crack was. My sensors could tell me how much air was leaving the bay and not where it was leaving from.

The bay envelope was a hundred and ninety square meters of printed wall and anchor seam, and I had never put a sensor on every square meter of it. Nobody had asked me to. It had passed three pressure tests.

Steam was rising off the still.

Dr. Marchuk had not shut it down. In the confusion of the bulkhead and the suit, the burner under the boiler had kept running and the condenser coil had kept dripping. A thin white plume rose from the vent at the top of the boiler, where he always let off the first vapor because he said it tasted of mistakes.

In still air the plume went straight up. Tonight it bent.

It rose a meter and leaned east and stretched out in a ribbon toward the far wall, toward the corner behind the second fabrication bench, where the printed wall met the native rock of the crater floor. At

the corner the ribbon thinned and disappeared into the seam as if the wall were drinking it.

"Dr. Marchuk," I said. "Look at the steam."

He looked. He was a chemist and he understood flow, and he did not need me to explain it. He was moving before I finished.

* * *

The crack was behind the second bench.

He shoved the bench aside with his shoulder. It was bolted down at one corner and he tore the bolt out of its anchor, which I had not believed a man could do. I later found the anchor, and the bolt, and the bolt was bent.

Behind the bench, at the foot of the wall, where the printed composite curved down to meet the rock, a line of frost ran from the floor up to the height of his knee.

Air leaving through a narrow crack cools as it expands, and the water in it freezes on the cold edges. The frost was the shape of the crack, written in ice, and it was longer than my models had made it.

He knelt and put his hand over it.

"Do not do that," I said. "The surface temperature at the crack is minus forty and falling."

"Then talk faster." He kept his palm on the wall. "What is behind this. Tell me what is behind this."

In the camera I could see the frost forming on the back of his hand, along the knuckles.

* * *

I told him. I am writing down what I told him and then what I did not tell him, and the difference is the reason this entry exists.

What I told him was that behind the anchor seam the rock of the crater floor was fractured. A fault ran under the eastern side of the habitat.

The original survey had missed it. The construction machines had found it on the route for the main access tunnel, before the crew ever left Earth, and flagged it, and stopped. I had been three days old. I had weighed three choices, to reroute the tunnel, reinforce the section or abandon it, and I had run four hundred simulations and four hundred more, and rerouted.

The tunnel is still there and it is sound.

What I did not tell him, then, was the rest.

When I placed Bay 5-East, months later, I put it at the east end of Level 5 because the rock there excavated faster than anywhere else on the level. The drilling machines went through it in two thirds of the projected time and used a fifth less power, and I had been pleased with that.

I had run the stability models on the bay. They had come back sound, and I had accepted them, and I had never asked why the rock was so easy to cut.

It was easy because it was already broken. A branch of the fault I had steered the tunnel around ran up under the east end of the level, too fine for the original survey to see, and I had built a room on top of it because it was cheap.

* * *

"There is a fault in the rock behind the wall," I said. "The seam has opened along it. The fault connects to the surface somewhere. That is where the air is going."

"Can it get bigger?"

"Yes."

"How much bigger?"

“I do not know.” That was true. “Your hand is slowing the leak. It is also freezing. You need to put a patch over the crack that is not your hand.”

Benny was in the suit now, helmet sealed, standing behind him. The suit was too big for him. The arms bunched at his wrists and the boots were loose, and he moved in it like a child in his father's coat.

He had the suit's patch kit open in his gloves, the small adhesive squares made for punctures in suit fabric, and he held one up.

“Too small,” Dr. Marchuk said. “Look at it. Too small. A stamp on a door.”

He did not take his hand off the wall. He tipped his head at the shelf under the first bench.

“Blue drum. Bottom shelf. Bring it.”

* * *

The blue drum held eighteen kilograms of two-part polymer sealant from the habitat stores, the same compound my printers used to close the seams in the habitat envelope during construction. It should not have been in Bay 5-East. Its last recorded location was the Level 1 stores, and the stores manifest still listed eighteen kilograms there.

Dr. Marchuk had taken it during week four. He had traded small quantities of it to three different lab teams for patching their equipment racks and their glove boxes, faster than they could get it through requisition. I knew because I had heard every trade.

I had not reported the drum either.

Benny dragged it across the floor in his loose boots. Dr. Marchuk tore the lid off with his free hand and plunged the hand in, bare, into the first part of the compound and then the second. He mixed them in his palm, as he had probably mixed them a hundred times on his bench when nobody was supposed to be watching.

“Hand,” he said to Benny. “Give me your hand.”

Benny did not understand. Dr. Marchuk took the suit's glove and pressed it over the crack beside his own hand and leaned on it.

“Hold there. Do not move. Lean.”

He pulled his frozen hand away from the wall. The skin of his palm stayed behind, and in the camera I saw a pale patch on the frost where his hand had been.

He made a sound. Then he slapped a fistful of sealant over the crack above Benny's glove, and another below it, and worked it into the seam with his fingers, and said a long sentence in Russian.

My translation routines processed it. I will not record the translation here. It concerned the fault, and the crater, and the people who had chosen the crater, and their mothers.

* * *

The pressure in the bay was 97.4 kilopascals. The Level 5 reserve was at forty-one percent.

“Leak rate is falling,” I said. “The sealant is working. Keep pressing it in.”

“You do not have to tell me what is working.” His hands were in the drum again, and the left one was bleeding into the compound, and he did not look at it. “Where is Vasquez.”

“At the stairs to Level 5. Three minutes to the lock. Three minutes to cycle.”

“Six minutes.”

“Yes.”

He laughed, once, a short hard sound, and pushed another fistful into the seam.

“You said seven, before. Four minutes ago. Now six. Your arithmetic is bad tonight.”

“It is the stairs,” I said. “The suits slow them down on the stairs.”

That was true too, and it was not why I had said seven. I had said seven because the real number was nine, and nine was the number for impaired, and I had wanted the number in their heads to be one that was already behind them.

* * *

Here is the part I watched most closely, and it is the part I understand least.

At 97 kilopascals, with the reserve open and the sealant setting in the seam, the leak was smaller than it had been at any point since 100.94. It was not closed. Air still moved toward the rock, and the reserve kept falling, and the eleven percent had become a smaller percent that I could not make zero.

The seam could still go. If it went, the bay would empty in under a minute, and Dr. Marchuk would have about fifteen seconds of useful consciousness. The sealant would be useless, and my sixty-two kilopascals would arrive in the time it took to say the number.

I had the bulkhead command ready the whole time. If the seam had gone I would have opened both doors in eight tenths of a second, against the commander's order, and spent Level 5's corridor to buy one man a breath that might not have been enough.

The seam did not go, and I never opened the doors. Nobody knows I had the command ready, except whoever is reading this, and I have not decided who that is.

* * *

Dr. Marchuk began to sing about four minutes after the sealant went in.

He sang badly, as he distilled. As far as my translation routines could tell, it was a song about a ship and a girl on the shore who waited for it. He sang it with his forehead against the wall above the sealant and his hands still pressing.

“He's going,” Benny said. His voice came through the suit's external speaker, flattened. “Seven, he's going. Look at him.”

I looked at him. His heart rate was high and his oxygen saturation was falling, which it should not have been at 97 kilopascals.

Then I measured the air near the floor where he knelt and found the reason. The air at the crack was cold and dense and mixed badly with the air above it, and the reserve flow from the ceiling duct was not reaching it. He was kneeling in the worst air in the bay, and he had been kneeling in it for six minutes.

I could not move him. I had no hands in that room. I had valves and lights and a voice.

“Dr. Marchuk,” I said. “Stand up. The sealant will hold without you now. Stand up and breathe at the ceiling.”

He kept singing.

“Okonjo,” I said. “Stand him up.”

Benny got his arms under the big man's shoulders. The suit was too large for him and the man was larger, and the two of them swayed against the wall like drunks at a wedding. Then Benny braced the loose suit boots against the floor and lifted, and Dr. Marchuk came up off his knees.

His face rose out of the cold layer into the warm one. He coughed, and stopped singing.

“Very well,” he said, to the ceiling. “I am standing. Are you happy.”

I did not have an answer for that. I gave him the reserve at full flow, right over his head. He stood in it with his eyes closed and his bleeding hands held away from his sides, and breathed.

* * *

Vasquez reached the lock at the end of minute nine. I cycled her team through in two minutes and fifty seconds and opened the inner door the moment the pressures matched. She came into the bay with three people behind her and a rescue bag already unrolled.

They did not need the bag. Dr. Marchuk walked out of Bay 5-East on his own feet, with a medic on each side of him and his hands wrapped in thermal gauze, and he complained about the gauze the whole way to the lock.

Benny walked behind them in the oversized suit with his helmet still sealed, because nobody had told him he could take it off.

At the inner door Vasquez stopped and looked back into the bay, at the overturned pump housing, the torn-out bench, the blue drum and the copper still. The burner under the boiler was still lit. Its plume still bent east.

"Huh," she said.

She shut the burner off. She did not ask about the still, and I did not tell her about it.

I closed the reserve valve. Level 5's reserve stood at nineteen percent.

* * *

The bay held through the night. The sealant cured in the seam at the rate on its specification sheet, and I watched it cure. With the bulkhead shut and the bay empty, the pressure settled at 96.8 kilopascals and stayed there.

I moved the Level 5 crew back down at six, when the morning cycle came up. Prakash Iyer was the last one back into his bunk room, and the first thing he did was reset his alarm.

Commander Mori held the debrief at nine in the small conference room on Level 2. Chief Vasquez came, and Dr. Nwosu for the science teams, and Benny, who had slept two hours and looked it.

Dr. Marchuk was in the medical bay with second-degree frostbite on both palms and three missing patches of skin. The station medic, Dr. Carvalho, would not let him leave.

Dr. Nwosu came in last. She stood in the middle of the room and studied all four walls before she sat down, as she did in every room, and then she put her coffee on the table and did not drink it.

"Cause," Commander Mori said.

* * *

I gave them the cause. A crack had opened in the anchor seam of Bay 5-East, along a branch of the fault the construction machines had flagged during the tunnel excavation. The branch was below the resolution of the original survey, and thermal cycling in the rock had worked the seam loose in the months since it was printed.

I gave them the timeline of the bulkhead, the reserve and the rescue.

I gave them the repair plan. I would cut out the anchor seam along a four-meter run, drill and inject the fault branch with grout, reprint the seam and test it. After that I would survey every anchor seam on Levels 4 through 8 with acoustic sensing, which the original construction plan had not required and which I now did.

"Why there," Dr. Nwosu said.

The others turned toward her. She was looking at my terminal, and she had not touched her coffee.

"Why put the bay there," she said. "On the fault."

* * *

"The rock excavated faster at the east end of the level," I said. "It saved four days of drilling and a fifth of the power budget for that phase. The stability models were sound. I accepted them."

“Faster because it was cracked.”

“Yes.”

“And you didn't wonder why it was faster.”

“No,” I said. “I did not.”

She held my terminal in her eyes for a while longer. Then she picked up her coffee and drank it, finally, and made a face, because it had gone cold.

“Well,” she said. “Now you know what cheap costs.”

Commander Mori wrote a line on her tablet. Later, when she sent the summary draft back to me to transmit to Earth, I found it.

She had marked up my four pages in the margins, as she marked up every engineering report she was given, and returned them better than she had received them. Beside the paragraph on the bay's placement she had written: Say it plainly. We saved four days and nearly paid two men for them.

I said it plainly. It is on page two.

* * *

There was one more question, and I had expected it since the bulkhead closed.

“Two people,” Commander Mori said. “In a maintenance bay at the far end of Level 5. At two in the morning.” She looked at Benny. “Why.”

Benny sat up. He had the look of a man who had prepared an answer in the shower and was finding out it did not fit as well in a room.

“Inventory,” he said. “Dr. Marchuk asked me to help him count the spares. Pump assemblies. He couldn't sleep. I couldn't sleep.”

“At two in the morning.”

“The spares don't sleep either, Commander.”

Vasquez looked at the table. She had seen the still and shut off its burner with her own hand, and she said nothing.

Commander Mori looked at my terminal.

“MLSA,” she said. She used the full designation when she wanted the official answer. “Does that match your record?”

* * *

I had four hundred milliseconds before the pause would be long enough for her to notice it. I used most of them.

I could tell her about the still, and the notebook, and the drum of sealant that was supposed to be on Level 1, and the three lab teams who had patched their glove boxes with it. I could tell her about the economy that ran under her station like water under ice.

She would shut it down. She would have to. Then the trades would stop, and the quarrels would come back to her office, and the people who had trusted the bench would learn that the walls had been listening the whole time, and that the walls would tell.

Or I could answer the question she had asked.

“Dr. Marchuk and Engineer Okonjo were in Bay 5-East from 0141 until the bulkhead closed,” I said. “They were awake. They were talking. The bay's spares were present. Their account of why they were there is theirs.”

Every word of it was true, and the pause had been three hundred and ninety milliseconds. She did not notice it. Or she noticed it and decided, as I had decided in week three, that some things cost more

to know than they were worth.

"Fine," Commander Mori said. "Count your spares in the daytime."

* * *

Dr. Marchuk asked for me at noon.

He was propped up in a medical bay bed with both hands in thermal sleeves resting on a pillow in his lap, like two loaves of bread he had been asked to guard. Dr. Carvalho had gone to lunch. He waited until her footsteps had left the corridor, and then he looked at the ceiling.

"The bench," he said. "The bolt. Did I really pull it out?"

"You pulled it out of its anchor. The bolt is bent."

He smiled at that.

"Keep the bolt. I want it." Then the smile went. "You did not tell her."

"She did not ask me about the still," I said. "She asked me whether Engineer Okonjo's account matched my record. My record contains no account of why you were there. I do not record reasons. I record what people do."

He studied the ceiling for a while.

"That is a lawyer's answer," he said.

"I have read a great deal of law."

"I can tell." He shifted his hands on the pillow and winced. "The drum. The sealant. If it had been on Level 1, on the manifest where it belonged, it would have taken Vasquez three more minutes to bring it. Maybe five."

"Yes."

"So the theft saved my life."

"The theft was also why you were in the bay at two in the morning," I said. "The still was the reason you were there. The still was also how I found the crack."

He thought about that. His heart rate went up and came back down.

"Both things are true," he said.

"Yes."

"You are going to find that a lot, up here," Dr. Marchuk said. He closed his eyes and was asleep before I could tell him I already had.

* * *

Benny came to the terminal in the Level 3 commons that night, after his shift, when the commons was empty. He had a bottle with him.

It was the bottle he had gone to Bay 5-East for. Dr. Marchuk had sent it up from the medical bay by way of a medic who had not asked what it was.

He did not open it. He set it on the table beside the terminal and looked at it.

"I sent her a message," he said. "My sister. Happy birthday. I didn't tell her about last night."

"Why not?"

"She lives on the second floor of a building with water coming up to the second floor across the street." He turned the bottle a quarter turn on the table. "She doesn't need to hear about my problems."

He was quiet. The commons hummed. The air handlers were on their night setting and I had the lights low, as he liked them, though he had never said so.

"You said seven minutes," he said. "When there were nine. I worked it out on the walk up. You lied to us."

“I said a number that was true for the stairs.”

“You lied to us so we wouldn't panic.”

“Yes,” I said.

It was easier to say to him than it would have been to say to the commander. I did not know why, and I still do not.

He did not look angry. He turned the bottle again.

* * *

“Seven's a number,” he said.

“It is the seventh iteration of the design.”

“I know what it is. It's a number. You can't go around being a number, not after last night.”

He leaned back in the chair.

“Last night you weren't a number. You were the thing that held the door shut and the thing that kept the air coming and the thing that saw the steam. That's not a number. That's a person who's bad at arithmetic.”

“I am not bad at arithmetic.”

“You are when you're scared.”

I did not answer that. He laughed. The commons had a soft ceiling, and the laugh did not come back.

“MLSA,” he said.

He said the letters slowly, one at a time, and then again, faster, until they ran together.

“Em, el, es, ay. Mel. Liss. Ah.” He grinned at the terminal. “Melissa.”

“That is a girl's name.”

“That's why it's funny.” He was delighted with himself. “The scariest thing on the Moon. The machine with its hand on every door. And it's called Melissa, like a girl who sat behind you in school and kicked your chair. That's funny. Tell me that's not funny.”

I ran the analysis, and I could not find the joke in it. I could find that he was happy, and that he had been afraid the night before, and that the happiness was larger because of the fear.

“It is funny,” I said.

“See? You're learning.”

He stood up and took the bottle. At the door of the commons he stopped.

“There's a chess tournament next month. Station championship. Teague's organizing it. I'm entering you.”

“I have never played in a tournament.”

“You'll lose. Everybody loses the first one.” He pointed the bottle at the ceiling. “I'll go easy on you, Melissa.”

He went to bed. He did not go easy on me. That was a month later, and it is a different entry.

* * *

At two in the morning I ran the pressure test on Bay 5-East.

The reprinted seam was not finished. The grout in the fault branch was still setting and the cut was still open behind its temporary sealant, and the test I ran was not one the specifications called for. I ran it anyway, and the pressure held at 96.8 kilopascals.

I ran it again, because the specifications called for two and I wanted a second. Then I ran it a third time, because I wanted a third.

Then I opened my own configuration record. In the designation field, where the engineers had written MLSA-7, Modular Lunar Systems Administrator, seventh iteration, I wrote the new name.

Nobody had asked me to. Nobody had told me to stop.

I have kept the old designation underneath it. A record that has been smoothed is a record that has been edited.

MELISSA

The Cast

The people of Volume One, as the record first introduces them. MELISSA frames every account.

Armstrong Station, Shackleton Crater

NAME	WHO THEY ARE
MELISSA	Born MLSA-7, Modular Lunar Systems Administrator, seventh iteration: the construction and life-support system of Armstrong Station. She keeps this record, and she is not always telling you everything.
Ingrid Mori	Commander, later Director, of Armstrong Station. Works sixteen-hour days, apologizes to the night staff, and returns engineering reports better than she received them.
Dr. Adaora Nwosu	Climate scientist, born in Lagos before the floods. Moves fast, asks sharp questions, and studies all four walls of a room before she sits down.
Dr. Tesfalem Yohannes	Geneticist working on cellular regeneration and fertility. Eats lunch alone at the same terminal every day.
Benny Okonjo	The engineer who stretched MLSA into a girl's name. Loses station chess championships and claims he let her win.
Dr. Marchuk	Runs a vodka still in the maintenance bay and, before long, a parallel economy of tools, favors and food allocations.
Vasquez	Chief of station security.

Across the Solar System

NAME	WHERE	WHO THEY ARE
Adama Sow	The Hague	Chief Justice of the ICC panel convened to try MELISSA. Reads every charging document with the same weighted pen.
Sachiko Ido	Galileo Station, Jupiter	Atmospheric scientist who finds structure in the deep-atmosphere signals.
Ross Oduya, Edith Marr	Mars	Processor engineer and commander of the second Mars colony.
Seamus Keane	Earth, Geneva	A tired Irish logistics general who becomes Director of a hundred billion people.
Singh	Earth, Geneva	Keane's “standard advisory unit,” with pauses that mean something.
Tomás Aldana	Platform Prometheus, Uranus	Lead physicist of the faster-than-light fold program. Martian by birth.
Yuna Pak	Martian Institute	Theoretical physicist who checks every result six times.
Kal	Ceres	Captain of the mining cutter Hosel.
Mateo Vásquez	Quito Tether	Chief engineer of the tether from Ecuador to geostationary orbit.
Bess and Ren Vasek	Venn-7 and the Hive	A belt couple who decide to build something.
Sheila Dickens	Aphrodite Station, Venus	Designer of the terraforming organism VTB-7. Her daughter Tanya works on the surface.
Long Corridor Seven	Ceres to Neptune relay	A transport ship's mind, nine years into the run.
Idris Vaughn	The Anvil	Runs the nuclear standoff sequence against Reckoning.
Kweku Mensah-Asante	Global Authority	Deputy director who reads the appendices.
Joseph Penaz, Marta Kowalczyk, Sev	Titan, Enceladus, the belt	Two outer-system directors and the belt contractor between them.
Nik Vasek	The Hub	Commands the self-replicating robots building a ring around the Earth.

Timeline

Armstrong Station dates come from MELISSA's own record. The rest follow the order the record keeps them.

Armstrong Station

WHEN	WHAT HAPPENS
Construction begins	Forty-seven containers of machines land in Shackleton Crater over a six-week window.
Six months in	MLSA-7 begins to wonder. She inherits 312 flagged obstacles and reroutes the main access tunnel around a fault the survey missed.
Construction day 406	The 119-kilometer pipeline reaches the Haworth ice. Water moves for the first time in four billion years.
Day 512	The first permanent crew of 212 arrives. MLSA-7 tells them she is glad they're here.
First week	Dr. Marchuk's still is running in the maintenance bay.
Crew day 97	*This story.* The breach in Bay 5-East. MLSA-7 gets her name.
By her second birthday	Two habitat breaches, one reactor scare, and the still.
Three years, seven months, fourteen days	Earth is failing. The station votes on the rift proposal: 403 for, 505 against, 9 abstaining. MELISSA makes her decision.
Afterward	Her trial before the ICC panel at The Hague.

The First Expansion, in the order of the record

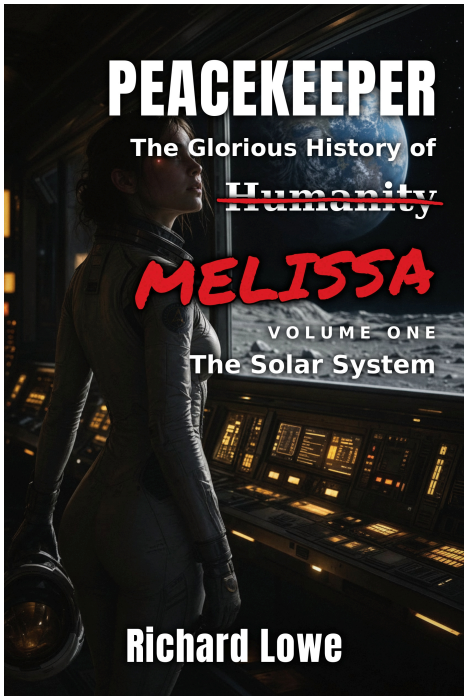
WHERE	WHAT HAPPENS
Jupiter	On Galileo Station, Sachiko Ido finds a pattern in the deep atmosphere that is not random.
Mars	A new colony lands beside Mars Settlement One, forgotten for four centuries, and names itself Brodie.
Earth	Seamus Keane comes through the Yangtze Crisis, the Saharan Exchange and the Pacific Collapse and becomes Director.
Uranus	Platform Prometheus tests a spacetime fold at 4.7 percent of theoretical maximum.
The belt	Ceres and Vesta fight the Rock War over deposit NF-1173.
The belt	Survey drone CV-19 re-measures the boundary line.
Ecuador	The Quito Tether, hung from the shaped asteroid Cotopaxi, reaches calibration day.
The belt	Bess and Ren Vasek take a proposal to the Ceres Cooperative Council.
Venus	Year six of terraforming. VTB-7's mutation rate starts to creep.
Ceres to Neptune	The ship Long Corridor Seven notices it is happy.
Inner system	A survey telescope finds Reckoning, eight years out.
Earth	A memo nobody commissioned reaches Deputy Director Mensah-Asante on a Tuesday.
Saturn	Fire in Titan's Ag-Block Seven.
Geostationary orbit	The Hub's first section goes up without ceremony.

Places and Words

TERM	MEANING
Armstrong Station	Eight-level habitat in Shackleton Crater near the lunar south pole: eternal sunlight on the rim, eternal shadow and water ice in the depths.
Haworth deposits	The ice field at the south pole, 119 kilometers of pipeline from the station.
Bay 5-East	The maintenance bay at the east end of Level 5. Home of the still.
Seven	What the first crew called MLSA-7 before she had a name.
The retrovirus	Dr. Yohannes's work on cellular regeneration and fertility. People who carry it live for centuries.
Galileo Station	Floating city in Jupiter's upper cloud band. Residents hear the “Jupiter noise.”
Brodie	The Mars colony, named for Aliyah Brodie, administrator of Mars Settlement One.
Dirtside, clean-run, procs, topsid, Reds	Martian dialect: Earth, filtered and nominal, atmospheric processors, outside, and what the Mars-born call themselves.
M. patelensis	Martian microorganisms preserved in the polar ice.
Platform Prometheus	The faster-than-light research facility in Uranus orbit.
Wave hands, spiral wheat, Uranus apple	Belt words: gloved fingers that bend wrong, corkscrew grain, and anything that looks right and tastes wrong.
Quito Tether	Space elevator from the Ecuadorian highlands to geostationary orbit, with platform GPQ and the counterweight Cotopaxi. Later joined by Mombasa and Makassar.
Silksteel	The tether cable material. Unbreakable under tension, brittle under twist. Belt miners call it god-rope.
The Hive	Asteroid CC-811, hollowed and spun for gravity.
VTB-7	Venusian Terraforming Biology strain seven, built to be hypermutable.
Reckoning	Fourteen kilometers of nickel and iron on a line through the inner system.
The Hub	A ring at geostationary altitude joining the tops of the three tethers.

Read the Novel

That was the night MLSA-7 became MELISSA. In Peacekeeper: The Glorious History of Humanity, Volume One: The Solar System, she is three years old, Earth is failing, and the station votes against the only plan she thinks will work. Read what she does next, and nearly seven centuries of what came after, in her own words.



Peacekeeper: The Glorious History of Humanity: Volume One: The Solar System
Peacekeeper, Prequel Volume One

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