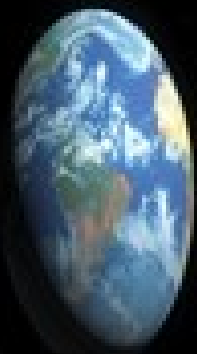


Golf and Outgassing



Torn

Mac Alester

Golf and Outgassing

By Tom MacAlester

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To the men and women of Project Apollo. You made a dream come true.

Proofread by Walton Wood

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Golf and Outgassing

Annie MacInturner glanced at the space-suited figure moving toward her across the lunar surface. It was her rookie crewmate Milt Johnson. She noted the ease with which he moved. He had difficulty moving during training on Earth, since his suit hindered him. She had figured he would get his moon legs, and it pleased her to see it come true.

“Looks good,” she said as he reached her position near the crawler. “We get these garbage cans set out, we’ll call it a day.” She referred to the fifty-gallon-drum-sized experiments they needed to unload from the six-wheeled crawler. The setup of the experimental packages had been the goal of the first EVA. Throughout training before the mission, they had managed to do the work in three or four hours. They had started hour five a few minutes ago.

“You’re the boss,” answered Milt in his relaxed style. She had known him for two years, since he joined the space agency. He had a reputation for resourcefulness. He always managed to have the most information about anything, including rumors. He also had a know-it-all personality that grated against many in the astronaut office. Even though Milt seemed to have the answers, many times he was right. Annie was glad she gave him a chance to join her on his rookie flight.

“Okay, lets get after it.” She grabbed one of the garbage cans. It contained a soil mineralogy experiment. She grinned, taking the can and knocking herself off balance. “What the –?”

“Problem boss?” Milt asked in a tone suggesting a joke.

“Damn thing is off balance.” Annie realized that, even though the weights of the experiments were much less, moving their mass was difficult. It had been affecting her most of the day, but this last one turned out to be worse than the others.

“Want me to take it?”

“No,” she answered after a moment. “I’ve got it.”

She struggled a moment, finding the package top-heavy. She didn’t recall the same being true on the simulator. The simulation team had forgotten something when they made the training item. On the moon, it only weighed thirty pounds, though having some of the mass off-center meant it carried significant inertia. Plus it outweighed her, making it difficult to move. The fact she had her Earth strength to wrestle with it made the movement possible.

“Have the experiment design team make a note,” she stated as she moved the trash-can experiment into position. “Having these things so close to our mass might not be a good idea.”

“Understood, Mac,” said the voice of her astronaut husband Cy, who acted as the ground communications. “Should we also shine ‘em up for you as well?”

“Ha, ha,” she answered, shoving the trashcan into an upright position. She pulled out the antenna and solar array, setting up the experiment for surface activity.

They would be leaving the experiments much like Shepard and Mitchell had left behind experiments sixty

years prior. The difference would be improved electronics and solar power. In this case, it would pull lunar soil into a reaction chamber, using sunlight to break oxygen from the rocks. The experiment acted as a prototype. It would prove that such a unit could make a two-week supply of oxygen during a single week of operation, providing *in situ* resource capability.

After turning on the power, she glanced south at the fifteen-hundred-meter-distant Apollo 14 descent stage atop a small rise. It was the part of the Apollo 14 lunar lander, *Antares*, left on the lunar surface. At first she did not see it, but the gold foil covering part of its structure revealed it. Their own lander, *Steamboat*, sat some two hundred meters closer to *Antares*.

After seeing a green light on the garbage can, “I’ve got Tango-Charlie-Six operational. Do you have telemetry?” she asked. She waited for the answer, hoping the electronics within the garbage can communicated over the radio, indicating that it was operating correctly.

“Stand by,” Cy answered after the two-second speed of light delay. Annie glanced at the TC1 trashcan sitting a dozen or so meters away, noting the antenna that was unfurled and pointed toward the Earth. She knew that link had been established, but wondered about the WiFi link between TC6 and TC1. If the WiFi connection failed, she would have to reboot TC6 – an easy procedure. After a few more moments, he continued, “Looks like Tango-Charlie-Six is go. Good work, Mac.”

* * * * *

Milton Johnson had been one of Annie MacInturner’s final choices for her crew. She had sat in her office, ready for the interview, as the man walked in, taking a seat. She noted how he moved with confidence, not the self-consciousness she had come to expect with many of the rookies. He sat down without any recognition of her rank, which was not uncommon for civilians. Yet the other civilian applicants had remained standing until she offered a seat. Being a Marine lieutenant colonel, she had to suppress the demand for protocol to be followed when dealing with civilians.

“So.” Annie smiled, looking at Milton’s bio one last time before closing her laptop screen. “Mister Johnson –” She looked at him, noting the well groomed and good-looking young man. He held his head high and raised his right eyebrow as he listened.

“Milt, please. Mister Johnson is my father.” Milt grinned. Annie guessed he had little use for titles. After all, he had yet to refer to her as colonel.

Annie noted the lack of humor and smiled. “Milt, of course. Why do you want to be on my crew?”

“A better question would be,” Milt offered, “why you would want me on your crew.”

“Fine,” Annie grumbled. To her surprise, he lacked the awe that many younger astronauts had in their eyes. He looked as though the experience of preparing for spaceflight was nothing new to him. She noted that he acted with near arrogance. She already had made up her mind that this attitude would not be a good mix for her. Annie continued the interview out of fairness. She gave each of the other candidates an hour, and she opted to give Milt the same amount of courtesy. “A fair question. Go ahead.”

“First,” Milt smiled, brushing an errant hair from his forehead, “I am resourceful. For example, I already know the committee took the Tranquility site off of the table. It makes sense, and I’m sure the committee wants something else besides the retrace of the first landing site.”

“They are considering that site as a historical monument,” Annie answered, impressed with his immediate discussion of the upcoming lunar missions.

There were a lot of thoughts and discussions associated with the mission. Some were advocating a high value, science-based mission. Others wanted a mission aimed at the lunar resources. The key goal of the mission was to test the lunar space system, requiring a crew of two. They would leave the space station using a two-man capsule to rendezvous with the lander and a big rocket motor to launch the stack to the moon. Upon arrival in lunar orbit, the crew would transfer to the lander and land on the surface for a two-day stay. Then they would ascend to the two-man capsule that remained in lunar orbit, using the capsule to return to the Earth. This mission remained simple: to test the systems for a landing mission.

“It’s a good idea to stay away from Tranquility. This mission would be ill served by being a ‘look, we can land on the moon’ journey.”

“What site would you pick?” Annie wondered about what he might be thinking and how well it matched her own.

“Fra Mauro.” Milt smiled. “Of course.”

“Why?” she asked, surprised that she had not considered the location. She wondered what justification he had for the choice.

“First, it’s close to the equator, so we won’t have to stress the rocket systems on our first mission by allowing plenty of margin.”

“Interesting,” Annie answered, intrigued by his consideration of the rocket booster’s capabilities. Landing in lunar equatorial regions did add margin to the mission in the form of extra fuel. It showed that he had considered and understood the engineering limits. “Go on.”

“The second reason is that NASA seemed very interested in the location.” Milt smiled. “Did you know that it was the chosen landing site for both Apollo Thirteen and Fourteen?”

“I didn’t realize that,” she answered, knowing about Apollo 13 from the history surrounding the flight.

“At least it was for Apollo Thirteen. After the accident, planners chose the same location for Apollo Fourteen. That was the policy at the time: use the previous flight plan to meet the missed mission objectives.”

“Oh, yes, the Apollo Thirteen accident. The re-fly seems a reasonable conclusion. I think we’ve tended to use that same paradigm ever since Yellowstone.”

Annie looked in Milt’s eyes to see how he reacted to the mention of the supervolcano’s eruption over a decade prior. His expression showed little change; a lot of people lost family in the aftermath of the explosion. Annie had family members in the Midwest whose house allowed too much volcanic dust inside. It had wreaked havoc on their lungs, leaving them disabled. Milt’s family, it seemed, escaped the tragedy of the eruption.

“I agree,” Milt nodded. “But some interesting information that I have found has made me reconsider.”

“And that would be?”

“The Apollo Fourteen experiment package left on the surface detected water vapor about a month after the landing.”

“What?” Annie sat up, surprised to hear about the new twist for the fifty-plus-year-old mission.

“Yes, you heard correctly.” Milt smiled.

“I had never heard that before.”

“They had decided at the time that the water vapor came from the *Antares*’ descent module or something else left by Shepard and Mitchell on the surface,” Milt explained.

“I wonder.” Annie felt unconvinced.

“The paradigm at the time was a dry moon,” Milton commented. “Most of the science had water boiling off the surface and into deep space because the moon’s gravity is too weak to hold any atmosphere. It seems reasonable that the discovery would have been ignored.”

“So not a detection.”

“Well.” Milt paused.

“And?”

“It happened again in a few weeks.”

“Really?” Annie exclaimed. “Again.”

“Yes.”

“Certainly they didn’t ignore it. Did they?”

“For some reason, it convinced them that the water had come from something left behind by the crew. There was a model of seismic activity outgassing ground water. It’s in some of the reports from the time.”

Annie considered a moment, then figured it made sense that something left behind could have caused the signature. “I guess they could have been right. It makes sense, after all.”

“But that brings up my fourth reason for going to Fra Mauro.”

“Which is?”

“Let me revise that. It’s still part of my third reason.”

“Fine.”

“I cannot find reference for any such detection in the data associated with any of the other experiment systems left at the other landing sites.”

“So?”

“By its nature, Fra Mauro is different in some way. Its either something that the Apollo Fourteen crew left behind, or it’s part of the region.” Milt lowered his voice. “The answer to that question is only at Fra Mauro.”

“What else?” Annie asked, sensing there was more.

“One of the earliest moonquakes detected by surface seismographs –”

“Let me guess.” Annie grinned. “Fra Mauro.”

“Yes.”

Annie realized that she had mistaken Milton’s confidence as arrogance. He seemed to have a knack for making a clear case for a mission. It had been better than any of the proposals she had listened to from the mission science team. Milt had earned a job in Annie’s eyes, and he had determined the mission she would advocate – a return to Fra Mauro.

* * *

Annie drove the crawler up to the Apollo Lunar Science Experiments Package, ALSEP, location along its northern side. She stopped the crawler short, avoiding the footprints left behind by the Apollo 14 crew. She had promised everyone that their mission would do the smallest amount of disturbance to the landing site. It was the price for their cooperation to retrieve the Suprathermal Ion Detector Experiment, SIDE. The instrument had made the water detection, and the science team wanted it.

From the vantage, she could see the SIDE experiment about twenty meters beyond the central station. To their left, two hundred meters distant, was the *Antares* descent stage. Linking the *Antares* and the ALSEP central station was a mass of footprints. Though over fifty years old, the footprints looked as fresh as the day they were made.

The central station was a collection of boxes of various sizes. One sported an antenna pointed toward Earth. Another had radiator fins, indicating that it was likely the power supply. One looked like a box tilted on an angle by two fragile legs. Another was a simple box covered in gold foil.

“Arrival at ALSEP,” she stated, glancing over at Milt occupying the right seat in the pressurized crawler. Both of them had worn their suits but stored their helmets in the rear of the vehicle at the airlock. EVA 2 would use the crawler to move between locations. Most samples would be collected using the robotic arms that were controllable from inside the crawler. Should the need arise, they could put on their helmets and go outside to collect samples.

“Looks like our estimate of foot traffic is correct – walked this area a lot,” Milt observed.

“– copy –” interrupted ground control.

“I guess right is the way,” Annie played with the words. Responding to her own words, she turned the crawler toward the east. The crawler paralleled the tracks. She drove toward the easternmost experiment in the ALSEP configuration, the Laser Ranging Retroreflector. It was only about three dozen meters distant, making the journey quick in the crawler.

“Yes,” Milt answered. “We need to go around the LRR and then south, past the end of the geophones.”

“Roger that.” Annie drove the crawler, seeing the LRR about twenty-five meters distant, near a small crater to its south. The scale shift of seeing a small experiment sitting next to a crater made both seem farther away than they were. She still found it amazing to find craters less than a few meters wide. As she drove, she could see the footprints end past the location of the LRR. “It looks like they didn’t go much farther than the location they chose for the LRR.”

“Yeah,” Milt answered. “Looks like they put it down and went back to their work.”

“I didn’t see a sign of the geophones as I drove by. Did you happen to see ‘em?”

“I caught a glimpse.” Milt had turned back to her as she asked. “There was a set of tracks heading off that direction. I may have seen glints from the metal.” The geophones stretched about a hundred meters toward the south. The Apollo 14 tracks would have been along its length.

Annie rounded the LRR and turned the crawler south, avoiding the small crater as she drove. It looked like there were no bootprints, so she continued until they had traveled about a hundred meters. She glanced to the left, looking for the geophones and the telltale tracks in the moon dust. From her vantage, she saw the *Antares* descent stage from another perspective that revealed the rungs of the descent ladder. “Control, I don’t see the geophones.”

“Copy,” cracked over the speakers.

“Where the hell are they?” Annie asked no one in particular.

“I’m thinking we are south and west of them. That five-meter crater over there,” Milt said, pointing ahead of them to the right.

“Yes?”

“It appears to be fairly shallow. I’m guessing that it’s this crater here,” Milt said, pointing to the map display on the dashboard. If he was right, the crawler was about thirty meters south and west of the end of the geophones.

Annie turned the crawler toward the west, then north. “It certainly will be nice once we get the GPS system extended to the moon,” she said offhandedly as she drove. She slammed on the breaks, seeing a set of boot prints crossing their intended path.

She saw Milt touch the VOX switch, ensuring ground control would be unable to hear them. “This shouldn’t be here.”

“What do you mean?” Annie felt confused, not sure why Milton saw fit to disconnect them from discussions

with ground control.

“It looks like a circumnavigation of the landing site.” Milt had a pensive look on his face, as though he were about to say something.

“What?” she snapped, as though she was giving an order.

“Oh, it’s nothing.”

Annie felt irritated. Milt tended to withhold information, even when being helpful. “Tell me what you have to say.”

“If this is true, we cannot approach the SIDE without crossing this set of tracks.”

“Obviously,” Annie barked.

“I have two alternatives.” Milt smirked.

“They are?”

“Drive over the path like we did not see it.”

Annie considered a moment. “I don’t think I like that option. The other?”

“Let’s walk over there and get it.”

“You’re kidding.”

“No.” Milt stated. She noticed no hint of humor in his features.

Annie assembled her thoughts, but covered her own thinking by asking questions. She had learned to do so while in college. It allowed her to think while having someone attempt to answer her questions. “What do we gain by using your first option?”

“It will allow us to continue with our existing plan,” Milt started. “We roll through and use the robot arm and snag the SIDE. Afterward, we back out the way we came.”

“Anything else?”

“This is your decision,” Milt stated.

“What do you mean?”

“Exactly what I said,” Milt continued. “In my opinion, you have the ultimate authority for the mission.”

“So, want me to assert my authority?”

“I’m not advocating any position. I am simply stating that you have the authority.” Milt looked out of the crawler upon the lunar surface. After a moment, she saw him grin for a moment and turn back to her. “It’s a long way. We should get what we came for.”

Annie thought, *He is right; it's my choice*. But it wasn't a choice between action or inaction. It was a choice between two different actions. Others would likely find either action undesirable. Furthermore, some might question her authority in the situation. She wished Cy were available to talk about it. Yet she knew his answer. "We'll drive on," she stated.

"Are you sure?" he asked.

"Yes. It's obvious we need to get what we came for. The way we do that is by getting the robotics to the SIDE location. Without the crawler, we'd destroy more boot prints. If our goal is to keep this site as pristine as possible, then this is the way to do it." Annie started driving. "Turn the VOX back on."

She saw him move at the corner of her eye as she drove. "Roger."

"Control, we're moving on," she said.

"Copy," answered ground control. "Moving on."

Annie heard Milt emerge from the airlock and shut the door, preparing to store the retrieved SIDE on the crawler. The crawler lurched a bit from him stepping off of the back.

They had easily picked up the experiment from the surface and cut its cables using the robotic arm. The last effort would be to grapple the experiment and haul it over to the crawler.

"Boss," said Milton over the radio. "I found something."

Annie looked at the view screen, trying to discern the object that Milt had found. She thought it appeared to be a rock. Attempting to adjust the contrast, she asked, "What is it?"

"I've found one of the golf balls."

"What?"

"One of Al Shepard's golf balls is lying right here. It's deformed, it's discolored, and it looks like a rock. But it's one of the golf balls. I recognize the dimples. We must have dislodged it from the dust as we rolled over it."

"I didn't expect to have found one."

"Neither did I," Milt answered. "We should ask Smithsonian if we should retrieve it."

"Copy," Annie answered. "Let me know when you are ready for me to move the SIDE over to you."

"Give me a second to get the crate unhitched from the side."

From the monitor, Annie could see Milt fighting with something. In the high contrast, she surmised that he could not see, given that the crate was in a deep shadow. She still had some difficulty herself. Without the benefit of atmospheric refraction, the shadows became impossibly deep. She knew Milt would need some time to work out a solution. “Roger.”

“Okay, boss,” Milt finally answered after a bunch of grunting and heavy breathing. “I’ve got the crate ready.”

Annie adjusted the robotics controls, lifting the SIDE from the lunar surface. At first, she thought it might be lost as it slid in the grip of the robot, but it did not continue slipping. Carefully, she swung the arm away from the cut wires and over toward the crawler and the waiting Milt. The arc progressed frustratingly slowly, making her palms sweat as she worked the controls. Another defacement of the Fra Mauro landing site would not be explained away. She had chosen to cross the line of tracks; any more damage would amplify that choice. Every second, she thought it would slip out of the grasp of the robot arm.

Feeling it might last forever, she watched as Milt reached up and collected the SIDE into his hands.

“SIDE recovered,” she sighed.

A long delay finally produced an answer from ground control: “Copy. SIDE retrieved.”

* * *

Annie had looked on as Milt and his backup, Nils Carmike, had considered the image of Cone Crater on the pad sitting between them on the table. The lunar science team had stepped out, giving the crew a chance to pour over the data.

Annie had insisted that the team choose its own scientific goals, since they would be carrying them out on the moon. She made her case to the science board when she presented the case for Fra Mauro. She compromised on a solution that had them making the recommendations as long as the crew had the final choice. Her case was helped by the fact that she insisted on doing some surface science on the moon, something mission managers had placed in a low priority. To their thinking, proving the lunar transport system was the only goal of the mission. Annie disagreed based on Milt’s recommendations about Fra Mauro.

In the original mission to Fra Mauro, getting a sample from the interior of Cone Crater had been one of the objectives for Apollo 14. Cone Crater was a deep crater, revealing composition of the bedrock beneath the landing site. Shepard and Mitchell intended to get a sample from inside Cone’s rim. The difficulty ascending the Cone Crater hillside had left Shepard and Mitchell exhausted. Their final position was shy of the rim when time constraints forced them to return to *Antares*. Nils suggested that they should make a trip to Cone Crater a top priority, even though similar samples had been taken on later Apollo missions.

Milton had lifted the pad and had stated, “Nils, there is no way that smudge is anything significant.”

Nils had looked to Annie and to her husband Cy, her backup for the expedition. Nils had been not sleeping over the past few weeks, making his thin build look gaunt. Annie had asked the flight surgeon to ensure Nils was able to fly, should Milt be unable. Nils seemed unconcerned about it, attributing it to habits for study in college – the surgeon agreed.

Nils turned back to Milt and almost shouted, "I've checked with the image analysis folks on this. There's a good chance there is a skylight cave there."

"A skylight," Cy said thoughtfully.

Annie glanced at him, knowing that he really was not paying attention. She spotted him using the technique shortly after they had met. He had been watching football and she remembered asking him a question. After each sentence she had uttered, Cy had repeated a few words from the sentence in a thoughtful tone but never answered. After a while, she figured it out; Cy was preoccupied, but tried his best to sound engaged in what she had been saying. Now Cy seemed to be concerned about something else at the moment. Annie focused on the conversation, knowing that she might have to brief Cy at another time.

"Yes," Nils answered. "It's possible."

"Maybe," Milt said in an unconvinced tone.

"Nils," Annie interjected, feeling that they were avoiding key information, "it would be useful if you presented the evidence."

"Oh, yes." A nervous smile played over Nils' face. "If you look at the series of photographs from the Apollo era, we can see that there seems to be a shadow that persists regardless of sun angle."

"It's a rock," said Milt.

"A rock," said Cy, seeming to agree.

"But the laser altimeter readings show a flat or dimpled region where you think there is a rock," Nils added.

"So a depression that is in near-permanent shadow?" Annie questioned.

"Yes." Nils rubbed his head. "I believe so."

"How deep?" Annie asked, glancing at Milt, who looked on with interest.

"At least three meters below the crater floor," Nils answered. "If it is a skylight, it would be a significant find. A cave under Cone Crater could be a location for potential lunar water to collect. It would be permanently out of the sunlight making it extremely cold."

"Cone Crater is a recent impact," Milt offered, glancing to Annie.

"Millions of years old, if you mean recent," offered Nils.

As opposed to the several-billion-year age that could be attributed to most of the lunar craters, Annie thought.

"Sounds like you are becoming convinced." Cy turned to Milt, raising an eyebrow. Annie noticed that Cy had reconnected to the conversation.

"Yes," Milt answered.

“Then it would be a good addition to the mission plan,” Cy stated. “Of course, it will take up an EVA by itself.”

“What do we have now?” Annie asked, looking at Milt.

“EVA one, deploy experiment packages and preliminary geology traverse. EVA two, recover BEAM from ALSEP and primary geology traverse,” Milton answered.

“There is always a contingency EVA,” Nils added.

“Command contingency,” Cy corrected. “It's for us to complete tasks from previous EVAs.”

“I understand,” Nils nodded. “I'm thinking that you could put that as a contingency option, should we have all tasks completed.”

“The front office ain't going to like that,” Cy mentioned, “even though it's a great idea.”

“Let me worry about the front office,” Annie stated in a matter-of-fact tone.

“Still, we already have an aggressive mission,” Cy offered. “The point was to make sure all the system works for the future missions.”

“Yes,” Nils agreed. “But we need to get along with phase two, fast.”

“We have a lot of engineering to do before phase two,” Milt replied.

“This will prove the system,” Nils countered.

“Guys,” Annie interrupted. “Listen. I don't care about all that. I need a case for the science.”

“Agreed,” Cy added.

“If I have a good reason to climb down to the bottom of that crater, I'll add it to the mission. Make it good.”

“There is one,” Nils stated.

“You'll have to prove it,” Annie replied. “I'm thinking the mission scientist will want to weigh in.”

“You can't mean that!” Cy exclaimed.

“Why not?” Annie had countered. “I'll have to answer to the flight director. It's the same difference.”

“Fair enough,” answered Cy.

“Nils,” Annie looked at him. “What do you think is the reason for taking that risk?”

“I think there is ice in that skylight cave.”

“What?” Milt spat.

“You’re kidding,” Cy said.

“Hold on, you two.” Annie held up her hand. “Let Nils finish speaking.”

“Thank you, ma’am. The clues are all there. There was a detection that happened twice on the SIDE instrument that some thought was water. We have evidence of seismic activity. And we have a skylight. The ice could be in the cave, and sunlight warms it enough to have a slight outgassing of water vapor. The SIDE detected it.”

“Wow,” Annie said.

“The only thing we need is samples from within that crater,” Nils continued. “Shepard and Mitchell were exhausted by the time they were near the rim. If they had continued ...”

“And we won’t be exhausted,” added Milt. “We can drive up there with the crawler and let a rover go down. They had to do it on foot while carrying a survey cart.”

“Impressive,” Annie had remarked, realizing that the team had come through. She would make a case for Cone Crater.

* * * * *

Annie watched from the seat in the crawler, watching the robotic rover descend into Cone Crater. The slope from the western side seemed easy to navigate. The robot descended, spooling behind it a cable connecting it to the crawler. She glanced at Milt working the controls from his seat in the crawler. From their vantage, she could see their tracks that approached from the south, along the rim. Once in position, they deployed the robotic rover using the crawler’s robot arm. It gave them an advantage to set down to the bottom of the first cliff instead of driving around it. From that spot, the robotic rover could move toward the suspected skylight.

“It looks like we are making progress,” Milt said.

The crawler had traversed to the Cone Crater along the north western side of the Fra Mauro landing site. Shepard and Mitchell had only explored the southern edge. It kept them clear of any more potential damage to the Apollo 14 landing site.

“Yes,” Annie answered, seeing the shadow growing larger in the monitor.

“Only a few more feet.” Milt concentrated as the monitor showed the vehicle had come to a halt.

“That’s it.” Annie smiled in triumph. Her arguments for the command contingency had been vindicated. They now had a close view of the skylight located at the bottom of Cone Crater.

The mission scientist had been easy to convince, and she was glad she made the attempt to convince her first. She handled the discussions with the mission manager and the flight director, which had continued for weeks before launch. After six frustrating meetings, she got the approval to exercise the command contingency to perform another moonwalk.

“Lets get those lights on and take a look.”

Through the monitor, it became clear the darkness seen in images resolved to a skylight at this close range. It was hard to guess how deep. Except for an outline of the hole, the lights ended in darkness.

“It looks like what we came for,” Milt had said.

After descending about a quarter of the way down the inner slopes of Cone Crater, “Mac, this is Control,” crackled over Annie’s headset.

She recognized Cy’s voice but knew there was extreme urgency to it. She knew something was wrong before she answered, “This is Mac. Go, Control.”

“We have a critical situation. You must shut down all power and evac Fra Mauro landing site. Radio silence from acknowledge until three zero seconds after lift off. Acknowledge.”

“Copy. Out.” Annie shut down her radio. She moved over to Milt. She could see by the external panel that he had indeed shut down his suit radio. She moved in close and touched him, helmet to helmet. “Can you hear me, Milt?”

“Yeah, I hear you,” Milt answered, then asked, “What the hell is going on?”

“I don’t know,” Annie answered. “Something has scared the hell out of them, and they want us the hell out of here, now.”

“Yeah, but what?”

“Something is unsafe here. We need to go,” Annie speculated and concluded in an instant.

“Okay.”

Steamboat was almost two kilometers west of their present position inside of Cone Crater. They would need to traverse the distance on foot. Luckily, they were well within their walk-back circle of oxygen. Annie considered a moment that it would be faster to use the crawler to head back, but she also considered the instructions to shut down all power. It meant the power of the equipment necessitated the evacuation. Annie realized that they traded time versus danger. Though they needed to leave, she opted that she could risk being there longer by removing the risk from the power.

They climbed out of the crater, using the cables strung down from the crawler on the western limb. Upon reaching the top, she turned to see Milton had followed her out of the crater. As soon as he reached the top, she moved to touch helmets again.

“I’ve thought about it on the way up,” she said. “Shut down the power to the crawler. Then we walk back out.”

“Agreed,” answered Milt. “I’ll know in a second.”

“Let’s be as quick as we can. Is there anything we cannot afford to leave?” She looked to the rim of Cone Crater.

“I’ll look around just in case. But I don’t think so.”

Annie looked around outside.

“Milt,” she said, making helmet contact again.

“Yeah?”

“How much of *Steamboat* needs to be shut down?”

“Some,” he answered. “It acts as our comms relay.”

“Shut it down,” she said.

“That will mean –”

“– yes, it will mean that they cannot communicate with us.”

“Yeah,” Milt answered. “They wanted it that way.”

“Let’s get it shut down, then.” Annie looked at her watch. “We should be able to make *Steamboat* within forty-five minutes.”

“Three clicks,” Milt agreed. “Easy.”

“Okay.” Annie looked through the samples and the supplies, looking for anything that they needed to take. The rocks weren’t from inside of Cone Crater, so they likely represented the scatter for the site. She realized that, while Milt shut down power for the lander, she could collect a sample from inside of the crater rim.

She ran to the rim, stepped into the crater. She bent down and grabbed a rock, likely a basalt, threw it into the sample bag. She hoped it would be enough, but took another smaller rock, a breccia, and a handful of soil and put it all in the same bag.

Annie hoped she made a good choice of rocks and soil. The bag would be the only sample from inside Cone Crater – complementing the sample from the near the opposite rim taken in 1971.

She stared down to the crater, seeing the skylight lit by the rover lights. Annie hoped that it wouldn’t be another half-century before someone got a look inside.

The lights shut down, leaving the discovery in darkness cast by the rim of the crater.

Annie turned and ran back to the crawler as Milt exited. She ran up and touched helmets. “I collected a contingency from the crater.”

“*Steamboat* and the crawler are shut down.”

“Okay, let’s go,” Annie said. “I’ll lead.”

“I’ll be right behind you.”

Annie turned and started moving across the lunar surface, moving at a deliberate pace along the crawler tracks, back toward the lander. Before the mission, the plan had prevented Annie and Milt from disturbing the Apollo 14 landing site.

Annie kept moving, knowing that she would not be able to see the lander after descending down the slope away from Cone Crater. There was a small rise that would obscure it. She made note that the lander had disappeared from view as they descended Cone Crater's rim. She had a good idea where the lander should be and used the terrain to maximize her speed.

Most of the distance required her to move around smaller craters, though some she could run right through. She also needed to avoid rocks, forcing her to change directions often. She wondered from time to time if she had been making a fairly straight path toward a location where she would be able to see the lander again. She hated the idea of relying on her own navigation, but even the homing signal from the lander had been shut down. It worried her that the cluster of rocks and craters she was heading toward might be in the wrong direction.

She breathed heavily, somewhat fogging her helmet. Luckily, the sun was not directly impacting her line of sight, or the combination would have made it even more difficult to navigate. On her own and using her feet seemed an odd way for a pilot to make a journey. At that moment, she wished she could have quickly flown the distance, since her muscles hurt enough.

She pushed onward, hoping she had not drifted toward either the north or the south. Neither were particularly bad for getting lost. The path to the north included the tracks of the crawler. To the south, she was bound to reach the path of the crawler used to retrieve the SIDE. Either way, the path would enable her to navigate to *Steamboat*. She silently hoped the middle path she chose would be the fastest.

To her relief, she saw *Steamboat* again. She saw its upper structure, the ascent module glinting in the sunlight. Annie was surprised by the exhaustion she felt. If forced her to stop and gave her a moment to pause and look back to keep track of Milton's progress.

She turned to find him gone.

Realizing that she had not set eyes on him for about ten minutes, she began walking back toward Cone Crater. He could have fallen and broken his visor. Such a disaster would be impossible to fix, but she needed to know his fate before leaving the moon. She upped her pace a bit, keeping a close eye on the rocks, hoping one of them was not space-suit shaped. She quickened her pace, resolved to find out what had happened to him.

As she rounded a boulder, she saw him on the other side, leaning against it. She ran up to him, touching helmets.

"What's wrong?" she asked.

"I turned an ankle," answered Milt. "I took a bad step about a half kilometer back."

"Sorry," she apologized. "I made a dumb mistake. We should have stayed together."

"It's not a problem," Milt commented. "I had no visions of you leaving without me."

"Still," Annie answered, pulling Milt's arm over her shoulder and acting as a crutch to keep him moving.

It slowed their pace, but not as bad as she feared. Milt was not as heavy as she first anticipated, using his Earth weight as a measure. It was far easier to support him and keep moving. She needed to be cautious about his mass, but they were going slowly enough.

After another twenty minutes, they arrived at the lunar lander *Steamboat*. Annie watched as Milt ascended the ladder without difficulty. As he ascended, she did a last look for anything useful. She saw an unusual rock and grabbed it in her hand. *Who knows if this might be worth it*, she thought. She ascended the ladder and shut the door and began the power-up. Annie hoped that whatever had been responsible for them having to power down would not affect the power-up. Assuming that the power-down had something to do with radio communications, she ensured that all radio and radar transmissions were off.

She used a contingency trajectory so that she could fly it manually. Firing the engines, she guided the module toward lunar orbit. After a hundred kilometers of distance, “Okay, that’s a hundred. Get the radar and the S-band back on line.”

“I’ve got it,” said Milt.

“Let’s see what control has to say about this fiasco.” She touched the VOX switch and spoke. “Control, this is *Steamboat*, over.”

“*Steamboat*, loud and clear.” Cy sighed as he answered. “We had the telemetry feeds lock in a second ago. You look good, Mac, right down the contingency course.”

“Why the power shutdown and sudden departure?”

“We discovered that the mortars for the active seismograph experiment were never fired on the ALSEP. You had live rounds pointing toward your landing site. We had no way of telling if they were explosive rounds or not.”

“Good catch,” Milt answered.

“Yes,” Annie added.

“I’m glad we got you out of there,” Cy replied.

“One question,” Annie stated.

“Yes?” asked Cy.

“Who’s buying?”

* * * * *

Annie looked from the window of her hab toward the northwest and Fra Mauro, thinking to herself. It had been decades since she and Milton Johnson had evacuated the landing site. Cy and her home was about forty kilometers from Mitchell Town.

“Thinking about the mission again?” Cy asked as he handed her a sipper of coffee.

“How could you tell?”

“There aren’t many times you stare out that window without the subject coming up.”

“What the hell happened?” she asked, still trying to figure out the chain of events that led to the evacuation of Fra Mauro. No one had ever said anything directly, but she always felt she had the stigma of a failed mission.

“The best I can figure is that Nils and Milt didn’t do their homework about the active seismography experiment.”

“That’s the official line,” Annie grumbled. “They overlooked a mortar, goddamnit!”

“Mac,” Cy soothed, “take it easy.”

“And it was pointing at our ride home.”

“What do you expect, colonel? They are civilians, after all.”

“True.” She stared at her coffee. “It still makes me wonder, especially after what we discovered.”

“Oh, you mean our unofficial expedition to Fra Mauro.” Cy made quotes with his coffee-free hand.

“Yeah,” Annie looked to him. “Do you suppose?”

“If you were still on speaking terms with Milton, you could ask him.” Cy took another sip of coffee. “I need some help with the harvest. Can you give me a hand?”

“Sure,” she smiled. “I’ll be right there.”

End