A MARS ODYSSEY

BY

MICHEL POULIN

A MARS ODYSSEY

A science-fiction novel

By Michel Poulin

WARNING TO POTENTIAL READERS

THIS FICTION NOVEL CONTAINS SOME COARSE LANGUAGE UNSUITABLE FOR CHILDREN.

ABOUT THIS NOVEL

This novel is meant to describe the reasons, motivations, means and achievements that would eventually land Humans on Mars, where they could then establish viable settlements. As such, it is not meant to be some sort of space thriller or action novel, but rather to be a celebration of the human spirit of adventure and exploration.

BOOKS BY THIS AUTHOR

(Available free online at Free-ebooks.net, at Goodreads.com or on request by email to natai@videotron.ca)

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THE LOST CLIPPER

ODYSSÉE TEMPORELLE (novel in French)

FRIENDS AND FOES

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CHAPTER 1 – A WORSENING SITUATION

09:56 (Washington Time)
Tuesday, March 5, 2041
White House Situation Room
Washington, D.C.
U.S.A.

President Ronald Mason looked quickly around the large table and, seeing that everyone that needed to be present was in the Situation Room, nodded to the staffer standing ready to brief him.

‘’Now that we all are here, you might as well start, Mister Blake.’’

‘’Thank you, Mister President!’’ replied the State Department briefer before switching on the first slide of his briefing on the large digital screen set against one wall of the room. With a laser pointer in his right hand, he then started speaking in a measured tone.

‘’Mister President, ladies and gentlemen, this is the latest State Department update on the World situation as it refers to the progressive global warming and consequent rise in sea levels. Yesterday, the last line of dikes protecting what was left of Bangladesh, along with the Indian city of Kolkata, broke and let the sea in. With the situation in that region already catastrophic and with little local government resources left, the flooding that ensued swamped the totality of the Ganges Delta, including the cities of Dacca and Kolkata. The millions of refugees that had been sheltering in and around those two cities never had a chance to escape and were swept away by the incoming waves. Our estimates are that most of the 43 million people who were in that region are now dead.’’

Ronald Mason, a slightly overweight big man approaching his sixties, lowered his head for a moment, saddened by such a tragedy. Unfortunately, such tragic news had become way too common in the past few years, with the steadily rising sea levels and increasing global temperatures causing a litany of floods and droughts. Those floods and droughts had in turn cost the lives of hundreds of millions of people around the World. While the floods could be prevented, at great cost, by the building of defensive dikes, there was little that could be done about the droughts and accompanying high

temperatures, which burned down the crops on which so many people depended. Most of the Indian sub-continent, Arabic Peninsula, North Africa and parts of Southeast Asia were now routinely experiencing ambient temperatures above forty degrees centigrade, with spikes up to fifty or more degrees centigrade. Millions of people had died from the excessive heat, while tens of millions more had died from the famines caused by the droughts. The stampede by millions of refugees trying to find more livable places in other countries had further aggravated that chaotic World portrait. Shaking off those dark images from his mind, Ronald Mason looked back at the briefer.

‘’How are the Indian and Bangladeshi governments responding to this?’’

An embarrassed look appeared on the briefer’s face as he recalled the information he had himself read only a couple of hours ago.

‘’From badly to not at all, Mister President. In the case of the Bangladeshi government, it was already in a state of deep turmoil, with the various local politicians blaming each other for not dealing effectively with the situation. From the last report received from our embassy in Dacca, the government’s senior members either fled to higher grounds or were swept away by the floods, leaving nobody in effective charge. Our assessment is that Bangladesh is now probably finished as a viable country, with its agricultural system destroyed for good. The already insufficient arable lands are now under seawater and will not be able to raise crops afterwards even if the sea withdraws, due to salt contamination. As for the Indian government, it has had to deal with more than its fair share of ecological disasters during the past decade and the Indian Army and police forces are having a hard time dealing with multiple mass riots by starving refugees and rural populations dislodged by the floods and droughts. The latest disaster which erased Kolkata from the map may just be the one that will break the Indian government’s back. And that is not all for that region, Mister President. General Ismail Khan, who took power last year in Pakistan via a military coup, is apparently preparing to deal with the floods and droughts that also ravaged his country by getting ready to grab some higher, safer and cooler lands, namely parts of the Indian Punjab and of Kashmir.’’

From sad, Ronald Mason suddenly turned to irritated.

‘’Is Khan crazy or just dumb? Has he forgotten that India has at least as many nuclear-tipped missiles than Pakistan has? Does he really think that the Indians will give up such vital lands without a fight?’’

‘’Well, Mister President, satellite imagery is clearly showing us that the Pakistani Army has started to mass itself along the border with the Punjab and the Kashmir.

Maybe Khan is counting on the floods in India to distract the Indians and thin out the Indian Army units in or near the Punjab. To be fair, I must say that the Pakistanis are presently as desperate as the Indians and have little left to lose by attacking India. On the other hand, the Punjab, being located at high altitudes, is basically safe from floods and is notably cooler than the rest of the Indian sub-continent, two points that make it invaluable right now in terms of real estate to both the Indians and the Pakistanis.''

''True, but that real estate won't be worth much once it is contaminated with radioactive fallouts.'' replied Mason before looking at his secretary of state, James Barrow. ''James, once we are finished here, I want you to call Khan and try to put back some sense in him. Make him understand that he will gain nothing by starting a war with India now.''

''I will do my best, Mister President.'' said the graying African-American man, nodding his head once. Mason then looked back at the briefer.

''Sorry if I keep interrupting you, Mister Blake. You may continue.''

''Thank you, Mister President! In terms of new international developments linked to sea levels and global warming, these were the sole items on our agenda today, Mister President. However, numerous spots and situations are considered critical and we will keep a close watch on them. Those spots and situations were included in the last weekly watch list that you received, Mister President. Do you have any questions, Mister President?''

''Not at this time. I read the watch list and I must say that it makes for some grim reading. Thank you, Mister Blake! Jena, do we have anything new on the domestic front?''

The Secretary of the Interior, Jena Westwood, a tall and still very pretty woman at the age of 58, nodded her head at Mason's question.

''Yes, Mister President! The last group of citizens from New Orleans and the Louisiana coast has arrived in their new designated homes in Birmingham and Atlanta. Other displaced citizens from along the banks of the Mississippi are still streaming in and are being processed as quickly as humanly possible. However, this still makes over half of the states of Louisiana and Mississippi irremediably lost to the rising waters, with their arable lands contaminated by seawater. I am afraid that completing the relocation and rehabilitation of so many people will take lots of time and money, Mister President.''

''Yes, we went through the same drill six years ago, when we lost most of the state of Florida to the rising sea, and that despite all our efforts to build protective sea

walls. Short of a miracle that would make the sea lower to its original level of a century past, I am afraid that we will continue to experience such losses, both in lives and in infrastructures and lands. In fact, if I can believe the latest studies from the Environmental Protection Agency, we will continue to face rising sea levels and warmer temperatures, unless we can somehow reverse that trend by cutting the proportion of CO2 and other warming gases in our atmosphere. I know that our Ecological Corps is doing a fantastic job of building and putting in operation more and more atmosphere scrubbing towers, or ASTs, across the country, but this problem is truly a global one and not strictly an American one. Even if we do everything possible here, we will still be affected by the pollutants produced in other parts of the World. Let's just say that experience from the past couple of decades on that subject does not make me optimistic. We thus have to continue focusing on our 'Plan B', on top of doing what we can in America to reverse this global warming or at least stop it. Administrator Cardona, how is the Mars Home Project doing? Do you still get all the help and cooperation promised by Russia, China and Europe?''

The small but energetic Latino woman in her mid fifties who was the new head of the NASA cleared her throat before answering, speaking in measured words.

''I still am very pleased with the degree of cooperation and assistance that I get from them on the Mars Home Project, Mister President. As for the project itself, it is actually slightly ahead of schedule and within budget, thanks to the incredible efforts of its project manager and chief engineer and designer, Mister Robert Lithgow. That man is truly accomplishing miracles. As a result of his good work, the main section of our first Mars ship has been completed and will be launched in orbit in two months. Once in orbit, the other sections of the ship will follow up aboard our new heavy space shuttles, to be assembled together in low Earth orbit. If all goes well, the FRIENDSHIP should leave Earth's orbit in two years, on its way to Mars.''

''Hopefully, that trip will fare better than what happened to the Mars One Mission.'' interjected Vice-President Dana Crawford, a tough politician in her early sixties. Everybody around the table was silent for a moment as they reminisced about the tragic outcome of that doomed space mission. Meant to be the first manned Mars mission, with six astronauts due to land on Mars and do some ground exploration there, the Mars One Mission had been launched with great fanfare in 2032. That hoopla had however covered a litany of mistakes and politically-motivated bad decisions, as the chief motive to launch the mission had been more for the Washington administration of

the time to make the people forget about the growing threat of environmental disasters to come than to truly start the exploration of Mars. As a result, too few astronauts had been launched in too small a ship, with grossly insufficient anti-radiation protection and no rotating carrousels aboard to create some artificial gravity. The nine month-long trip to Mars had proven to be a Calvary for the six astronauts, with growing interpersonal conflicts, cumulative physical and brain damage from constant radiation exposure and progressive degeneration of their bones and muscles due to the effects of long term exposure to zero gravity. A powerful, unexpected solar storm in mid-trip had then dramatically increased the radiation dosage absorbed by the astronauts. When they had finally arrived in Mars orbit, still facing nearly two more years either on Mars or in space, the six astronauts were weak, sick and mentally diminished. The 'coup de grâce' to the mission however came when the astronauts went down in their lander capsule to set foot on the Red Planet. With their automated controls damaged by radiation exposure, the landing had been a lot more brutal than planned. The bones of the astronauts, already weakened by a long period in zero gravity, broke on impact at landing, incapacitating the unfortunate astronauts in their seats. Unable to move even inside their small lander, the six men had died a slow, painful death under the remote, sad eyes of Humanity. The sole good thing out of that disaster had been that the politicians in Washington had finally understood that such long, manned space missions were no place to cut corners or provide insufficient budgets. More importantly, a sensible, long-term plan with clear and justifiable goals was needed. Another result from that disaster had been a mass purge of NASA's top and medium levels administrators and the scrapping of its stuffy bureaucratic, cover-your-ass culture. What replaced them was inspired by the examples provided by the first pioneering commercial firms that had joined the space adventure, notably SpaceX and Virgin Galactic.

Getting over those sad souvenirs, Mason redirected the meeting on more mundane subjects, like budget appropriations and the continuing sea walls building and Atmospheric Scrubbing Towers programs. After another fifty minutes of discussions, the President called an end to the meeting, making the participants disperse back to their respective offices and buildings around Washington. Going back to the Oval Office, Mason went to the large windows behind the presidential work desk and spent a couple of minutes contemplating the Washington scenery while thinking. The capital had been built originally over low, swampy grounds, making it quite vulnerable to the rising sea

levels of the 21st Century. What had saved it up to now was a high sea wall that had been built at a huge cost in the third decade of this century, along with elevated highways to connect it to the higher grounds of the Appalachian Mountains to the West, where many of the original residents of the American East Coast had moved to when the waters had started to seriously rise. A similar solution had been used to save the major cities along the East Coast, but that had cost money, lots of money. That in turn had forced a massive shift in spending priorities at the federal level, a shift made mostly at the expense of military budgets. With the United States fighting for survival against the rising sea tides and hotter temperatures scorching its lands, the traditional World policeman role that the United States had assumed by itself could not be sustained and much of its military personnel and equipment had been recycled into an enlarged Army Corps of Engineers, which had then been renamed the 'Ecological Corps'. The Ecological Corps was now at the forefront of sea wall building and AST network expansion, plus was charged with disaster relief work and refugee relocation. The other major military powers of the planet, Russia, China and Europe, also having to fight large scale environmental disasters, had quickly imitated the United States in this, understanding that long term survival as viable nations was more important than short term gains via military means. Yes, there were still a number of small wars going on around the globe, but the days when the World population feared a World War 3 and a nuclear holocaust were well over by now. Only a few stubborn, radical governments, like the Pakistani one, still believed in the use of military force as a mean to survive and grow. Ronald Mason couldn't help then wonder if that new international spirit of peaceful cooperation would survive long enough to permit the Mars Home Project to attain its ultimate goal: the colonization of Mars and its transformation into a second home for Humanity in the Solar System.

CHAPTER 2 – A REAL NAIL BITTER

14:44 (California Time)
Friday, May 17, 2041
Launch Control Center, Vandenberg Space Center
California, U.S.A.

Despite his deep faith in the project he led, Robert Lithgow couldn't help feel somewhat nervous as he looked at the video image of the huge disk and its six booster rockets displayed on the giant plasma screen of the Launch Control Center, situated inside a bunker at the Vandenberg Space Center. While he had carefully reviewed every possibilities for a launch failure and done his best to prevent them, nothing in space exploration and travel was risk-free. One seemingly insignificant mistake or oversight could be enough to delay the launch of the main section of the Human Space Ship FRIENDSHIP or, worse, lead to its destruction and loss at launch. If that last thing occurred, then it would set the Mars Home Project back by at least three years. Worse, it could shake the political support that the project so depended on in the long term to achieve its ultimate goals.

Lithgow briefly looked to his right at the other important guests who had come to Vandenberg to watch this critical space launch. Maria Cardona, the NASA Administrator, was here of course, along with Doctor Misha Borisovich, the head of Roskosmos, the Russian Space Agency, Wang Lao Xi, the head of the Chinese Space Agency, Michel Dupré, the head administrator of the European Space Agency, and Shinzo Kurozawa, the head of the Japanese Space Agency. Normally, the head of the Indian Space Agency, which had participated in the development and design of the H.S.S. FRIENDSHIP, would have been present as well. Sadly, Doctor Chandra Sahriman was now dead, along with his whole technical team and more than half of India's population. Faced with an impending Pakistani land invasion of its parts of Kashmir and of the Punjab, the Indian government had issue an ultimatum to Pakistan to cease and desist, to which General Khan had replied by launching a 'preemptive' nuclear strike on India, concentrated against the main cities and military bases east and

south of the Punjab. With over 140 Pakistani nuclear-tipped missiles in the air and with dozens of Pakistani combat aircraft loaded with tactical nuclear bombs flying into Indian airspace, the Indian government had no other option but to launch a retaliatory nuclear strike of its own on Pakistan. The subsequent explosion of over 290 nuclear warheads around the Indian Sub-Continent had killed instantly tens of millions of Indian and Pakistani citizens, with hundreds of millions more dying from radiation exposure in the weeks to follow. The radioactive fallouts, apart from irremediably contaminating most of the arable lands in both countries and ensuring mass famines in the near future, had also played havoc with a number of neighboring countries, contaminating vital agricultural lands, forests and rivers and forcing the mass evacuation of millions of Iranian, Afghan and Burmese citizens. Ismail Khan, the man who had started it all, had then compounded his stupidity with cowardice, fleeing by plane to China and abandoning his people to its grim fate. However, instead of being given refuge by the Chinese, who had been up to now his allies, Khan had been summarily executed on arrival by the furious Chinese, who were also suffering indirectly from the nuclear war that had happened on their doorstep. Sadly, that lone act of justice could not erase the fact that over a billion people had died in the last month, while tens of millions more would die from either famine or radiation poisoning during the next few months. Robert Lithgow momentarily felt a flash of anger as he remembered some of the cruel, racist comments he had heard on some of the most extreme right wing American radio stations, in which a few radio talk show hosts and their listeners had exchanged gleeful comments about the nuclear destruction of India and Pakistan, calling the deaths of over a billion people ‘an overdue culling of excess population’. However, the storm of public outrage that had followed had shut up those racists and even forced the closure of two of the most extreme right wing radio stations.

Chasing away with difficulty those awful souvenirs, Lithgow concentrated his attention back on the giant disk resting vertically on its edge, supported by six big integrated rocket-ramjet engine pods attached at the vertical to its underside and topside. The disk section itself, which had a diameter of 190 meters and a thickness of 36 meters, was capped with an aerodynamic cover along its top edge. That cover would prevent damage from air pressure and friction heat as the assembly would rise and take up speed within the atmosphere. It would also help make its flight more economical in fuel by virtue of its shape, which would make the disk section form an airfoil with

appreciable aerodynamic lift coefficient and would cut drag as well. The cover would then be jettisoned before the disk section attained Low Earth Orbit, or LEO. As for the rocket-ramjet engine pods, they were essentially similar to the engine pods used by the new fleet of heavy cargo shuttles now in NASA service. Once their work of orbiting the disk section would be completed, the six integrated engine pods were going to detach themselves from the disk section and then individually reenter the atmosphere, to return and land in Vandenberg, which was now the prime space launching base in the United States. Cape Canaveral and its huge space complex had unfortunately been lost six years ago, along with most of the state of Florida, when it had been submerged by the rising sea.

''ONE MINUTE TO LAUNCH!... THIRTY SECONDS TO LAUNCH!... TEN SECONDS TO LAUNCH!... FIVE, FOUR, THREE, TWO, ONE! IGNITION!''

Lithgow felt Maria Cardona's hand search for his right hand and then press it nervously as the final seconds of the countdown were called. In response, the systems engineer and astrophysicist gave her a reassuring smile.

''Everything will be fine, Maria.''

He didn't have time to say more before the overhead speakers of the launch control room suddenly blared with the powerful rumble of six engine pods coming to life simultaneously, while huge flames came out of their exhaust nozzles, to be deflected sideways by specially built concrete-lined trenches. With a total initial thrust of 52,000 metric tons from the chemical rocket engines of the six pods, which burned liquid oxygen and RP-1[1], the huge 42,000 metric ton assembly, 16,000 tons of which was the disk section, started rising vertically at once from its launch pad. With nearly everyone in the launch control room excitedly shouting encouragements, the disk and its six engine pods quickly acquired speed, accelerating continuously as the volume of air entering the pods via their forward intake nozzles increased with speed, boosting further the mighty thrust of the engines via what was called 'ram air effect' and also making the engines more fuel efficient.

''GO, FRIENDSHIP, GO!'' shouted Maria Cardona as the main section of her future spaceship reached the speed of sound while still climbing and accelerating. Once

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[1] RP-1 : A form of refined kerozene fuel that is commonly used by many types of liquid chemical rocket engines, mixed and burned typically with liquid oxygen.

at a speed of Mach 2.1, the six integrated engine pods switched to nearly pure ramjet mode, injecting liquid hydrogen inside the ramjet tubes surrounding the chemical rocket engines, while the rocket engines throttled down to idle. The hydrogen, vaporized by the air heated via compression after entering the intake nozzles, helped greatly lower the temperature of that ingested air, thus improving the efficiency of the ramjet part of the engine pod. It was then mixed with the oxygen in the atmospheric air and ignited, creating huge thrust while operating at a fuel efficiency rate, or specific impulse in aerospace parlance, much greater than that of any pure chemical rocket engine. The ramjet engines went on until the big structure reached a speed of Mach 5.5 and an altitude close to 30,000 meters, where the air started becoming too rarefied to let the ramjet function. Then, the liquid oxygen and liquid hydrogen chemical rocket engines of the pods ignited, taking over at an altitude where they could perform much more efficiently than at sea level. That ultimate thrust phase finished pushing the main disk section into its initial low Earth orbit, where the six integrated engine pods detached themselves under remote control and started flying back to Earth, where they would be inspected, refurbished and reused for other launches. The aerodynamic nose cover also detached itself a few seconds before that moment, but went down only to burn on reentry, as planned.

More wild cheers greeted the reaching of low initial orbit by the main section of the H.S.S. FRIENDSHIP, prompting Lithgow and Cardona to exchange happy handshakes and hugs with their foreign colleagues. Misha Borisovich in particular proved quite effusive, in line with his reputation for joviality and cheerfulness. He nearly crushed Maria Cardona in his arms when he cheerfully hugged her while celebrating the success of the launch.

‘’We did it, Maria! We did it!’’

‘’I know, Misha, but could you press a bit less strongly?’’

‘’Oh, sorry!’’ said the Russian astrophysicist, who was built like a bear. ‘’Still, to launch in orbit such a huge mass, and this without a single hitch. It must be a record.’’

‘’It is a record, Misha, and one that we can be extremely proud of. However, there is still a lot more to be done before we can send the H.S.S. FRIENDSHIP towards Mars and even more to be done before we end up with a self-sustaining colony on Mars. Hopefully, we will be able to achieve all that before Humanity destroys itself through sheer stupidity and lack of vision.’’

‘’Or is able to reverse this damn global warming and make the sea lower to its previous levels.’’ added Michel Dupré, of the European Space Agency, or ESA. Robert Lithgow nodded his head at that but inserted a comment of his own.

‘’That would definitely be nice to see, but even then I hope that our political leaders will understand that this project must be brought to its ultimate end state: a viable, self-sustaining colony on Mars. This global warming crisis was brought on by us, through our own lack of common sense. There is no way to know what other stupidity we will do in the future that could kill for good Earth’s ecosystems. We need to invest into space colonization, no ifs or buts!’’

‘’I fully agree with you, my friend.’’ said softly Misha Borisovich. ‘’Right now, we still don’t know the true extend of the damage done worldwide by that stupid Indo-Pakistani Nuclear War. As things grow worse, with seas rising and temperatures increasing, more such follies could easily happen.’’

The group slowly nodded their heads at those words before Robert Lithgow clapped his hands together and smiled to the others.

‘’Well, enough about the doomsday talk! How about if we go celebrate this success in style? I know a very good restaurant near the base where we could have supper together. I’m paying!’’

‘’Well, in that case, what are we waiting for?’’ exclaimed Borisovich, making the others laugh.

02:46 (Greenwich Meridian Time)

Monday, May 20, 2041

NASA light space shuttle AURORA

On approach to the H.S.S. FRIENDSHIP’s main section

Low Earth orbit

‘’Shuttle AURORA on final approach to docking station Alpha of main FRIENDSHIP’s section. Fifty meters and closing!’’

Denise Wattling, who was piloting the light shuttle, waited until her craft was within twenty meters before speaking again to the Vandenberg controller via radio.

‘’Going down the glide path nicely, autopilot and automated approach system fully synchronized. Approach speed: 0.4 meters per second… Five meters to docking port… Docking clamps engaging!’’

Denise then pressed a couple of buttons in sequence, tightening the docking clamps to render the docking collar airtight, then filling the nose airlock with warm, breathable air. She nodded her head inside her spacesuit's helmet when an indicator light turned green.

''Nose airlock pressurized! We are now going to go inside FRIENDSHIP.''

''Understood, AURORA! Proceed at your own pace.'' replied the NASA controller. Denise then looked at her team leader, Mark Dempsey, sitting in the copilot's seat.

''We can go inside the ship, Mark.''

''Good! There is quite a lot to do for us in there.''

Dempsey released the safety harness of his seat, then got up and put one boot down on the deck plate between the two forward seats of the light shuttle. As was now standard in all spacesuits, be they produced in the United States, Russia, China or Europe, the soles of his boots had a number of small permanent magnets incorporated into them. That allowed astronauts to cling to a spacecraft or ship's decks, which were lined with very thin steel sheets. While that cost a bit in terms of mass, the fact that one could move and walk nearly normally even in zero gravity conditions made working and living in space so much easier. Even the soles of the astronauts' inner slippers incorporated small magnets, for the same reason. Being cautious not to walk at a too brisk pace and thus risk breaking completely contact between the deck and his boots, the activation team's leader walked down the wide central aisle of the light shuttle, passing by the seven members of his team who were sitting in their padded, crashworthy seats.

''Come on, guys and girls: time to get to work!''

Imitated by Denise Wattling, who put her shuttle into dormant mode first, the members of the activation team got out of their seats and followed Dempsey down to the lower deck, where the airlock chamber of the nose docking ring was situated. Double-checking first that the airlock was properly pressurized, Dempsey then opened its wide, aluminum alloy door and entered the airlock. He let two members of his team join him, nearly filling the airlock, then gave a couple of orders.

''Seal your suits! Omar, close and secure the airlock's door.''

In theory, and with all instruments indicators telling him that the airlock on FRIENDSHIP's side was pressurized, he could have simply left both doors of the shuttle's airlock opened, thus accelerating greatly the rate at which his team members would enter the huge main section of the spaceship. However, instruments could go wrong for all kinds of reasons, while a bitterly learned lesson about space work was that

about anything could happen at any time with little or no warning. He thus was resolved to play it safe all the way on this mission and not risk unnecessarily the lives of his team members. Once Omar Kawaji had closed back the shuttle's inner airlock door, Mark opened the outer airlock door and glided inside the transfer chamber of the docking station's airlock, followed by Roberto Calderon and Viktor Ponichnikov. He waited until Viktor had secured the shuttle's airlock' outer door before unlocking and opening the outer door of the spaceship's airlock, revealing a wide chamber big enough for ten astronauts in spacesuits to stand in. All three astronauts then glided inside the spaceship's airlock chamber and planted their boots on the steel-lined deck, with Viktor closing and securing the outer door before Mark spoke in his helmet's microphone.

''The spaceship's airlock is confirmed as pressurized. The rest of the team can now come in.''

''Understood!'' replied Denise Wattling, who was the second-in-command of the team, on top of being the pilot of their shuttle. Less than four minutes later, all nine members of the team were together in the spaceship's airlock, with the outer doors of both the ship's airlock and of the shuttle closed. Mark paused for a second before opening the inner door of the airlock: they were about to enter the largest space structure ever put in orbit. He then corrected himself: that space structure was still incomplete, with many more sections to be added to it before it became a fully flyable spaceship.

The activation team members were happy when they were able to finally open the visors of their spacesuits' helmets once inside the large reception area of the docking station: No matter how well designed a spacesuit was, there was always a claustrophobic element to them. At this time, however, the reception area, like the rest of the ship, was only dimly lit by secondary lights powered by the solar panels that had deployed out of the main disk section once it had attained its parking orbit. They would have to activate first the main and secondary nuclear reactors of the spaceship before the main disk section could be fully powered up. Mark Dempsey thus looked at Viktor Ponichnikov, the nuclear engineer loaned to this mission by Roskosmos, the Russian space agency.

''Viktor, you take Max with you and go activate the two nuclear reactors of the spaceship. I will go with Denise to the central command section to activate the other

ship systems from there, while Jiang Min will lead the rest into the carrousels to remove the braking clamps, so that we could initiate their rotation. Let's go!''

The team then started walking down the seventy meter-long padded tube that linked Docking Station Alpha to the central axis section that contained both the central command section and the nuclear reactors' compartments. Twenty meters down the tube, five of the team members, led by Jiang Min, split from the rest of the group and entered a side airlock that led to the contra-rotating carrousels of the ship. The two huge carrousels, which actually worked like rings running on circular racetracks rather than carrousels with moving spokes, were each contained in adjacent but separate, airtight sections, so that any accidental decompression would not endanger both carrousels. Jiang Min, a member of the Chinese Space Agency, knew pretty much everything about those carrousels, as his own father had designed what was possibly one of the most critical components of the H.S.S. FRIENDSHIP. One reason for the failure of the previous Mars One Mission had been the poor health on arrival on Mars of the astronauts, partly due to the long time spent traveling in zero gravity conditions. Thus, incorporating some sort of a rotating carrousel section into the next generation of spaceships, so that some artificial gravity could be created via centrifugal effect, had been one of the prime lessons from that tragic failure. The genius of Min's father, Jiang Chao, had been to do away with the space-consuming moving spokes that came with classic carrousels. Struck by the sight of open cars going up and down a roller-coaster track at an amusement park, Chao had adapted the roller-coaster concept to a spaceship design, with a system of two airtight rectangular-section rings turning smoothly in opposite directions inside circular tunnels, using magnetic cushions similar to those of high-speed maglev trains. This eliminated the need for heavy and complicated rotating spokes and their supports, with their problematic central axis seals around their base rings. It also insured a complete separation, pressure-wise, of the two carrousels, or 'running rings', as Chao preferred to call them. The compactness of the design had also permitted design engineers to surround them with various auxiliary systems and hydrogen fuel tanks, which gave the carrousels precious and effective anti-radiation protection against space radiations, including deadly energetic cosmic rays. Finally, it greatly simplified internal circulation aboard the spaceship, with crewmembers not having to go down a long, rotating communication spoke and then go up another one just to go from one carrousel to another. Instead, crewmembers could do like Jiang Min was now doing, stepping inside a transfer compartment and then going four meters

down a tube with a metallic ladder. He and his four companions ended in a three meter-wide by four meter-long compartment featuring two airtight doors, one at each end but on opposite corners. A few small armored windows gave the astronauts a view into the two dormant carrousels, both immobile and obscure save for the sparse light from secondary lamps.

‘’Alright, follow me, friends!’’ said Jiang Min before opening the inner door of the airlock giving access to the forward carrousel. Once his whole group was inside that airlock, he secured the inner door and checked on an indicator panel that the forward carrousel was effectively pressurized and that its air was breathable. Only then did he open the outer door, which swung inside the airlock, and set foot on the narrow platform adjacent to the edge of the top level deck of the forward carrousel, also known as the Promenade Deck. Looking left and right, he saw the apparently endless floor of the Promenade Deck, which curved gently upward on both sides along the circumference of a circle with a radius of 65 meters. That deck was a full seven meter-wide and its ceiling stood over four meter-high, giving it a very generous internal volume compared to that of even orbital space stations. There were however three additional decks under this one, while another, similar carrousel stood on the other side of an airtight wall separating the two carrousels. Keiko Minegumi smiled with contentment as she eyed the vast carrousel space.

‘’This is great! Such vast spaces should do wonders for the morale of the future crew of the FRIENDSHIP. And to be able to travel as well while feeling close to one G of artificial gravity along the whole trip to Mars will prevent so many health issues.’’

‘’Those were exactly the reasons that pushed our respective space program managers into requiring that this ship have contra-rotating carrousels, Keiko.’’ said Min. ‘’However, those carrousels won’t start to rotate by themselves, so let’s get to work! Keiko, Roberto, you come with me down the left side. Benjamin and Omar, you go down the right side. Remember, we have a total of eight braking clamps to disengage on both sides. We will meet again here once we complete our tour around this carrousel.’’

On their part, Mark Dempsey and Denise Wattling went down the communication tube all the way to the central axis core section, which contained the most vital systems of the spaceship deep within its bowels and well protected against the most penetrating radiations. They again had to open an airtight door before exiting the tube and entering the core section, carefully closing it back before proceeding further: in space, safety

rules, while sometimes appearing to be inflexible, always had a clear purpose and one only ignored them at their peril. Securing back every airtight door you went through was possibly one of the most primordial of those safety rules. Using their magnetic soles to walk along the surfaces of the compartments they went through, the pair soon arrived at a section surrounded by a water-filled jacket. That section, which contained the command and control systems of the spaceship, was also meant to act as an ultimate anti-radiation citadel for the crew in the case of abnormally powerful solar storms or cosmic ray shower. Even the access hatch to that section had its own water jacket, making it distinctly heavier than the other airtight doors in the ship. Going through that hatch and closing it, the two astronauts then floated to the airtight door of the command center proper and entered that compartment, which was filled with work stations, status display screens, computers and padded seats. Mark Dempsey went first to the work station reserved for the duty engineer and strapped himself in its seat, while Denise Wattling went to the communications station. The first thing Mark did was to check on the auxiliary power systems, to see if all the solar energy panels of the spaceship had properly deployed once the disk section had attained parking orbit. To his satisfaction, all of the solar panels, along with the multiple radiator panels, had deployed correctly.

‘’Excellent! Even without the nuclear power plant online, we already have enough juice to light up the inside of the ship. Let there be light!’’

Throwing in succession a series of switches, he was rewarded by the main ceiling lamps of the compartment lighting up. Throwing another series of switches turned on the ventilation and air recycling system of the central core section.

‘’It is now safe to open our visors, Denise.’’

‘’Thanks! On my part, I am in audio and visual communication with the other members of the team. I am now switching on the internal and external surveillance cameras of the ship.’’

Mark was about to ask a question to Denise when the instruments on his work station registered a sudden and massive surge in electrical power on the main circuits. That prompted him to call Viktor Ponichnikov, who had gone to the main reactor plant with Max Kruger.

‘’Hey, Viktor! That was some fast work!’’

‘’Hell,’’ replied the Russian nuclear engineer, ‘’I only had to throw a few switches and power breakers! No need to praise me for so little.’’

‘’Alright then, I will say instead that you simply did your usual, barely adequate work, Viktor.’’

The noise that the Russian made in response made Mark and Denise laugh briefly. With plenty of electrical power now at hand, Mark next contacted Jiang Min and his team.

‘’Min, this is Mark. How are you doing in the carrousels?’’

‘’We have taken off up to now five of the rotating brakes of the forward carrousel. I will call you back when both carrousels will be ready for rotation. By the way, thanks for the extra lights and powers.’’

‘’Thank Viktor for that!’’

Mark and Denise then concentrated on running a long, extensive checklist of systems, making sure that the powerful vibrations caused at launch had not disconnected some wires or shaken some equipment loose. They were still going down their checklist when Min called back twenty minutes later.

‘’Mark, this is Min! All the rotating brakes have now been released. We are ready to start the rotation of the carrousels.’’

‘’Excellent! Just brace yourselves at first, in case of some glitch.’’

‘’We are all strapped into seats on the top deck main promenade, Mark. You may go ahead now.’’

‘’Understood! Powering up the magnetic cushions and rotation motors now!’’

Mark watched like a hawk the various indicators connected to the rotating carrousels as he very gradually powered them up. His biggest fear was that the strong vibrations at launch would have deformed the rings or their running tracks, thus making useless a vital part of the ship. To his relief, everything seemed to be working smoothly at first.

‘’Min, how are things sounding and feeling out there?’’

‘’I can hear the soft humming of the magnetic motors and I also can feel a growing sensation of gravity here. Keep going!’’

Encouraged by those words, Mark continued to gradually augment the rotation speed of the carrousels, until they attained their normal operating speed of 3.7 revolutions per minute.

‘’How’s that now, Min?’’

‘’I can tell you that we are now feeling a centrifugal force of 0.84 G here on the Promenade Deck of the forward carrousel. Ben, how are things in the aft carrousel?’’

Benjamin Weiss answered Min nearly at once on the radio.

‘’Our carrousel is also rotating smoothly, with a local felt centrifugal force of 0.84 G. Me and Omar will now go configure the inside of our carrousel for rotating status.’’

‘’Acknowledged! I will do the same here with Keiko and Roberto.’’ replied Min.

‘’Great work, all of you!’’ said Mark on the radio. ‘’And that includes you, Viktor! You may now go to your assigned cabins and get out of your spacesuits before continuing your work: it will make your jobs a lot easier to be in light internal suits.’’
Mark next looked at Denise, still sitting at the communications station.

‘’You may go to your designated cabin now and take off your spacesuit before coming back here. I will man the communications with Vandenberg in the meantime.’’

‘’Thanks, Mark! I will make it quick.’’

The tall blonde ex-fighter pilot got up from her padded seat and floated out of the command center, then went to the circulation tube connecting the core section with the third quadrant of the disk section. Denise chose to continue floating while negotiating the tube for fifty meters, as she loved to go around in zero gravity. Then transferring into the forward carrousel, she walked part of its top deck circumference, going to the secondary staircase leading down to the portion of the second deck where her assigned cabin was situated. Along the way, she couldn’t help admire and appreciate the décor of the Main Promenade: everything had been done to provide the crew of the H.S.S. FRIENDSHIP with an environment that would do the utmost to make them forget that they were actually in a spaceship on a trip away from Earth. Ultra-large, Super High Definition 3-D displays made to look like windows giving views to the outside, showed a variety of beautiful Earth sceneries, complete with appropriate soundtracks of wind blowing and birds singing. The displayed videos were actually films recorded in situ on Earth and covering in real time over a year of constant filming, adding a touch of seasonal changes to the reality of the scenery displayed. The furniture along the promenade, while made with lightweight materials, had been designed to look like old-fashioned furniture instead of the techno look too common on orbital space stations. Denise actually passed by displays showing the city of Paris at night, as would have been seen from one of the observation decks of the famous Eiffel Tower, as she approached the stairwell that was her destination. Those views of Paris also were quite appropriately displayed in the area occupied on the Promenade Deck by the bar-lounge of the ship, with soft accordion music reminiscent of the 1920s piped out by an overhead speaker. Further on the Promenade Deck, Denise could see the area of the crew

cafeteria, which had been made to look like the inside of a classic road-side American dinner restaurant, complete with partitioned booths with tables and padded benches, while the display screens in that section showed the panorama of a Midwest prairie, with a busy highway running by the dinner.

‘’This is as close to a dream spaceship as I will ever see.’’ Said Denise to herself as she went down the stairs leading to the second deck, where individual crew cabins were. Her own cabin, numbered 047, shared a bathroom with the adjacent Cabin 048 and was situated only ten meters from the foot of the staircase leading up to the Promenade Deck. Pushing open the sliding door of her cabin, Denise stood for a moment in the doorway while eyeing her personal accommodations. Her cabin was actually configured like a mini-suite, with a small lounge with a sofa, work desk and wall entertainment unit next to the entrance. Crossing the lounge in four wide steps, she entered the adjacent bedroom, a compact affair containing a fairly large bed with storage drawers underneath, a clothes closet with storage shelves and an airtight compartment with a solid door meant to act as an emergency refuge in case of a sudden, catastrophic decompression. That emergency compartment also acted as a storage locker for one spacesuit, something that allowed Denise to get out of her own custom-fitted spacesuit. Now wearing a two-piece internal ship outfit and a pair of soft slippers with magnetic soles, she took out of one of the drawers under her bed the large personal effects bag that had been stored there before the launch of the disk section and that contained her spare clothes, personal things and hygiene kit that would help her spend the next two months aboard the spaceship. She then used a couple of minutes to distribute her things between her bedroom closet, the drawers of her lounge’s work desk and the small cabinet reserved for her use inside the common bathroom she would share with Keiko Minegumi, the assigned occupant of Cabin 048. That bathroom was small but it did contain a standard flush toilet, a sink and counter and a shower stall, plus a padded bench to sit down, plus wall hooks for towels. The toilet and sink were meant to be used only when the carrousels were rotating and providing artificial gravity, but a zero gravity toilet stall was situated thirty meters down the hallway, in case of a malfunction of the carrousels. If that ever happened, then a safety cover would automatically slide in place over her flush toilet and sink, preventing their use. The last touch that Denise put to her cabin before leaving it was to hang from a pre-installed wall hook a framed picture of her parents. At the age of 38, she still was not married and had no children, as she had concentrated her life on her career as a fighter pilot first, then on her second career as

an astronaut. In this, Denise was far from being an oddity in NASA's Astronaut Corps. Once she was satisfied that everything in her cabin was in order, she left to return to the command center and replace Mark Dempsey there.

07:13 (GMT)

Crew cafeteria, Promenade Deck of the forward carrousel

The nine astronauts joined back together at the crew cafeteria for breakfast, or for whatever kind of meal their stomach felt like having, as the official ship time, synchronized with the Greenwich Meridian, was eight hours ahead of the local time at Vandenberg Space Base, from where their light shuttle had taken off. While the cafeteria of the H.S.S. FRIENDSHIP was equipped to serve a wide variety of food, either fresh, freeze-dried or out of tin cans, its pantry and cold room was presently mostly empty, as the disk section had to be as light as possible initially for its launch into orbit. However, a couple of tons of foodstuff and beverages had been stored aboard prior to launch, so that Dempsey's team could have something to eat during their two month-long stay. Heavy shuttles would come later to fill the storage rooms of the ship, bring to orbit the remaining sections of the FRIENDSHIP and fill its fuel tanks.

Denise finally decided to go for a supper menu after reviewing the list of rations available and selected Chicken à la King with rice for her meal, along with a glass of fresh milk. Ripping open the two pouches containing the two main components of her meal and pouring their content in a deep, partitioned plastic food tray, she then put the tray inside one of the microwave ovens lining one of the service counters of the cafeteria, heating her food before grabbing her tray and glass of milk and walking to one of the booths of the cafeteria. Seeing Mark Dempsey already sitting in a booth and eating with Viktor Ponichnikov, she decided to join them and went to their booth, stopping beside it and smiling to the two male occupants.

‘'Would you guys mind if I sit at your table?''

Viktor gave her an amused smile on hearing her question.

‘'And why would we refuse to eat with one of the only two women aboard, and a pretty blonde at that?''

‘'Ha! I smell an ulterior motive in your answer, Viktor.''

‘’Well, I am a nuclear engineer and I like to plan things in advance. That goes both on and off work for me. Please sit, Denise.’’

Denise put her tray, utensils and glass down on the table before sitting next to Mark Dempsey, facing Viktor. A quick look told her that the Russian had gone for a supper of Beef Stroganoff, while Mark had selected a steak with mashed potatoes.

‘’I see that you guys went for substantial meals, rather than for breakfast menus.’’

‘’Hey, we did work hard and accomplished a lot in the last few hours.’’ replied Mark, a 43 year-old systems engineer who had built a successful private career for himself before a NASA recruiter had convinced him to join the space agency. ‘’And we still have lots left to do, so why stay hungry? After all, the ship’s gymnasium is well equipped and we could burn there any excess calories that we eat.’’

‘’You know that there is a nicely equipped sauna and baths section next to the gymnasium, right?’’ said Viktor while looking with a malicious expression at Denise. ‘’There are also massage tables and even bubble baths there.’’

‘’Hum, you definitely have ulterior motives, Viktor…but I would be happy to sink into a hot tub with you and the rest of the gang tonight.’’

That made the Russian rub his hands together, while glee showed on his face.

‘’Yes! The more people, the merrier!’’

‘’Please excuse him, Denise.’’ cut in Mark with a smirk. ‘’They found him somewhere deep in Siberia, so he is somewhat lacking in social skills.’’

‘’That’s alright with me, Mark: I appreciate lonely, sex-starved men from deep in the woods and snow.’’

Keiko Minegumi and Roberto Calderon, who were eating at the booth across the aisle from their booth, obviously heard that and gave falsely indignant looks at Denise.

‘’Denise! I didn’t know that you were like that!’’ exclaimed the Spaniard before lowering his voice and adding in a conspiratorial tone. ‘’Can we join you in the hot tub tonight?’’

‘’Only if Keiko comes in as well.’’ replied Denise, straight-faced, before bursting into a giggle. ‘’God, this really sounds risqué, isn’t it?’’

‘’The more risqué, the better!’’ said Viktor. ‘’Hey, our respective space agencies have been too hypocritical and prudish for too long on the subject of sex in space, so why not push the envelope a bit now? With the incredible facilities aboard this ship and its artificial gravity environment, most of the old excuses to ban sex in space no longer hold water.’’

Keiko Minegumi, a pretty, 36 year-old computer scientist, bent towards Viktor while pointing an accusing index at him.

‘’I heard that some unspeakable things happened in orbit years back, aboard your MIR space station, Viktor. You wouldn’t know anything about that, by chance?’’

The jovial Russian put on a falsely offended expression at that question.

‘’Me? Why would I know anything about those space sex experiments?’’

That declaration made the whole group break out in laughter. Holding her own laughter with difficulty, Denise shook an index at the Russian.

‘’Viktor, you are a real pervert!’’

‘’And a proud one at that! This however leaves an existential question to answer.’’

His four companions looked at each other with confusion, until Roberto asked Viktor about it.

‘’And what would that question be, by chance?’’

‘’Simple: do we bathe together tonight with or without bathing suits?’’ replied the grinning Russian, winking twice. A concert of ‘OOOHH’ then came from the four other members of their team, who had been eating in nearby booths and had been listening with widening grins to the exchange. Denise then answered Viktor while keeping a straight face.

‘’That’s easy enough to answer: I didn’t bring a bathing suit with me.’’

‘’OOOOOHHH!’’

19:50 (GMT)

Baths and saunas section, aft carrousel

H.S.S. FRIENDSHIP

Low Earth orbit

‘’God, all my muscles are aching from moving around and unpacking so many storage crates!’’ groaned Roberto Calderon as he slowly slid down in the hot, bubbling water of the communal tub, in which Viktor Ponichnikov and Mark Dempsey already soaked. While Roberto and Viktor had come fully naked, Mark, as a married man with values that were a bit conservative, was wearing a swimming trunk.

‘’Maybe we should lower a bit the rotation speed of the carrousels, to decrease the felt gravity when we have some hard physical work to do.’’ suggested Viktor, making both Mark and Roberto nod their heads.

‘’Not a bad idea, actually.’’ said Mark. ‘’It would certainly help us in those physical jobs, while it won’t really impact the living conditions aboard. A temporary decrease to a felt gravity of 0.5 G should do the trick.’’

‘’I agree!’’ said Roberto, who was then silent for a moment, apparently thinking, before he spoke again. ‘’You know, this brought back to my mind a question that I have been asking myself for months now.’’

‘’Oh, and what would that question be?’’ asked Viktor.

‘’It is about the felt gravity on Mars. As you all know, it stands at 37% of Earth’s gravity, or 0.37 G. Now, if we are going to establish a human colony on Mars, its future inhabitants will be living permanently in a 0.37 G environment.’’

‘’So?’’ said Mark, not seeing yet Roberto’s point.

‘’So, that means that any Mars colonist who would be born on Mars and would grow up there would basically be unable to go to Earth and live there or even visit normally: he or she would be too weak and fragile in terms of muscle mass and bone structure to be able to withstand Earth’s gravity and would probably end up going around in a wheelchair or using an exo-skeleton force multiplier. Basically, future Martians would not be able to visit Earth. Now, what could we possibly do to prevent such an outcome?’’

‘’Hum, you are raising a very valid concern here, Roberto.’’ said Viktor, caressing his short, carefully trimmed beard. ‘’The obvious solution at first would be to use centrifuges to keep Martian citizens accustomed and fit to endure Earth’s gravity, but such centrifuges typically weigh tons, consume a lot of power and space and you would also need thousands or even tens of thousands of them to accommodate every Martian in, say, a hundred years or so. Not what I would call a very practical solution.’’

The trio was then left silent for a moment as they thought that problem over. Roberto finally spoke slowly, obviously still thinking about the problem.

‘’Maybe I should talk with Min about this: his father designed the ‘running ring’ system that we use as a carrousel aboard. Maybe he could ask his father to think about that problem?’’

‘’That’s actually a good idea, Roberto: Jiang Chao is universally considered a true genius when it comes to applied physics engineering. You should talk with Min about that tomorrow.’’

‘’I’ll do that! We…’’

Roberto was cut short by the entrance in the hot tub compartment of Denise Wattling and Keiko Minegumi. Both wore large towels wrapped around their bodies, towels that covered their chests, bellies and groins. Viktor was starting to feel some disappointment at seeing them covered, until both women let drop their towels, ending completely nude, before sitting down on the ledge of the tub and sliding down slowly into the hot, bubbling water. Denise gave an apologetic smile to Mark as her firm breasts sank under the water.

‘’Sorry if this could embarrass you, Mark, but I really didn’t bring a swimsuit up in orbit with me. As for Keiko, any good Japanese will tell you that a hot bath must be taken nude.’’

‘’That’s right!’’ confirmed the computer scientist. ‘’Communal hot baths are an old tradition in Japan and having men and women mix in is considered quite normal there.’’

‘’Who are we to dispute such a healthy practice?’’ replied a smiling Viktor, who then nudged a bit closer to Denise. He was pleased to see that she didn’t move away then and didn’t show any sign of discomfort or tension. However, he didn’t go closer still, not wanting to push his luck or incommode the tall blonde. Instead, he deviated the conversation by telling Denise and Keiko about Roberto’s misgivings about the ability of future Martians to withstand Earth’s gravity. His diversion worked, with both women making comments and suggestions of their own for the next minute or so. The conversation soon turned into a kind of round-table meeting about the work done that day and what was next on the to-do list for tomorrow. After a half hour or so of conversation, Mark decided that he was starting to feel like a cooked lobster and excused himself for the night before climbing out of the tub and walking out. Denise then pushed herself up by a few centimeters, making her nipples rise to just under the surface of the bubbling water. Viktor got her silent message and snuggled closer to her, until their shoulders touched each other. Seeing that, Roberto took a chance and moved closer to Keiko. The Japanese woman didn’t object to that and smiled to him.

‘’We discussed enough about work already. How about talking about us instead?’’

‘’A good idea, Keiko. What would you like to know?’’

‘’Well, I already know that you are single, with no children. That is a bit surprising for a man as handsome as you. Are Spanish women immune to your charms?’’
That last question brought a grin on the face of the Spanish aerospace engineer.

‘’Hardly! The truth is that I love my job and am quite dedicated to it. Watching around me what happened to the marriages of other dedicated engineers I know, who worked long hours and were often absent from home, like me, convinced me that marrying would mean having to spend much less time at work. While I am not a workaholic, I do take the time needed to make the best job I can. A marriage for me would thus probably end eventually in a divorce or separation, something that I would hate to see ever happen. Thus, I continued concentrating on my job. I do date occasionally women, of course, but I always tell them that there could be no future to it. This is even truer now that I will be in space for long periods.’’

‘’Well, you are honest about it, Roberto, something I like. In Japan, we have a similar situation: many men still follow the old work ethics mentality of the so-called ‘company salary man’. They work long hours, mostly to look good to their bosses, then go drink with their male work comrades until the late hours of the night, before returning stone drunk to their homes. In the past decades, the Japanese women had to accept this and mostly stayed silent about it, taking care of their home and kids alone and rarely going out with their husbands. However, that started to change in the early 2,000s, with more and more Japanese women speaking up and revolting against that culture. A growing number of Japanese women stayed single, often living with other single women in order to be able to pay the rent of their apartments, which is astronomical in Japan. As a result, the birth rate in Japan went way down, resulting in an aging population and a slow but steady decrease in population numbers. That last thing actually helped Japan avoid the overpopulation problem that too many other countries have been experiencing.’’

‘’And did the Japanese men learn their lessons then and paid more attention to their wives?’’ asked Viktor, whose submerged right hand was discretely roaming over Denise’ lower body, while the blonde’s own left hand was covering the Russian’s groin.

‘’HA! Fat chance! They instead appealed to our patriotic sense, enjoining us to marry and have more children, in order to make the population younger. That mostly didn’t work. Now, in Japan, you have a society mostly divided along gender lines, with only a minority of traditional couples, while a majority of the women stay single and have

one or two children from passing male friends that they then raise as single parents. Those children often end up being raised in female-only households and I must say that they are generally much happier and better cared for than in most traditional homes. The Japanese traditional men pretend that this creates effeminate boys, but that argument was widely ridiculed and only hardened our resolve not to be taken for granted by men. I myself was raised in such a female-only household.''

''Wow! A war of the sexes!'' exclaimed Denise. ''I however must say that I can understand the attitude of the Japanese women, Keiko. If I married and my husband treated me like what you say the Japanese men do, then I would leave him pretty quickly. Thankfully, most American men have proven to be devoted to their families, rather than to their work.''

''Lucky American women!'' replied Keiko, sighing. ''And you, Viktor, how do Russian men treat Russian women?''

''Uh, that is a bit complicated, Keiko.'' answered the Russian, suddenly becoming quite serious. ''The real scourge of the Russian society, and this for many past decades already, is alcoholism. Russian men always drank hard and often, something that unfortunately caused too frequent cases of wife abuse and brutality. Unfortunately, old habits die slowly and that problem is still widespread. The despair and fears caused by the climate calamities of the past couple of decades have in fact worsened the problem, with alcohol consumption rates shooting up. This may sound incredible, but vodka may eventually be the death blow of the Russian society, rather than the rising seas and increasing temperatures. I myself am no teetotaler, but I am realistic enough to see how grave that problem is in Russia.''

The two men and two women were silent for a moment as they thought about the various problems faced by the Human race. Roberto Calderon was the first to speak again, trying to deflect the conversation.

''So, do any of you plan to volunteer to eventually go live on Mars permanently?''

''I do!'' answered at once Keiko. ''I have no real personal attachments in Japan and the Mars Home Project will truly be the adventure of a lifetime. And you, Roberto?''

''I am still undecided, but I am sorely tempted to go, mostly for its technological challenge.''

''I will definitely want to go, if I can get through the mission's crew selection process.'' said Denise, making Viktor look at her while smiling.

''And what makes you think that you could fail the selection process, Denise?''

‘’The fact that the psychological and personality requirements for the mission will actually be even more stringent than the scientific and technical abilities requirements. Will they want to have a fun-loving single girl aboard, someone who could attract male attention and possibly trigger jealousy and male infighting?’’

‘’I see no problems with having a fun-loving girl around me.’’ said sneakily Viktor while his hand concentrated on a particular spot of Denise’s body. ‘’As for me, I will definitely want to go to Mars. Without wanting to brag, they will need a talented and experienced nuclear engineer like me on the mission. On the other hand, I fervently hope that, if my old boss in Moscow applies for the trip, that he will be refused on personality grounds: while he is a true scientific genius, he also happens to be a first class asshole. If we ever end up traveling together to Mars, I may just kill him.’’

‘’WEEE!’’ then shouted Denise, taking her three comrades by surprise. ‘’A murder-mystery on a spaceship! That sounds fun!’’

While realizing that she had said that as a joke, Viktor, Keiko and Roberto all stared at Denise with false indignation tainted with amusement.

14:38 (GMT)

Friday, May 24, 2041

Hangar Number One, forward face of Disk Section

H.S.S. FRIENDSHIP, in Low Earth Orbit

‘’Denise, the heavy cargo shuttle CONDOR is now on final approach. You may now exit your hangar and go to your planned standby position.’’

‘’Acknowledged, Mark. I am launching out of the hangar now.’’ answered Denise before tripping the switch that released the docking clamps holding her space tug to its hangar berth. Pushing another button made the space tug fly forward from the gentle push of a pneumatic piston at the center of the berthing cradle. Floating slowly out of its hangar, situated near the forward outer edge of the ship’s disk section, the space tug then started maneuvering under the commands of Denise, using the small craft’s thrusters. Going up and then reversing course, Denise piloted her space tug to a position about a hundred meters behind the disk section, where she stopped and waited. She could clearly see the big heavy cargo shuttle, which measured a good 120 meters long and had a span of 84 meters, through the transparent sphere of thick acrylic that constituted the crew compartment of the space tug. A few anti-collision bars protected

that sphere against accidental bumps that could happen during maneuvering with a heavy load. The load she was to put in place today was now being raised out of the large dorsal cargo hold of the shuttle. After a minute or so, the voice of the shuttle's pilot came on the radio.

''Space tug, this is the CONDOR. You are now free to approach and grab my piece of cargo, over.''

''Space tug understood! Am approaching now from your overhead side.''

First firing up her maneuver thrusters and starting her approach towards the heavy cargo shuttle, Denise then deployed and swung into place the four telescopic capture arms of her tug, then adjusted their angle and separation distance from each other so that their multi-configuration gripping extremities could fit around the shuttle's payload. That payload was in fact the first module of the aft hull section of the H.S.S. FRIENDSHIP. Of square section and 31 meters long, that module was to be connected by one end to the disk section of the ship, which constituted the main building block of the FRIENDSHIP. Once in place, it would be used as an attachment point for up to four external liquid hydrogen tanks, which would be used to feed the nuclear rocket engines of the ship during its initial boost towards Mars, plus four liquid argon tanks that would fuel magneto-plasma cruise engines. A total of five such modules were due to be connected end to end behind the disk section. Then, once completed, the aft section would receive the sixteen PHOENIX 2000 nuclear rocket engines that would be used as the FRIENDSHIP's main space propulsion engines.

Keeping her approach speed low, Denise carefully flew her space tug to a position parallel and above the big module, then pivoted on the spot to face the rear face of the ship's disk section.

''Space tug to CONDOR, am now initiating payload capture maneuvers.''

''CONDOR acknowledged! Payload retaining clamps now off.''

Activating again her MMH[2] and $N2O4$[3]-fuelled attitude thrusters, Denise slowly flew down to meet the module. When the grappling extremities of her capture arms were less than three meters from the aft section module, she switched to automated approach

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[2] MMH : Monomethyl Hydrazine. A common storable chemical rocket fuel.

[3] N2O4 : Nitrogen Tetroxide. A common storable chemical rocket oxidizer burned in conjunction with MMH or other rocket fuel types.

mode, letting her flight computer direct the final part of her docking maneuver. While she prided herself in knowing that she could easily pilot her tug during the whole maneuver, she still used the automated approach mode as a further safety measure against unexpected difficulties, but she stayed vigilant the whole time, monitoring her approach on her computer screen. In space, the old saying of 'Haste makes waste' held true. With small laser beacons embedded around each attachment points of the payload, the sensors in the capture arms enabled her craft to get into perfect position, then activated the gripping ends of the capture arms, making them grab solidly the aft section module. A green light indicator on her instruments panel lit up, telling Denise that she now had a firm grip on her payload.

''CONDOR, from space tug: I have the payload in my control. I am now going to approach the ship with it.''

''CONDOR understood!''

With a mass of over forty metric tons clamped to her capture arms, Denise fired up for two seconds her main chemical rocket engine, in order to accelerate it towards the aft central axis point of the disk section. Now approaching the disk section at a speed of 0.8 meters per second, Denise carefully fired her positioning thrusters, slowly lining her tug and its payload with the central axis point. At the ultimate moment, when the end of her payload was less than six meters from its intended attachment point, she fired up her retro-thrusters, slowing down to an approach speed of 0.2 meters per second. Again, her flight computer controlled the final positioning maneuver. Denise grinned with contentment when her instruments told her that her payload had been safely delivered in its intended spot and was now secured in place by mooring clamps.

''Space tug to FRIENDSHIP: the first aft section module is now securely in place, with its docking clamps on. You may now test the module for airtight integrity, over.''

''Checking pressurization integrity now!... Everything seems to be okay: no pressure leaks detected and all the electrical and data connectors registering as being under tension. You may now return to your hangar, Denise. Good job!''

''Thanks, Mark!''

Detaching her gripping hands first and then pivoting and retracting her capture arms in travel position, Denise again fired up her thrusters, this time to fly back to her hangar.

During the next three weeks, Denise ended up flying out in the space tug of the ship a total of twelve more times, taking delivery of various ship sections and

components and assembling them to the rest of the FRIENDSHIP. Next came a number of heavy cargo shuttles meant to deliver the initial fuel and supply loads to the ship. First to be filled were the tertiary liquid hydrogen fuel tanks surrounding the rotating rings and central core section, providing them with precious extra anti-radiation protection. Those fuel tanks were meant to stay full until the ultimate part of the return trip to Earth, to be used only once the ship was back within the protective magnetosphere of the planet. Next were shuttles that brought the support frames on which their VASIMR[4] cruise engines would be fixed, followed by more shuttles carrying the cruise engines themselves. However, Denise did not go out to meet the following sixteen heavy cargo shuttles that arrived a month later, as they carried the sixteen PHOENIX 2000 nuclear rocket engines that were to constitute the main propulsion system of the H.S.S. FRIENDSHIP. Robotic arms on both the heavy shuttles and on the engines support frame took care of installing those nuclear engines, as they still emitted significant amounts of radiations despite their individual shielding. As soon as they were in place, secured and connected to the rest of the ship, a surrounding sleeve made of titanium pipes was filled with hot water, so that the water could fill the pipes before the intense cold of space could freeze the water. With a thickness of over sixty centimeter of water inside the sleeve surrounding the sides of the engines support frame, it became safe again to approach the ship from the rear sector without absorbing unhealthy doses of radiations from the uranium rods contained in the cores of the nuclear engines. Mark Dempster and his eight companions were then free to celebrate the completion of the spaceship and wait for the orbital crew that would soon relieve them.

[4] VASIMR: Variable Specific Impulse Magneto-plasma Rocket. A type of electric plasma engine with very high specific impulse suited for long space trips.

CHAPTER 3 – CREW MATTERS

10:40 (California Time)
Tuesday, August 6, 2041
Office of the Director, Human Resources Department
Mars Home Project headquarters, Vandenberg Space Center
California, U.S.A.

Francine Dubois, Director of the Human Resources Department of the Mars Home Project, braced herself mentally before activating the intercom box on her work desk.

‘’Miss Steinberg, you may send in Doctor Bulganin.’’

‘’Right away, Miss Dubois!’’

The 51 year-old French psychologist then got up from her swivel chair and walked around her desk to greet the big, balding man that came in. She smiled to her visitor while shaking hands with him, speaking in good Russian, one of the five languages she spoke fluently.

‘’Doctor Vladimir Bulganin, I am Francine Dubois, Director of Human Resources for the project. Welcome to Vandenberg!’’

While the man smiled as well while shaking hands with her, his face still reflected a trace of frustration and impatience. In view of what Francine had read about the man’s character, that didn’t surprise her a bit. She however stayed polite and welcoming as she pointed at a low coffee table and sofas in one corner of her large office.

‘’I believe that we will be more comfortable to speak while sitting in those sofas, Doctor.’’

‘’Thank you, Miss Dubois! I hope that this is to announce to me that I was selected to be part of the crew of the H.S.S. FRIENDSHIP?’’

‘’Your candidacy is indeed what we are going to discuss this morning, Doctor Bulganin.’’ replied Francine diplomatically. She then led the Russian physicist to one of the sofas around the coffee table, then sat herself in a sofa, in front of which lay a file folder on the table. After a short pause, she looked the Russian straight in the eyes and spoke calmly but firmly.

‘’Doctor Bulganin, I have reviewed carefully your personal history file and the results of the various physical, mental and skill competency tests that you passed. I must say that your scientific achievements in nuclear physics are impressive, while you proved to be in excellent health for your age. However, your personality test pointed to a couple of problems that are of concern to me.’’

The Russian frowned at once and gave her a hard look.

‘’Me, personality problems? This can’t be serious! What kind of problems are you exactly alluding to?’’

‘’Basically, your interpersonal skills and your aptitudes for teamwork, Doctor Bulganin. If I can believe the info in your personal history file, you are known to be a rather harsh supervisor and somewhat of a disciplinarian.’’

‘’So? When you are in charge of a science project worth billions of rubles, you can’t afford to keep around lazy or incompetent employees. Such major science projects need a firm hand at the helm in order to avoid it to derail and fail.’’

‘’That may be an accepted management philosophy here on Earth, Doctor Bulganin, but not in space. Please understand that the crew of the H.S.S. FRIENDSHIP will be in deep space or around Mars for over two years and that all of its members will need to work in harmony with each other in order to ensure the success of the mission. As important as their technical and scientific qualifications are for the mission, so is their ability to interact smoothly with each other while in space or on Mars. One negative personal conflict could be enough to seriously affect the morale of the rest of the crew, especially if the person in contention is in a supervisory position. Now, you were a candidate for the position of head physicist aboard the FRIENDSHIP, with up to four other top physicists under that position. We are talking here about men and women who have proved themselves as top scientists, with major advances and discoveries to their credits. They are also mature persons with lots of experience in working as part of a group. While you are highly qualified scientifically, your career history has shown you to be less than ideal as a project manager.’’

‘’What are you talking about?’’ exclaimed Bulganin, his voice reflecting anger. ‘’Has someone spread nasty stories about me? If that is so, then it probably is some incompetent that I had to fire in the past and who is now trying to take revenge on me.’’

‘’I rest my case, buster!’’ thought Francine while giving a dubious look at the Russian. She then picked up the file on the table in front of her and opened it, reading silently a particular paragraph before looking back at Bulganin.

‘’Doctor Bulganin, you were put in charge of the Kurchatov Nuclear Science Institute in Moscow nine years ago. Within a year of you taking over as chairman, fully sixteen percent of the scientific personnel of the institute quit or was fired by you, including the deputy chairman at the time.’’

‘’They were fired because they were incompetents and wouldn’t follow directives!’’ interrupted Bulganin.

‘’Then, in the following year, another 26 percent of the original scientists left. Are you going to tell me that the Kurchatov Institute is in the habit of hiring incompetent scientists, Doctor Bulganin, or did these people leave simply because they found it impossible to work under you?’’

‘’Why would I keep people who are not ready to obey my directives, Miss Dubois? I was the chairman of the institute and it was up to me to direct it and give it a focus.’’

Francine sat back in her chair, her mind now made up.

‘’Maybe, but we won’t have the luxury of firing people left and right while they are aboard the FRIENDSHIP and on their way to Mars, Doctor. We need team players, not martinets. I am sorry, but your candidacy for this project is rejected.’’

‘’WHAT?!’’ exploded Bulganin, shooting up from his sofa while glaring at the psychologist. For a short moment, Francine became afraid that the big Russian would physically attack her. However, she quickly overcame that fear and got up as well, facing off across the table from Bulganin.

‘’You heard me well, Doctor: your candidacy has been rejected. This decision is final, by the way, and has been approved by all the members of the project’s High Council.’’

‘’WE WILL SEE ABOUT THAT!’’ raged Bulganin before storming out of Francine’s office. The psychologist couldn’t help shake her head then: rarely had she met with so many inflated egos in such a short time.

13:07 (California Time)

Thursday, August 22, 2041

Main conference room, Mars Home Project headquarters

Vandenberg Space Center, California

Robert Lithgow, posted at the door of the conference room, greeted with a handshake and a smile each member of the project's High Council as they arrived with their aides and scientific counselors. The last member to arrive was Jacques Rocard, the head of the French National Center for Space Studies, or CNES in French.

‘’Welcome to Vandenberg, Doctor Rocard!’’ said Robert in his laborious, heavily-accented French. The French astronomer replied in his own polished English.

‘’Thank you, Mister Lithgow. I understand that this meeting will be about matters a bit less dry than scientific dissertations.’’

‘’Oh?! I thought that astronomers, astrophysicists and the likes had orgasms listening to scientific formulas.’’

That made Rocard laugh briefly before he replied with a smile.

‘’We scientists, and especially French ones, still prefer to have orgasms in bed with a suitable partner. So, we are going to discuss matters pertaining to the crew of our spaceship, right?’’

‘’Correct, Doctor Rocard. If I can go by your last reply, you may find today's questions quite interesting.’’

‘’Really? You are starting to intrigue me.’’

‘’Well, you will all know soon enough what I want to speak about. But please, go take your seat. It is the one to the left of Maria Cardona.’’

‘’Aaah, a judiciously chosen seat indeed!’’ said Rocard before walking to the swiveling padded captain's chair set beside that of the NASA's Administrator. On his part, Lithgow went to his own chair but stayed standing at first as he opened the meeting.

‘’Welcome to Vandenberg, my friends. While our project is technically on track and on schedule, we still have to take firm decisions concerning a few personnel matters. While our project specialists have already studied in depth those matters and have presented their recommendations to me, I will ask you today to study those recommendations and to either approve them, modify them or reject them. However, if you reject certain proposals, we will then have to agree on alternative ideas, as we need to take firm decisions so that our project could continue advancing without uncertainties.’’

Lithgow then sat down and clicked on a button of his computer station integrated to the conference table, making the first image of his presentation appear on a giant video screen set on a wall of the room.

‘’Lady and gentlemen, here are the points we will discuss this afternoon: policies about sexual relations in space; the possibilities of space pregnancies and our response to such pregnancies and, finally, whether our astronauts on Mars should keep fit to withstand Earth’s gravity. The two first points may sound a bit frivolous to some of you, but they are very serious ones indeed, as they may heavily affect crew morale during their long space mission. First, our policies about sexual relations among the crew of our spaceship. Right now, we don’t officially have policies about that matter, mostly because a lot of people were too embarrassed to talk publicly about it. However, we can’t hide from that question anymore and must take some definite decisions now.’’

‘’Could we review first the reasons why sex in space was not allowed in the past…officially?’’ asked the head of the Japanese Space Agency, Shinzo Kurozawa, making Robert Lithgow nod his head.

‘’A logical thing to do, I must say. Basically, the past reasons not to allow sex in space had to do with the conditions in the capsules and space stations of the time. Zero gravity was actually the biggest culprit: all kinds of bodily fluids and other things would end up floating around the spacecraft or station, something not very pleasant for the occupants, as you may imagine. Also, there was the fact that, unless you anchored yourself to something, you would find yourself bouncing around with your partner. Finally, the risk of developing pregnancies in orbit was deemed too great.’’

‘’All good points!’’ said Misha Borisovich, the head of Roskosmos. ‘’If I may introduce here a piece of information that had been kept confidential up to now, I can tell you all that a Russian couple once tried sex during a long sojourn aboard our MIR space station, many years ago.’’

‘’And?’’ asked Michel Dupré, of the European Space Agency, an amused smile on his lips. Borisovich rolled his eyes in response.

‘’The male cosmonaut said later: the girl was fine but the act itself wasn’t. As for the female cosmonaut, she said in rather unprintable terms that it had to have been the worst sex ever. Basically, that couple kept slamming around against other objects rather than inside each other. The cleaning job afterwards was even less pleasant.’’

That triggered a short round of laughs around the table as the respective heads of national space agencies pictured that scene in their heads. Maria Cardona then asked the next question.

‘’So, in view of that past experience, what are the recommendations on the subject that our experts arrived at, Robert?’’

‘’In the specific case of the future trip to Mars by the H.S.S. FRIENDSHIP, our experts say that having sex in the artificial gravity of our spaceship should be both safe and as enjoyable as if done on Earth. Please understand that the living conditions aboard our new spaceship are infinitely superior to those found even on our current space stations. Now, that leaves the question of whether we want to allow our astronauts to pursue sexual relations during the trip to Mars or on Mars itself. Our expert psychologists told me that being able to have sexual relationships aboard the FRIENDSHIP could only be beneficial to the long term morale of the crew. The only point that would be touchy is about the possibility of a female crewmember becoming pregnant during the trip. Even though our spaceship is superbly equipped in terms of medical facilities, giving birth to a baby onboard and then raising that baby inside our spaceship is bound to raise a few problems.’’

‘’Is it, really?’’ countered Michel Dupré, of the ESA. ‘’The long term goal of this project is to create a self-sustaining Human colony on Mars. To me, a self-sustaining colony means one where its members can procreate and multiply. Whether some like it or not, we will one day have to allow pregnancies to develop on Mars. So, why not start right now? Don’t we want to find out as soon as possible if long space trips and sojourns on Mars could have any deleterious effects on fetus development and pregnancies? If some unknown factor could impact negatively on future births away from Earth, we should find out about it as soon as possible, no?’’

The other participants looked at each other, struck by the common sense in Dupré’s arguments. Wang Lao Xi, of the Chinese Space Agency, was the first to speak in support of the Frenchman’s position.

‘’I must say that Administrator Dupré makes a lot of sense on this subject. As you know all, China has a long history of carefully controlling its demographics and we learned quite a few lessons from it. For one, Administrator Dupré is right about the need to eventually allow pregnancies to happen on Mars. He is equally right about the need to ascertain if some unknown factor could make human procreation in space hazardous or even impossible, and this as quickly as possible, before we could end up with a non-viable colony on Mars. I thus say that we should allow the crew of the FRIENDSHIP free rein about starting sexual relations between themselves. I further say that we should ensure that our spaceship has both the facilities and the qualified personnel to deal with an eventual pregnancy during the mission to Mars. We should also ensure that some baby-related supplies and equipment be brought aboard our spaceship, just in case.’’

‘’I will second Administrators Wang and Dupré on this.’’ announced Shinzo Kurozawa. ‘’We can’t afford to play the offended virgins here, not when we are talking about the long-term growth of our future colony on Mars. A few hundred kilos of baby supplies shouldn’t make a difference in a 64,000 ton plus spaceship.’’

‘’I second this as well!’’ said Jacques Rocard, of the French CNES. With Misha Borisovich also jumping on that bandwagon, that left Maria Cardona and Robert Lithgow to ponder their own points of view as the other participants stared at them, awaiting their response. The Spanish-American scratched her head, taken off balance by such a quick, unexpected group consensus on what she had expected to be a contentious subject.

‘’Uh, I must say that I was expecting a more vigorous discussion on the subjects of sex and pregnancy in space. However, I have to agree that Administrator Dupré’s arguments are quite solid. I will thus go with the opinion of the majority here. Mister Lithgow, we will need your medical experts and psychologists to study the question again, with the view of formulating practical rules and protocols concerning crew sexual relationships and possible pregnancies and their aftermaths aboard the H.S.S. FRIENDSHIP.’’

Lithgow wrote down a few notes quickly, then looked up with a smile at the other participants to the meeting.

‘’Well, this leaves us with the question of keeping or not our astronauts and future colonists on Mars fit to withstand Earth’s gravity after a few years on the Red Planet. As you know well, the astronauts who spent months in orbit aboard either the MIR space station or the International Space Station came back to Earth with greatly weakened muscles and bones, and this despite exercising vigorously while in orbit, to the point that they could barely walk once back on firm soil. Their visual acuity was also affected negatively and their DNA was modified by exposure to space radiations. This question was raised again recently by one of the members of the team sent in orbit to help assemble and activate our spaceship. Personally, I would like to see our astronauts and future colonists stay fit for Earth gravity levels, but the sole technical solution available to us right now, meaning the use of rotating living quarters on Mars, would entail the shipping to Mars of lots of heavy extra equipment, something that would cut into the quantity of more essential equipment and supplies we will send to Mars.’’

‘’I would say that such a requirement is not essential right now, Mister Lithgow.’’ Said Wang Lao Xi, bending forward and putting his forearms on the table. ‘’Our crew will

travel in normal felt gravity conditions, while the Mars landing crew will stay on Mars for less than a year while living under 0.37 G conditions. We will be in a better position to discuss this at a later time, when we will have established a permanent base on Mars.''

''I would tend to agree with you, Mister Wang,'' cut in Maria Cardona, ''but I believe that it would be prudent to start studying designs for lightweight rotating carrousels, which would eventually be shipped to Mars.''

''I would have no objections to that, Administrator Cardona, as long as such studies don't impact negatively on the financing of the rest of the project.''

''I believe that the costs associated with this problem are quite modest, actually.'' Added Lithgow. ''It shouldn't be a problem for our project. If you are all…''

A buzz from his personal cell phone then interrupted Lithgow, who excused himself after seeing who was calling him under an 'urgent' heading.

''Yes, Francine?''

Francine Dubois, the head of the human resources department of the project, looked and sounded a bit embarrassed as she spoke up on the line.

''Robert, I am sorry to disturb you in the middle of such an important meeting, but something came up that could actually need the members of the High Council to discuss that new problem and take a decision on it, and quickly.''

''And what is exactly that new problem, Francine?''

''Our crew size requirement estimates for the H.S.S. FRIENDSHIP: they were incorrect.''

''What do you mean, incorrect?'' Replied Lithgow in a suddenly raised volume of voice, making the others around the table look sharply at him.

''Basically, our actual roster for our spaceship is too low, mostly thanks to incorrect assumptions about the number of hours of work per day to be demanded of our astronauts. The man who had been in charge of that roster count still believed in the old NASA tradition of working our astronauts to death while they are in orbit, with only six hours of sleep per day allotted. While this could pass on a short duration mission, it would be grossly abusive to ask our astronauts to live on such a demanding work schedule for two years. When I found this out while doing an ultimate review of our mission crew profile, I spoke about that with Greg Stransberg, the one who had calculated our needs. Unfortunately, Stransberg refused to change his point of view and I finally fired him out of frustration. I immediately put his assistants to work on a revised work schedule and crew requirements estimates.''

‘’And how many extra crewmembers would we need now on the FRIENDSHIP, according to them, Francine?’’

‘’Well, the biggest discrepancy concerned the number of positions allotted to the onboard specialists charged with analyzing the data collected by the ship’s sensors while mapping Mars from orbit. Just for that, we will need an extra twelve specialist at a minimum in order for them not to drop out like flies from exhaustion. Our review is still going on, but I already foresee the need for at least an additional 24 specialists and scientists, on top of the twelve needed for sensors data analysis.’’

‘’YOU’RE SAYING THAT WE NEED TO ADD A MINIMUM OF 36 EXTRA CREWMEMBERS ON THE FRIENDSHIP?!’’ nearly shouted a shocked Lithgow, making the other participants to the meeting snap their heads around. Seeing their concerned expressions, the systems engineer briefly excused himself with Francine, time to tell the members of the project’s High Council about the new problem. He then returned his attention to the French psychologist.

‘’But, our planned crew already counted 98 members, while we have a grand total of one hundred individual cabins aboard the H.S.S. FRIENDSHIP. Where are we going to lodge all those extra crewmembers?’’

‘’I think that this will actually be easy to take care of, Robert: we simply need to add a supplementary, elevated bunk bed per cabin, making them double bunk cabins. In view of their very generous present space allocation per member, this should not impact much on the crew morale. However, we will have to revise the amount of food, clothing and other supplies that we will need to bring aboard our spaceship. By the way, these estimates for extra crewmembers can still go further up. I will have firmer numbers for you by Saturday.’’

‘’Great! Talk about a rock thrown into the pond! However, this is not your fault, Francine, so don’t feel too bad about it.’’

‘’Thanks for your comprehension, Robert. I will contact you the minute that I have definite numbers for you.’’

‘’I will be awaiting your call with trepidation, Francine. Thanks for calling!’’
Lithgow then closed the line and looked at the other members of the High Council, feeling a bit of discouragement.

‘’Well, it seems that our discussion about sexual relations and possible pregnancies aboard our spaceship is now even more relevant than before, lady and gentlemen. We are talking here about having to accommodate a minimum of 36 extra

crewmembers on our spaceship. The only way we could accommodate them is to install double bunk beds in each cabin, along with extra clothes lockers. We will also need to store more food, clothing and other supplies aboard our spaceship in order to provide for these extra crewmembers.''

''Well, better that than finding too late that our crew is insufficient in numbers to analyze in reasonable time the data we will be collecting on Mars while orbiting it.'' said Misha Borisovich. ''An overworked crew often leads to higher stress and more interpersonal tensions, something we found out the hard way while operating our old MIR space station.''

The other members of the High Council nodded their heads at that, as they mentally recollected some of the past incidents on old space missions.

Two days later, as promised by Francine Dubois, Robert Lithgow got a visit from the French psychologist, who had an amused smile on her lips as she put a printed document on Robert's desk.

''The new, improved crew list for the H.S.S. FRIENDSHIP! You will see that many positions are still not filled at this time, but I don't expect any extra position over this new list to be added aboard our spaceship.''

Robert quickly looked through the list before looking up at Dubois.

''We will now have a total of 145 persons aboard our spaceship for its trip to Mars? It will look like a cruise ship to Mars, Francine.''

''More than you think, if the suggestion I got from someone is accepted, Robert.''

''What do you mean?''

''That one of the already designated crewmembers has asked me to allow his wife to apply for one of the still unfilled positions aboard. A few other crewmembers who are married but have no children heard about it and have also put up similar requests. The funny thing is that those spouses are all well qualified in terms of pertinent professional skills, are physically fit and will only need basic astronaut training and a psychological profile exam to fully qualify for a ship position, something that they should be able to easily complete in the two years left before the launch. Before you say no, think that this would be one nifty way to fill one of the new goals of the mission: that is, to study the prospects and problems associated with eventual pregnancies in space.''

Robert was about to object to this but stopped himself. The truth was that Francine's proposal was both valid and interesting. For one thing, having married couples aboard could only improve morale, at least in the case of the married persons involved.

''Damn! You keep pulling surprises out of your hat, Francine. Very well: add the names of those willing spouses to the list of people to be tested as prospective crewmembers. Just out of curiosity, what are the professional trades of both the selected and prospective member of that couple?''

''The already selected crewmember, a U.S. Air Force sergeant, is one of the three assistant cooks of the FRIENDSHIP, while his wife presently works as a barmaid in a club near the base and is postulating for the job of bar attendant and stewardess on our ship. Both are in their mid twenties and the husband swore to me that his wife is very fit and healthy. To top the cake, the wife speaks Chinese fluently, along with a fair Spanish, on top of English. The husband also speaks Chinese, thanks to his wife.''

''Double damn! Could you show me the personnel files of the couples who will pass the qualifications tests, once you will have completed the primary selection phase? I am really curious to see what kind of complementary skills this business of bringing couples into space will give us on this mission. Thinking about it, why don't you discreetly pass the word around our selected married members without children that their spouses could apply to ship's positions relevant to their skills, as long as they are both professionally qualified and medically fit?''

''I will be more than happy to do that, Robert. Thanks for your comprehension.''
Robert sat back in his captain's chair as Francine walked out of his office. As a systems engineer, he never would have believed until now how complicated and delicate, yet crucial, selecting the right personnel for a job could be.

CHAPTER 4 – COMING ABOARD

16:51 (GMT)
Monday, October 19, 2043
Heavy cargo shuttle CALYPSO
Docking Station Number One, H.S.S. FRIENDSHIP
Low Earth orbit

‘’Your attention, please! Our shuttle is now safely docked to the H.S.S. FRIENDSHIP. You may now leave your seats and proceed with your luggage towards the nose transfer airlock.’’

Xiulan Sommers pressed her gloved left hand around the gloved right hand fingers of her husband, Jack Sommers, as the overhead announcement triggered a wave of emotions in her. Jack, a tall and solidly built United States Air Force cook seconded to the Mars Home Project, smiled in return to his beautiful, delicate young wife.

‘’We are about to start living a great adventure together, Xiulan. I am so happy that they took you for this mission.’’

‘’And I am happy that we could stay together, Jack.’’

The shuffling forward of the other 36 passengers of their shuttle then made them get up from their heavily padded seats and grab their individual kit bags from the overhead bins. Since they were in zero gravity conditions, they had to move cautiously in their spacesuits, but the magnets integrated into the soles of their boots helped them stay attached to the floor of the aisle running by their seats. They were among the last to leave the shuttle by its nose transfer airlock and to enter the arrival compartment of Docking Station Number One, where two men and one woman wearing ship internal uniforms were waiting for them. The woman, who was in her early fifties, was the spitting image of what a Viking woman would have looked like, with pale blue eyes and platinum blond hair mixed with a few gray strands. She was also tall for a woman and looked very fit despite her age. She waited until all the 38 passengers from the shuttle were inside the arrival compartment to start speaking in a firm voice.

‘’Welcome to the H.S.S. FRIENDSHIP, ladies and gentlemen! I am Janet Larsson, commander of this spaceship. You are actually the last contingent of

crewmembers we were expecting for this ship, so we will now be able to leave Earth orbit in a month, after you will have had time to accustom yourself to your new environment and jobs. Since you just completed a five hour transit from the surface, I will now hand you over to misters Pedro Alvarez and Xu Ling Wei, who will guide you to your cabins. Once there, you will be given some time to unpack and make yourselves at home before going to the crew lounge for 17:45 hour, ship time, where you will get a preliminary safety briefing prior to having supper. If you want to adjust your watches now, it will be exactly 17:03, ship time, in twelve seconds…five, four, three, two, one, top! I will see you all again in the crew lounge. Mister Alvarez, Mister Xu, they are now all yours!''

A Latino man and an Oriental man standing behind Larsson stepped forward as the ship's commander left the compartment, with the Latino man speaking up after looking around at the faces in the crowd in front of him.

''Good day and welcome, everybody! I am Pedro Alvarez and I am a hydroponics technician, like my friend Wei. If you will look at the cabin number given to each of you before departure, you will find that it starts with either the letter 'A' or the letter 'F'. 'A' stands for 'Aft', meaning that cabins lettered as such are located in the aft carrousel ring of the ship. The cabins lettered with 'F' are located in the forward carrousel ring. I will be guiding those whose cabins are in the forward carrousel ring, while Wei will guide those whose cabins are in the aft carrousel ring. If those lodged in the forward carrousel ring may now follow me…''

Jack and Xiulan ended up following Alvarez, as their cabin number was F-39. Imitating the Latino man, who was walking at a sedate pace in order to let his magnetic boot soles stick lightly to the floor and thus avoid simply floating down the tubular passageway, the young couple followed him down a tube leading to the core section of the ship. However, they turned off into another, separate tube after only twenty meters, then entered a compartment closed off by airtight doors. Alvarez stopped there for a moment, time to point to his followers the floor hatch near him, which was closed.

''First capital rule about safety on this spaceship: always close behind you any airtight hatch or door that you go through. This simple rule could save lives in case of an accidental decompression. Once down in the compartment below us, you will see two widely separated airtight doors: one marked 'F' for forward ring and one marked 'A' for aft ring.''

Alvarez then opened the hatch, which looked quite solid, and slid down the ladder fixed under it. With the twenty persons of his group following him, he patiently waited for all of them to be down and pointed yet another airtight door marked with a red letter ‘F’.

‘’Beyond this door is an airlock meant to prevent both carrousel rings from decompressing because of a single door damaged or left opened. Once you will step out of that airlock, you will be standing on a fixed strip of floor one meter wide, which serves as a stepping platform from which you will then be able to set foot on the adjacent rotating floor of the Promenade Deck of the forward ring. The ring carrousels each turn in opposite direction at a rate of 3.7 rotations per minute, thus creating a felt gravity of close to one G via centrifugal effect. Please look both ways down the rotating floor before stepping off the fixed platform if you don’t want to collide with someone else.’’

Following scrupulously the instructions of the Latino man, the Sommers soon stood on the rotating floor of the forward ring, their feet firmly staying on the carpeted surface. Xiulan grinned to her husband as she experienced that moment.

‘’This is incredible! You could think that we are on Earth. And I don’t feel any disorientation.’’

‘’This ship is certainly way ahead of anything I have seen before in terms of facilities. But let’s follow Mister Alvarez: I am anxious to get to our cabin, so that I could take off this bulky spacesuit.’’

Less than five minutes later, the Sommers were dropped off by Alvarez in front of their assigned cabin. They had already seen pictures and mockups of the typical cabin on the spaceship while training in Vandenberg, so knew what to expect inside. They still were impressed when they entered a small lounge measuring three meters by four meters and furnished with a sofa, a work desk with chair and a video entertainment unit. Xiulan then entered the adjacent tiny bedroom, finding that a larger mattress and support frame had replaced the usual single bed. Space was thus even tighter, but she couldn’t care less: to be able to sleep beside her husband rather than in some double bunk bed arrangement was what was important for her. Going to one extremity of the bedroom, she opened the airtight door of the emergency decompression shelter cum spacesuit locker and saw that a second spacesuit resting stand had been added, taking the place of the closet normally found inside but which had been moved to the lounge. Helped by

Jack, Xiulan gratefully got out of her spacesuit and fixed it to its stand, then connected it to a maintenance terminal that would recharge its battery and also refill its oxygen tank if needed. She then returned the favor to Jack, helping him out of his own suit. Once both in their internal ship uniforms, they hugged each other, with Xiulan resting her head on Jack's chest.

''It is so good to be here with you, instead of having to wait two years for your return from space.''

''Believe me, baby: those two years away from you would have felt like eternity to me.''

They then exchanged a long kiss, which Jack interrupted with regret.

''Well, we better hurry to undo our bags now: that meeting in the crew lounge is due in less than fifteen minutes.''

''Right!''

After another six minutes, the couple left its cabin and made its way to the crew lounge, situated on the top floor of the same carrousel ring they were in already. They found that most of their companions who had traveled with them on the CALYPSO were already sitting around the small, round tables of the lounge. Taking place at an empty table, which sat under a lemon tree, Jack and Xiulan patiently waited the start of the announced briefing. Two minutes prior to the fixed time, Janet Larsson showed up with a laptop computer, plugging it to the large flat display screen fixed to one wall. Taking the time to make her first presentation slide appear on the screen, Larsson then eyed quickly the 38 persons facing her, smiling to them.

''Hello again! First, I would like to remind you that this is an international spaceship with an international crew under civilian control. Thus, no military style discipline is required or expected of you, even if you are an ex-service person. What is required and expected though are two things: team spirit and respect for others. If everyone aboard go by those two things, then we will have a great trip and a fantastic adventure that we will be proud to tell to our grandchildren. Now, while this ship would rightly appear to you to be quite extraordinary, it is by no means unbreakable, while space has plenty of dangers to offer, starting with cosmic radiations, meteorites and solar flares. That is why we have to work and live as a team through this mission. My sincere vow is that, by the end of this mission, we will feel more like a family than like a team. Let us now review the safety rules pertinent on this ship.''

Larsson's presentation ended up taking less than fifteen minutes, something that Jack appreciated, as he was starting to feel both hungry and tired. Once dismissed by Larsson, the newcomers left the lounge and walked to the crew cafeteria, situated on the same deck and same ring, some eighty meters away from the lounge. Xiulan nearly clapped her hands together in joy on seeing the classical American dinner restaurant looks of the cafeteria, with its partitioned booths lined up along huge wall display screens, which simulated windows giving a view of a Midwest country panorama.

''Oooh, I'm loving this place already! They really did their best to make us forget that we are aboard a spaceship.''

''And they were quite successful, I must say. Let's see what's on the menu. If I don't like it, I will go complain to one of my new work comrades at the kitchen.''

Xiulan giggled at that before following Jack towards the service counters. She was both surprised and happy when she saw the spread available at the salad bar.

''Fresh lettuce and sweet peppers? It must have cost a fortune to bring these up from the surface.''

''Don't forget that this ship has extensive hydroponics gardens, Xiulan. These were probably grown aboard. If they really can provide fresh produces during the whole trip, then it will make wonders for the morale. However, I doubt that they could produce meat or fish on the ship: raising animals requires a lot of feed grain and would not be economical here in space. Beside, modern freeze dried preservation techniques are good enough to keep meat for many years.''

''What about dairy products, milk, butter?''

''Uh, dairy products are a bit more complicated to keep, although ultra-high-heated milk stays good for months. Well, let's see what is on the hot menu.''

Going to the service counter of the kitchen, set at one extremity of the open area cafeteria, the couple grabbed sets of utensils and trays and looked at the large containers of food lined up on top of the steam table. Jack nodded his head in approval on seeing that there was both beef and pork on the menu, along with mashed potatoes, rice and stir-fried vegetables. He then smiled to the cook standing behind the steam table and passed his right arm over for a shake.

''Hi! I'm Jack Sommers and I will be working with you in the kitchen.''

The man, a jovial looking one wearing the traditional white apron and hat of a cook, returned his smile while solidly grabbing his hand and shaking it.

‘’Raoul Bonnet, at your service! We won’t mind an extra pair of hands here: there is a lot to do, as we don’t only prepare and serve the food: we also help inspect and store away the vegetables, eggs and poultry meat produced on the ship.’’

‘’We raise chickens on the ship?’’

‘’And turkeys and rabbits as well. We don’t raise enough of them to be able to serve fresh meat every day, but it will help a lot in varying the menu from freeze-dried meat. We however produce enough eggs to provide them to all at breakfast.’’

‘’That’s great! Oh, I nearly forgot to present you my wife, Xiulan. She will be working as a bar attendant.’’

‘’Pleased to meet you, Madam Sommers.’’ said the French cook while shaking hands with Xiulan. He then pointed the various containers on the steam table. ‘’So, what can I serve you? We have roast beef with peppercorn sauce, pork cutlets and chicken fried rice.’’

‘’The chicken fried rice looks really good, Mister Bonnet: I will have some.’’ replied Xiulan.

‘’And I will have the roast beef, Raoul.’’

‘’Good choices!’’ said Bonnet while starting to serve them. ‘’Right now we are still regularly receiving arrivals of fresh meat and dairy products via shuttles, but we will have to switch to freeze-dried rations a couple of weeks after our departure for Mars. But don’t worry about the quality or diversity of these freeze-dried rations. Our chief cook, Alfredo Caldi, who is renown across Europe, has concocted the various menus we will eat and prepared them himself for preservation in communal size freeze-dried bags. We will be eating like kings during our mission.’’

‘’Hell, that will definitely be better than the sad, unappetizing stuff the early astronauts had to eat.’’

‘’You got that right! Alfredo told me to pass the word to you that you won’t need to start working in the kitchen until tomorrow morning, so you will have this evening and night free for yourself.’’

‘’Thank him for that on my part, Raoul. By the way, is he a demanding boss? I heard a few scary things about European chefs and their huge egos.’’

‘’Naah, not with Alfredo! He is an easy man to work with and is actually quite a funny guy, but don’t overcook the pastas.’’

The trio laughed briefly at Raoul’s joke, then Jack and Xiulan left the service counter with their food and went next to the beverage counter and the salad bar before going to sit in

one of the booths that was still unoccupied. Jack looked for a moment at the display screen/false window just beside him, contemplating the recorded images of the road traffic passing in front of the 'dinner', before attacking his food. His beef proved to be excellent and he smiled to Xiulan, who was eating her fried rice with gusto.

''I think that we will have a good time aboard this ship, Xiulan. Also, with the salary bonuses for deep space service that we are getting both, we will be able to save a nice bundle, maybe enough to buy a house on our return.''

His wife was thoughtful for a moment before replying in a hesitant tone.

''What if we continue serving on this ship on its following missions? It cost tens of billions of dollars to build and launch. Surely, it will not be scrapped after only one trip to Mars. We could simply take some vacation on Earth between missions, if we really like working aboard the FRIENDSHIP. To be frank, conditions on Earth are going to continue deteriorating and the prices for houses built on safe grounds keep shooting up sky-high. In a few years, the real estate market will be so expensive that only millionaires will be able to afford detached houses of their own. And I am not even factoring yet the mounting pollution levels and the social troubles that are growing around the planet. Do we really want us to have children and then raise them in some overcrowded, low-level and overpriced apartment building?''

Jack put down his fork, alarmed at that turn in the conversation.

''Don't tell me that you don't want us to have children anymore, Xiulan?!''

''That's not what I am saying, Jack. What I am saying is that we should use to the maximum the opportunities offered by working on a long term basis aboard this spaceship.''

''And when would we have children then?''

''How about now, on this ship? During my selection process and training, I was told that pregnancies would be allowed during the trip, so that the project managers could learn if procreating in a future Mars colony is feasible and risk-free.''

''But, would it be risk-free, Xiulan? There is this business about space radiations that could cause malformations and mutations in fetuses.''

''I asked a doctor in Vandenberg about that and he told me that, with the amount of anti-radiation shielding that the FRIENDSHIP possesses, we won't be exposed to more radiations than we would normally be exposed to on Earth. Things may be different on Mars, but none of us is due to go down on Mars…at least on this trip.''

Jack was silent for a moment as he weighed his wife's arguments.

‘’Okay, I can see the merist in your arguments. So, you really would like us to try to have a child on this trip? When would you like us to make a first try?’’

Xiulan smiled to her husband while covering his right hand with her left hand and caressing it.

‘’How about tonight, Jack?’’

CHAPTER 5 – DEPARTURE

14:08 (GMT)
Wednesday, November 25, 2043
Command center, H.S.S. FRIENDSHIP
Low Earth orbit

‘’To all the crew: we are five minutes away from nuclear engines ignition. If you are not already strapped into a seat, do it now and seal your spacesuits. This is the last warning.’’

Switching her microphone off, Janet Larsson looked to her right at her flight engineer, Roberto Calderon.

‘’Systems status, Mister Calderon?’’

‘’Everything is a go, Commander.’’

‘’Mister Ponichnikov?’’

Viktor, who was occupying the nuclear engines control station, answered at once.

‘’All nuclear engines are in pre-boost mode, switched to the primary fuel tanks and are ready to go, Commander.’’

‘’Navigator?’’

‘’Route entered and locked in the computer, Commander.’’ replied Shen Li Yang, sitting to the right of the ship’s pilot, Anton Kubtchev.

‘’Good! Close your visors, people!’’

The eight other men and women inside the fairly small compartment closed their visors and secured them, then made sure that their individual breathing systems were functioning. The command and control section, mounted on an axial pivot inside the center core module, was already pivoted to make its floor point aft, so that the thrust of the nuclear engines would be felt by the astronauts as coming from under them. As for those in the ring carrousels, the engine thrust would add a less than five percent gravity tangential force to the rotational gravity they already felt, enough to make someone feel like in a gently rolling ship but not enough to significantly disturb objects and persons around the spaceship. However, Janet Larsson did not believe in taking unnecessary risks, which was why the crewmembers would have to stay strapped in their seats for

the total duration of the nuclear engines burn time of a bit over one hour. Ten seconds before the planned time for engine ignition, Janet spoke again briefly.

‘’Mister Ponichnikov, put the nuclear engines at idle power. Mister Kubtchev, initiate the final countdown.’’

‘’Understood, Commander! Time to ignition: five seconds!...three, two, one, engines ignition at full rated power!’’

A powerful roar and strong vibrations transmitted through the structure of the ship followed as the sixteen PHOENIX 2000 nuclear rocket engines started burning a total of 4,160 kilos of liquid hydrogen per second, producing a total thrust of 4,000 metric tons. The huge spaceship started at once to rise from the low Earth orbit in which it had been parked for more than two years. As they started to follow their flight path to Mars, Janet couldn’t help look at one of the holographic video display screens which gave a view of the space outside the ship. Visible as a tiny dot in a lower orbit was the H.S.S. MIR, which was nearing completion in Earth orbit. The MIR was a twin of the FRIENDSHIP and was meant to add to the transport capacity towards Mars. It was also meant to act as a rescue ship if anything bad happened to the FRIENDSHIP. To see it there, nearly ready to travel into space, did a lot to reassure Janet. Not that she believed that the mission had low chances of success, on the contrary, but extra backups were always welcome in space.

There was little talk inside the command center during the next hour, with only short reports and instrument readings being given around while the nuclear rocket engines roared, pushing the spaceship into a Hohmann transfer orbit[5] towards Mars. Then, following a pre-calculated flight plan, Janet Larssen gave an order to Viktor Ponichnikov at a precise time.

‘’Bring the nuclear rocket engines to idle power and cut the flow of liquid hydrogen. Once at idle, switch the nuclear engines cores to power production mode.’’

‘’Throttling down nuclear rocket engines to idle… liquid hydrogen flow cut to zero… Switching to power production mode.’’

From a working temperature of 2,450 degrees Kelvin, or 3,950 degrees Fahrenheit, the uranium cores of the PHOENIX 2000 engines started cooling down as the control bars

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[5] Hohmann transfer orbit : Elliptical orbit used to transfer between two circular orbits of different radii in the same plane.

quenched the nuclear reaction in them. With the flow of liquid hydrogen fuel, which had circulated around the cores to both produce thrust and cool the exhaust nozzles, now cut, distilled water was next injected into a network of pipes closely surrounding the pressure vessels of the nuclear engines. That water quickly flashed to superheated steam as it collected the waste heat from the cores while helping the latter to cool down. That steam then was directed to steam-powered turbo-generators, producing massive amounts of electricity. With the sixteen nuclear rocket engines now functioning pretty much like individual nuclear power plants, the H.S.S. FRIENDSHIP ended up with over 480 megawatts of extra electrical power flowing through its power circuitry. Viktor, who was closely following that switch into power production mode on his instruments, soon spoke up again.

‘’Nuclear cores now stabilized in power production mode. We have 480 megawatts of extra power now available.’’

‘’Excellent!’’ said Janet Larssen. ‘’Mister Calderon, start our magnetoplasma engines, cruise thrust mode.’’

‘’Starting our magnetoplasma engines. Low thrust, high specific impulse mode selected!’’ replied the flight engineer as he switched on the eighteen two gigawatt VASIMR plasma engines of the spaceship. Those plasma engines, which constituted the cruise engines of the spaceship for long, deep space missions, started heating gaseous argon fuel via powerful electromagnets, transforming it into hot plasma before that plasma was compressed, further heated and accelerated by a second set of electromagnets, then ejected through an exhaust nozzle, producing thrust. That plasma left the engines at a temperature of over one million degrees Kelvin, 173 times hotter than the surface of the Sun, at velocities close to 70,000 meters per second and with a specific impulse of 10,000 seconds, over ten times more efficient in fuel than the PHOENIX 2000 rocket engines. While the engine thrust to spaceship mass ratio thus created was a measly 0.001, that thrust could be sustained for months and even years, greatly increasing the final velocity of the ship at little cost in fuel mass. While the PHOENIX 2000 nuclear rocket engines by themselves cut in half the duration time of a trip to Mars compared to the eight to nine months needed with pure chemical rocket engines, that travel time was further cut to forty days with the use of the VASIMR engines. Less travel time needed in space meant in turn less possible radiation exposure to the crewmembers of the ship and smaller quantities of supplies and foodstuff needed aboard, two factors highly beneficial to the mission.

‘’Magnetoplasma engines now at steady cruise power.’’

Viktor Ponichnikov concentrated for a moment, trying to detect any felt push given by the VASIMR engines.

‘’Hell, we are accelerating even more slowly than the first clunker I bought at a Moscow used car dealer when I was a teenage student.’’

Roberto Calderon threw Viktor a faked look of outrage on hearing that.

‘’Are you calling our 23 billion dollar spaceship a clunker?’’

‘’He better not!’’ added Janet Larssen, painting a severe expression on her face. ‘’If so, then he will be practicing his space walking…without a spacesuit.’’

Viktor faked a terrified look in response, making the other occupants of the command center burst out in laughter. Janet Larssen, who had also laughed briefly, then became serious again and switched her microphone to ship wide announcement mode.

‘’Attention all hands! You may now unbuckle your safety harnesses, get out of your spacesuits and resume your activities. Thank you!’’

Undoing her own seat harness, Janet then got up and looked at the others in the small command center.

‘’You may now get out of your spacesuits in rotation. Anton, Roberto, Paul and Ken, you take the first shift until 19:00. I will be touring the ship and talking to the crewmembers in the meantime.’’

Janet then floated out of the command center, which was in near zero G conditions in this stage of the flight.

Inside their cabin, Jack and Xiulan Sommers gladly got out of their spacesuits, then stored them in their alcoves, ending up in internal ship uniforms. Since they were not astronauts by profession, being instead classified as non-technical support personnel with only basic training on space systems, both still found their spacesuits a bit claustrophobic, on top of being rather heavy and cumbersome. Jack smiled on seeing Xiulan take off her uniform’s vest to change it for a white blouse and a classic blue and black, double-breasted barman’s jacket, ending for a moment with only her bra to cover her small but firm breasts. Gluing himself to her back and kissing her neck, Jack also gently fondled her breasts with both hands, making Xiulan purr with appreciation. She in turn put both hands in her back, rubbing his hardened penis through his trousers. Xiulan however put a stop to it after a few seconds, turning around to face her husband and smile to him.

‘’We can continue that after we complete our first work shift, Jack. You have to prepare supper for all the famished crew members aboard, while I have to get the bar ready to operate.’’

Jack sighed with regret but did stop his rubbing and fondling and kissed her on the lips.

‘’You are right, as always. I hope that you will have a nice first work shift.’’

‘’The same for you, Jack. Shall we walk together to the crew lounge?’’

‘’Of course! Let the other see what kind of nice couple we make.’’

Xiulan giggled at that before finishing to change. Both then walked out of their cabin and headed to the nearest set of stairs leading up to the Promenade Deck.

They found the crew lounge already occupied by a good thirty people, as many crewmembers would have little to do while the ship cruised towards Mars. Xiulan split with Jack once they got near the bar of the crew lounge, kissing him again before she went through the door giving access to the back of the bar and to its alcohol storage room. She found the other barmaid of the ship, Mary McGregor, behind the bar, taking out glasses from their protective boxes and lining them up in shock absorbing trays under the service counter.

‘’Hi Mary! Need help with this?’’

‘’I sure can, Xiulan! Take care of the cocktail glasses and I will take care of the beer mugs.’’

‘’Deal!’’

Going to the small storage room at the back of the bar that contained glassware, utensils and towels, Xiulan picked up a container of beer mugs and, using the small pair of wheels fitted to one end of the bottom, raised and pulled the container, rolling it out of the storage room and near the counter, where she put down the container and opened it before taking out the beer mugs one by one, inspecting them visually for any cracks or damage before storing them under the service counter. While doing so, she couldn’t help ask a question to Mary, an Irish girl married to an hydroponics technician working on the ship.

‘’Hey, Mary, is it true that this spaceship will be the first place in space where alcohol will be served routinely?’’

‘’It is true, Xiulan. Before, alcoholic drinks were either banned in orbit or severely regulated, being served rarely and in controlled conditions. Here, we will be able to

serve beer, wine and spirits to our customers at will, until they are judged to have had enough and failed the alcohol meter test.''

Xiulan threw a quick glance at the alcohol meter machine, standing in the middle of the counter and fitted with a quick-change mouth straw. On the H.S.S. FRIENDSHIP, the maximum permitted blood alcohol limit had been set at 0.04, enough to get a feeling but too little to be considered truly impaired. Even then, the crewmembers were expected to show moderation in their drinking habits. Some non-alcoholic beverages and substitutes, like alcohol-free beer and coolers, were stored in quantity aboard but real beer, wine and hard liquors would also be served, with a fairly diverse variety available at the bar, including beer on tap. Beer on tap, being stored in aluminum kegs, weighed much less per liquid volume than when stored in glass bottles and was also much less susceptible to breakage and leaks, making it ideal for a spaceship's bar. Beer on tap however had a shelf life of only a few months, so bottled beer with a strong alcohol content had also been brought aboard in quantity, in order to ensure a supply of beer during the whole two-year mission.

A bit over one hour later, with the bar ready to operate, Mary and Xiulan took off their barmaid's jacket, closed the counter's shutters and went to the nearby cafeteria to have supper. There, they ended near the head of a growing lineup of waiting customers, with the kitchen counters due to open for service in a few minutes. Mary and Xiulan took that time to study the menu of the day, written with erasable pens on a dry white board hooked to a wall near the service counter.

''Hum, should I go for the lamb curry, the sauté chicken and vegetables or the deep fried cod in batter? They all sound good.'' said Xiulan, making Mary point firmly at one item.

''For me it will be the deep fried cod in batter, no questions asked. The cooks in Vandenberg always managed to screw up fried cod but they do it really well on this ship.''

''Why not try a little of everything, Mary? This mission is a great occasion to be exposed to truly international cuisine.''

''You may be right, Xiulan. I think that I will do just that. With such good food served aboard, I will have to be careful not to get fat.''

''Me too! Aaah, the service counter is opening now.''

With the lineup then advancing quite quickly, Xiulan ended up being next to be served by none other than her smiling husband.

‘’Hi, honey! What will you have?’’

‘’Gives me some sauté chicken and vegetables, along with one lamb chop and one fried fish fillet on the side. Everything looks and smells so good.’’

‘’Thanks! I must say that Chef Caldi is a true culinary master: he can cook about any dish from around the World that you can think of, even if his forte is French and Italian cuisine.’’

‘’And you, Mister Sommers? What is your specialty?’’ asked Mary McGregor, making Jack beam with pride while he started serving Xiulan.

‘’Me? I’m the king of grilled meat! I’m especially good at making barbecued, spicy pulled pork.’’

‘’Spicy pulled pork? Hum, I never tasted that. When do you expect to cook some of it on this ship?’’

‘’Well, I will have to discuss that with the Chef: he decides the menus on a weekly basis. And what will you have tonight?’’

‘’I will also go for a mix, but centered on the fried fish rather than the sauté.’’

‘’Then, here you go. Bon appétit!’’

‘’Thank you!’’

Going first to the beverage counter, then to one of the unoccupied booths lining the walled side of the cafeteria, next to a lemon tree planted between two sets of booths, the two women quickly started eating their food while glancing out from time to time at the road traffic passing by their ‘dinner restaurant’ and visible through their ‘restaurant window’.

‘’I nearly could think myself back in Vandenberg right now.’’ said Mary. ‘’This mission promises to be quite pleasant, on top of being an incredible adventure.’’

‘’The space service bonus is also quite nice.’’ added Xiulan, making Mary nod her head.

‘’That too! The pay me and Sean were getting in Ireland was positively meager compared to what we are making now. We will be able to put aside a nice bundle from this mission.’’

‘’And how are things in Ireland these days, Mary?’’

Mary's expression changed then, becoming somber and making Xiulan regret having asked her question.

''Not too good, I'm afraid. Floods, torrential rains and mud slides are now way too frequent around Ireland, while a number of fishing villages that have existed for centuries have been washed away by the rising sea. The changing water temperatures also played havoc with the fish stocks and catches are way down from past decades. Overall, the general standard of living in Ireland has taken a hard hit, like in the British Isles. We were damn lucky to have been selected by the ESA[6] for this mission. And you, Xiulan?''

''Me and Jack were lucky, in that he was serving at Vandenberg, which is situated high enough not to be endangered by the rising sea levels. However, before we married a year ago, I had lived many years in Los Angeles and that whole coastal strip, along with the port of Long Beach, had to be protected with long lines of sea walls and dikes. All the nice beaches that California had once been famous for are now under water, while droughts have become both more frequent and more severe every year.''

''That is sad indeed. I hope that we manage one day to reverse this global warming and its consequent ice caps melting.''

''Me too! Now that most nations on Earth understand fully how serious this climate crisis is and have cut drastically their respective military budgets in order to fight natural disasters, real and meaningful efforts are being done at last to reverse the situation or, at the least, stop the damage from spreading.''

''I wish that people would have awakened earlier to all this. It would have avoided us a lot of misery and deaths.''

Xiulan could only nod her head to that before continuing to eat slowly in silence.

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[6] ESA : European Space Agency.

CHAPTER 6 – IN MARS ORBIT

08:49 (GMT)
Tuesday, January 5, 2044
Command center, H.S.S. FRIENDSHIP
Arriving in low Mars orbit

‘’Third main engines burn completed! We are now in low Mars orbit, with a present altitude of 310 kilometers and an orbit inclination of 26 degrees.’’

The announcement from Shen Li Yang, the spaceship’s copilot and navigator, attracted a concert of cheers around the command center and the rest of the ship. Janet Larsson took the time to exchange handshakes with her command crew before issuing a series of orders.

‘’Viktor, switch our nuclear engines to power production mode.’’

‘’Already done, Commander.’’

‘’Excellent! Anton, we will start regulating our orbit as soon as we establish precisely the altitude of our apogee and perigee. Paul, send a message back to Vandenberg, stating that we arrived safely in low Mars orbit and that we will send them our exact orbit parameters once we will know them. Ken, how strong are the radiations outside at this altitude?’’

‘’Not healthy at all, Commander: I am currently reading a steady shower of 0.16 milligrays per hour of charged particles radiation. However, our shielding is more than adequate to easily absorb that amount of radiation.’’

‘’You reassure me, Ken.’’ said Janet before switching to ship-wide announcement. ‘’Attention all personnel, this is your commander speaking! We are going in the next few hours to regulate our orbit. Once that is done, we will start mapping and studying in detail the planet in order to confirm our choice of landing point for our lander craft. The satellite maintenance crews will now start doing an ultimate check of our various satellites prior to launching them once our orbit will have been circularized. That is all! Thank you for your attention.’’

Typing a command on the computer screen attached to the right arm of her seat, Janet then reviewed the list of satellites stored aboard her ship, along with their intended order of launch and their planned orbital parameters. The H.S.S. FRIENDSHIP carried in a

number of hangars inside the outer edge of the disk section a total of thirteen satellites and two drone explorer craft meant to help map and study in unprecedented detail Mars and its surrounding space. Some of those satellites would also serve as communications relay satellites, in order to keep a permanent link between the ship and a surface crew, while other satellites were going to be used as global positioning satellites, to provide at all times an accurate position to surface team members and rovers. Larger hangars in the bow of the ship and around the disk section housed the main Mars manned lander, four Mars lander cargo ships, a planetary shuttle, a mini-orbital shuttle, a space tug and four flying maintenance boats. All these were lessons from the tragedy of the Mars One Mission, which had failed mostly due to undue haste and lack of support to its lander team. This time, the first Humans to land on Mars would do so only once various satellites and the sensors and telescopes aboard the FRIENDSHIP would have studied in detail the red planet, helping to select an optimum landing point. Once that point would be chosen, the two drone explorer craft would go down and let out remotely-piloted mini-rovers, to explore from up close and on the ground the chosen landing area. With luck, those mini-rovers were going to help find the perfect location for a fixed Mars base, one which would offer good protection against the radiations that constantly showered the surface of Mars and, if really lucky, would be near a significant source of water. For these two reasons, any cliff-side cave or old lava tunnel would constitute prime targets for the mini-rovers. Only once such a location would have been found would the manned lander go down with its crew of sixteen people. As for the four lander cargo ships, they would be sent down afterwards to the site of the fixed surface base, to provide it with extra supplies, construction materiel and heavy machinery. If more equipment or stores were still needed after that, the planetary shuttle would be able to bring those to the surface, while bringing up to orbit any ground samples deemed of interest. Janet was extremely proud to command such a ship as the FRIENDSHIP, which was in effect the first true interplanetary spaceship, able to fly return missions to the most remote planets of the Solar System. In fact, the H.S.S. FRIENDSHIP was probably going to fly one day to Jupiter and Saturn, to study the prospects for establishing human colonies on selected moons.

Five hours later, with the ship’s orbit regulated to a very low eccentricity ellipse, Janet gave the order to launch the first satellites. The first to come out of its hangar was the Mars Polar Eye One, or MPEO, a large satellite with a battery of multi-spectral

sensors, including cameras and radar antennas. Once freed from the ship, the MPEO took some distance before its chemical rocket engine was fired up, pushing it into a low polar orbit around Mars. As the MPEO proceeded to establish itself in a stable polar orbit, a constellation of four geostationary communications satellites deployed out of the H.S.S. FRIENDSHIP and flew to positions high over the Mars equator, where they were going to be able to retransmit any signal between the surface, the ship and Earth, thus ensuring permanent communications links. The sixth satellite to be launched was maybe the most important one, as the MEHRI (Mars Equatorial High Resolution Imager) went to take a very low equatorial orbit with an inclination of thirty degrees around Mars. Its altitude of merely 150 kilometers, its large aperture cameras and its powerful, high resolution mapping radar were going to combine to provide the most detailed and accurate maps to date of the surface of Mars, maps that would prove crucial in helping to choose a final landing point for the manned lander.

On the ship itself, a team of astronomers, planetologists and geo-physicists, assisted by sensors specialists and geomaticians[7], became quite busy, using the powerful telescopes, cameras, spectrometers and radars of the FRIENDSHIP to start to study in exquisite detail the surface of the planet. Within another day, those scientists and geomaticians became even more busy, as they started receiving and analyzing massive amounts of data from the satellites now orbiting Mars. As for the rest of the crew, it fell into an orbital maintenance and support activities routine, a routine much less glamorous than that of the scientists but one which was as important for the good functioning of the mission.

19:45 (GMT)
Saturday, January 9, 2044
Bar-lounge of the H.S.S. FRIENDSHIP
In low Mars orbit

Xiulan looked with concern at Julie Deloncle as the 48 year old French geomatician sat down wearily on one of the high stools of the bar counter.

‘’My poor Julie! You look exhausted!’’

[7] Geomaticians : Specialists in producing maps.

‘’I am! The amount of planetary data that we are receiving constantly from our various sensors and satellites is staggering. Even with working twelve hour shifts, my mapping specialists and our astronomers and planetologists can barely cope with that mass of data. The one good news out of that is that we are in the process of producing by far the best and most detailed maps of the surface of Mars ever compiled and assembled. I however decided that me and my team had to slow down a bit, in order not to burn ourselves out early in the mission, so I came here for a nice, refreshing drink.’’

‘’A good decision, Julie. How about a nice, cold cup of Vino Verde wine?’’

‘’I see that you know about my favorite refreshment already, Xiulan. I will gladly have a cup, please.’’

‘’One cup of Vino Verde coming up!’’ said cheerfully Xiulan before fetching a short, fat bottle from a refrigerator under the bar. She then opened the already half-empty bottle and filled a cup before putting it on top of the counter in face of Julie Deloncle, who grabbed it thankfully. Xiulan next presented to Julie her portable fingerprint teller terminal, so that the French woman could put her thumb on it and debit her ship’s account to pay for her drink. While alcoholic beverages were served on demand on the ship, they were not free and there were limits to the amount one could consume before being told to cut it. In case of doubt, Xiulan had the authority to ask a potential customer to blow in the alcohol meter of the bar, to see if that person had reached the maximum allowed limit of 0.04. If so, Xiulan would then have no choice but refuse to serve that person. Thankfully, she had not had to do this yet during the past nearly three months since her arrival on the ship.

Xiulan was bending down to put the bottle of Vino Verde back in its refrigerator when a wave of nausea hit her and she nearly let the bottle drop from her hand. Another bar customer, a hydroponics technician, saw her stumble behind the counter and got half up from his chair, concern on his face.

‘’Are you okay, Xiulan?’’

‘’I…I think so.’’ said weakly the barmaid. However, simply saying those words only intensified her nausea and she had to hurry to the waste basket set behind the bar counter, arriving just in time to throw up in it. Julie Deloncle, seeing that, jumped off her high stool and went around the counter to go help Xiulan, imitated by the hydroponics technician. Xiulan tried to wave them off, pretending that she would be okay.

‘’No…no need: it was just a passing thing.’’

‘’The hell it was, Xiulan!’’ replied Julie. ‘’You are pale and sweaty. I’m bringing you to the infirmary. Mister Alvarez, find me a bag or something that she can use if she needs to throw up again.’’

‘’Right away, Miss Deloncle.’’

The technician soon found an unused plastic bag and handed it to Julie, who in turn gave it to Xiulan before helping her get up.

‘’Here, keep it under your mouth, in case you feel like vomiting again. I will support you on the way.’’

‘’Thanks, Julie.’’ replied in a weak voice Xiulan, who didn’t feel well at all now. She let the geomatician guide her around the bar, then walked with her down the promenade strip towards the ship’s medical center. When they entered the reception room of the medical center, the nurse on duty rose at once from her chair and came to help Xiulan sit down.

‘’What happened, Misses Sommers?’’

‘’I…I was working behind the bar and was bending down when I suddenly felt nausea and vertigo. I threw up a couple of times.’’

The nurse touched Xiulan’s forehead with the back of her hand, then took her pulse and her blood pressure while asking her a few questions.

‘’Have you had those symptoms recently before?’’

‘’No! This is the first time I felt like this.’’

‘’When did you eat last time and what did you eat?’’

‘’I ate a fresh salad and a chicken and noodle soup two hours ago.’’

‘’Hum, nothing that would be hard to digest. Let me guide you to the examination room, then I will get Doctor Gorushkova.’’

‘’Thank you, Nurse Yamashita.’’ said weakly Xiulan before getting up and walking to the adjacent examination room, where Meiko Yamashita made her lie down on her back atop a medical examination bed. As the nurse went to get the ship’s assistant medical officer, Julie smiled to Xiulan while holding gently one of her hands.

‘’You are now in good hands, Xiulan. Everything will be fine.’’

Xiulan didn’t reply to that, too busy thinking about the possible causes of her nausea. Doctor Nadia Gorushkova entered the examination room less than a minute later and gave a critical look at Xiulan before smiling to her.

‘’So, what is the problem here?’’

‘’I was suddenly overcome with nausea as I was working behind the bar, Doctor.’’ answered Xiulan, who then recounted in detail what had happened. Gorushkova listened to her, then took a couple of minutes to examine her, watched on by Julie and the nurse. At the end of it, the Russian doctor helped Xiulan to sit up on the examination bed, swinging her legs over the edge before smiling to the barmaid.

‘’I see a couple of possibilities here. First, when were your last menstruations?’’ Xiulan was struck by that question as she realized something.

‘’Uh, seven weeks ago, Doctor. I am normally very regular but I put my missing menstruation on account of my trip in space.’’

‘’Well, I can tell you from past experience and knowledge that being in zero gravity may affect female menstruations. However, most of this ship has been under artificial gravity from the start of this mission. I believe that you are married and that your husband is aboard, correct?’’

‘’Yes, that’s correct, Doctor.’’

‘’Then, let me get something quickly. I will be back in a minute.’’

Gorushkova returned in the examination room after less than a minute and handed a small, elongated object wrapped in plastic to Xiulan.

‘’I will need you to go to the washroom adjacent to the reception room and follow the instructions on the package, Misses Sommers.’’

Xiulan had one look at the inscriptions on the packaging and felt emotions wash over her.

‘’A pregnancy test?’’

‘’That’s right! I suppose that you have been active sexually during the last few weeks?’’

‘’Uh, quite active, actually, Doctor.’’

‘’Then, go to the washroom and we will see if your husband hit the jackpot. Nurse Yamashita will help you if need be.’’

With the nurse then escorting out an excited Xiulan to the washroom, Julie Deloncle grinned to Gorushkova.

‘’Xiulan could be the first woman to become pregnant in space?’’

‘’She very well could be, in view of the symptoms I saw. We will know better in a few minutes.’’

Both women had to wait only three minutes before a muffled shout of joy was heard from the center’s visitors washroom, making Nadia Gorushkova smile to Julie.

‘’It looks like I was right. Mister Sommers will be able to claim himself as being the father of the first baby conceived in space.’’

‘’But, our mission still has over 23 months at a minimum to go before we will be back in Earth orbit.’’ nearly stuttered Julie. ‘’That means…’’

‘’That Xiulan’s child will be born in space, on this spaceship? Yes, it does! Furthermore, that baby will have time to celebrate its first birthday while still on this ship.’’

‘’Oh my god! This is one hell of a news.’’

‘’Yes it is!’’ said Gorushkova, becoming quite serious. ‘’Something tells me that Xiulan won’t be the only woman to become pregnant on this trip. It is a good thing indeed that they loaded some baby supplies and equipment aboard before we departed Earth, just in case.’’

As she had predicted, another female crewmember was found to be pregnant three weeks later, with a third woman getting a positive test another week after that. The ship’s chief medical officer, Doctor Alexander Cranston, soon had to put the brakes on the avalanche of questions that came from medical experts on Earth, essentially refusing to turn the three pregnant women on the ship into some kind of medical guinea pigs. In that, he was firmly supported by Janet Larsson, who basically blacklisted the messages coming from the most obnoxious specialists on Earth. Those specialists were going to have to content themselves with the routine medical reports concerning each crewmember, which were regularly transmitted to Earth and were also filed in the ship’s medical archives.

CHAPTER 7 – FINAL DECISION

14:13 (GMT)
Thursday, February 18, 2044
Ship's conference room, H.S.S. FRIENDSHIP
Low Mars orbit

Janet Larsson, along with the scientists sitting around the conference table, studied for a long moment the detailed color picture displayed on the main viewer screen of the conference room. Roman Denisovich, the ship's chief planetologists and geophysicist, who was the presenter at the time, waited patiently while Janet looked at the photo mosaic of the Melas Chasma region of the Valles Marineris, the huge, 3,500 kilometer-long, 300 kilometer-wide and up to ten kilometer-deep canyon running East-West close to Mars' equator. The image on the display screen also included various types of data accumulated to date by the sensors of the ship and of the mapping satellites that had been viewing the surface of Mars for over five weeks now. That data, including spectrometer readings of the surface soil and altitude elevations established via radar mapping, was as important if not more than the terrain picture itself for the purpose of this meeting. The mission was now at a crucial turning point, with a final decision to be taken today on which exact spot on Mars should be the landing point of the ship's manned lander craft. In that, there was no margin permitted for error, as the H.S.S. FRIENDSHIP carried only one manned lander. Their planetary shuttle, while designed to land and take off repeatedly from Mars, had only a small cargo and passenger carrying capacity and no scientific research facilities aboard. If they sent down the manned Mars lander to a spot that would then turn to be a deception, then they would have wasted the major part of their mission. Denisovich, like Janet Larsson, was not ready to let that happen through undue haste, so he waited silently as the mission commander made her mind. Janet finally stopped gazing at the display screen and looked at the astronomers, planetologists and geologists assembled around the table.

''Ladies and gentlemen, I believe that our choice is now clear: the Melas Chasma region of the Valles Marineris is one of the most striking geological features on Mars and

promises to reveal to us many secrets about its past. Its ten kilometer-high cliffs, with its stratified layers dating back 3.7 billion years, will provide us with a detailed geological history of the planet. Also, the abundant presence of hydrated soils at the bottom of the canyon, both sulfates and clays, is a clear indication that liquid water flowed through that part of Valles Marineris in the distant past. With luck, we will find in Melas Chasma where all that ancient water has gone. Here, I must emphasize again how important it is for us to find an exploitable source of water on Mars. If we don't find such an exploitable water source, then the future of any Human colony on Mars will become highly questionable and we will then have to limit ourselves to exploring, with no attempt at colonization.''

Jason Terlecki, the mining and base construction engineer assigned to the Mars Lander crew, then raised his hand briefly before speaking in turn.

''We still could choose to build our base at one of the poles of Mars, where there are permanent ice caps, with plenty of water ice for us to use. I know that, geologically speaking, the poles are far less interesting than the Valles Marineris and other regions around the equator, but we should not dismiss for good the poles as ultimate locations for a permanent base and colony. I thus propose that we reserve our Mars Explorer Drone Craft Two for possible surveying of the South Pole ice cap, in case that the Melas Chasma region turns out to be a disappointment after the sending of our first drone.''

There were a few approving comments and whispers around the table as the scientists looked at each other. Seeing that there seemed to be a consensus forming about Terlecki's proposal, Janet spoke up.

''I personally find Mister Terlecki's proposal to be highly sensible and logical. Do you all agree with it, ladies and gentlemen?''

The scientists present quickly expressed their unanimous approval to the proposal, to Janet's satisfaction.

''Excellent! Now, to return to the Melas Chasma region, which is by itself a huge piece of estate with a maximum width of close to 300 kilometers and a length of over 1,200 kilometers. Exploring the whole of that region will be well beyond the capabilities of our ground team, so we will have to target only a specific portion of it. What are your opinions on this, ladies and gentlemen?''

This time, it was Julie Deloncle, the ship's chief geomatician, who spoke up first.

''I believe that we should target the westernmost part of Melas Chasma, southwest of Candor Chaos. That portion of the Melas Chasma is covered with thick

depots of hydrated soil, thus holds many promises for us about finding sizeable quantities of water under its surface. Also, by concentrating our search on the southern cliffs of the canyon, which is nearly at its deepest in that region, we maximize the chances to find a cave, grotto or empty lava tube that could provide a safe environment against space radiations for our future base.''

''Uh, while I find Julie's opinion valuable, I would prefer that we concentrate our attention on the northern cliffs of that part of the Melas Chasma.'' said Roman Denisovich. ''A number of ancient river beds running West to East end up at the edges of those northern cliffs. If anything, those northern cliffs could hold even bigger promises in terms of underground water layers.''

That counter-proposal triggered a passionate group debate on the merits of each of the proposals, a debate that went on with many forceful arguments for nearly fifteen minutes, until Janet Larsson decided to wade in to settle the argument.

''Ladies and gentlemen, I see that both proposals have plenty of merit, along with many supporters. I thus propose that we concentrate on the westernmost section of Melas Chasma, but that we also have our reconnaissance drone explore in detail both the southern and northern cliffs of that region. Once we will have detailed imagery and readings for the whole target area, we will be able to take an informed, final decision about the desired landing point of our manned lander. Do I have objections to that? No? Then, we will launch our drone number one tomorrow, with the western end of the Melas Chasma as its target of interest. Misters Templeton, Denisovich and Walsingham, I will expect from you a detailed proposed flight plan for our drone craft by tomorrow morning, with a planned launch at four o'clock in the afternoon, Greenwich time. I now declare this meeting over.''

15:58 (GMT)

Friday, February 19, 2044

Drone command compartment, core section of the H.S.S. FRIENDSHIP

Low Mars orbit

Jeremy Brown, an ex-U.S. Air Force drone pilot, smiled to Peter Walsingham as he floated into his seat next to the ex-British R.A.F. fighter pilot.

''Ready for your big flight, Peter?''

‘’You bet I am!’’ replied Walsingham, who was reviewing his instruments panel in front of him and who also already wore his remote viewing helmet and visor. However, Peter’s visor was still switched off, so that he could look normally at his instruments before his drone’s launch. Jeremy buckled his seat harness, then put on his own remote viewing helmet, so that he could assist Peter during the flight of Mars Explorer Drone Craft One. Once both men were satisfied that the drone appeared to be fully online and functional, Peter pushed a button on his instrument panel.

‘’Opening the doors of Drone One’s hangar.’’

The one piece hatch closing one of the craft hangars situated around the outer edge of the main disk section of the ship opened, exposing to the vacuum of space a large conical object.

‘’Launching Drone One now!’’

The push of another button ejected at slow speed the drone from its hangar and into space, where it floated downward towards the surface of Mars. Next, Peter activated the automated flight plan of the drone with a radio command, making the craft’s attitude engines light up to rotate it into the correct flight axis. The main retro-rocket of the craft then came to life, making the drone cut its orbital speed so that it would go down and enter the very thin atmosphere of Mars, whose pressure was only one percent of Earth’s atmosphere. Both pilots closely followed the flight of the craft on their instruments, ready to take over manually if anything went wrong with the programmed descent of the drone. Thankfully, everything went smoothly and the craft’s base heat shield soon started to heat up from the friction with the rarefied Martian atmosphere, friction that helped decelerate the drone further. Both pilots however knew that, contrary to Earth’s atmosphere, which was thick enough to drastically cut by itself the speed of any de-orbiting object, Mars’ atmosphere was too thin to cut more than a small portion of the drone’s speed, so the retro-rocket engine continued burning for a few minutes, lowering gradually the speed of the craft. Then, when the speed went down to a secure level, a first parachute deployed from the nose of the conical craft. While big by Earth’s standards, that parachute was only barely enough to further decelerate the craft by a few more hundreds of kilometers per hour. Once down to low subsonic speed, another, much bigger parachute, deployed out of the nose cone, while the retro-rocket engine shut off. That parachute was however a rectangular one that could be steered, contrary to the round first parachute meant solely to slow the drone down. While positively huge and dwarfing the craft hanging from it, that parachute still left the drone falling down at

an appreciable speed but quickly turned its descent into a nearly vertical one. That was when a large, thin balloon attached to the center top of the main parachute started inflating as helium gas at very low pressure was let in. Once loosely filled, the balloon helped the main parachute break further the downward speed of the drone. Back in the H.S.S. FRIENDSHIP remote command compartment, Peter Walsingham smiled when the descent speed of the drone fell to a specific level.

‘’Gliding speed attained! Time for my magic touch.’’

Grabbing his flight control stick, the ex-R.A.F. fighter-reconnaissance pilot switched the drone craft to ‘parachute gliding mode’, then started sending command signals via his stick. Like standard directional parachutes used by free falling parachutists on Earth, the rectangular main parachute of the drone could be steered by pulling onto selected corner wires attaching it to the craft, making it turn left or right and either accelerating forward or braking its forward speed. In this case, remotely-actuated hydraulic pistons did the wire pulling under Peter’s control. Checking on the position and altitude of the drone via a mapping camera and radar, Peter steered slowly the craft towards the Melas Chasma as it started overflying at medium altitude the eastern end of the giant Valles Marineris canyon.

‘’Jeremy, unmask the drone’s in-flight cameras and sensors. Be ready to study the pictures we will be receiving, guys, and tell us if you see something worthy of a second look.’’

The ‘guys’ in question were a group of seven geologists and planetologists sitting at viewing stations set around the two pilots’ stations and waiting anxiously to see what the drone’s cameras would show them of the Valles Marineris. Their viewing screens soon filled will high definition color pictures of the terrain under and on both sides of the drone, now gliding slowly westward above the giant canyon. The scientists kept relatively silent at first as the drone flew over the eastern parts of the Valles Marineris, Capri Chasma and Coprates Chasma. Their excitement shot up when they started getting pictures of the Melas Chasma, the huge central portion of the canyon that was their main target of interest.

‘’There’s the Ophir Labes, on the right! I see some interesting strata above the level of the landslide slopes. With the old alluvial beds on the surface nearby, they could contain some water frozen within the dirt and rocks.’’

‘’Indeed! But the bottom of the canyon on the left side, opposite the Ophir Labes, seems to be really rich in hydrated soil depots. This whole region saw a lot of water flow

through it in the distant past. The big question now is: where has all that water gone? I'm not ready to believe that it all evaporated into the atmosphere.''

As the planetologists and scientists discussed that point and others while viewing the images sent by the drone, which continued to glide down at a slow rate under its combined parachute and balloon, Peter Walsingham watched carefully the ground relief the drone was overflying, with the elevations mapped and recorded by its mapping radar. After half a hour of gliding over the canyon, he noticed something previously recorded by the mapping radar of the H.S.S. FRIENDSHIP, but now visible in much better detail.

''The ground in this part of the canyon is now getting progressively deeper towards the center of the Melas Chasma. The depth of the floor is now 8,640 meters below the top of the cliffs on either sides, with the depth increasing as we fly westward. Could water have gathered at the bottom as the rivers dried out, thus forming a sort of lake in the center of Melas Chasma?''

''That is very possible, Mister Walsingham.'' said Roman Denisovich. ''With the vast expanses of hydrated soil visible to the left, there could very well have been a lake here, millions of years ago. I would love to be able to drill a deep hole there to check for possible underground frozen aquifer strata under all that red dirt.''

''I always could make the drone land there after it will have flown over the portion of canyon of interest to us and performed a 'U' turn to come back eastward, Doctor Denisovich. The drone has a belly drill that it can deploy once landed.''

''An excellent idea! Mark that spot on your navigation map as the drone's landing spot of choice. Hopefully, it will have enough altitude left at the end of its run to come back to that spot.''

''Don't forget that the drone has a small rocket motor that I can use to sustain or increase its flying altitude. As things are going now, I believe that our chances of landing the drone there are fairly good.''

''Excellent! Can you start flying closer to the left, to get near the southern cliffs of the canyon?''

''No problem, Doctor.''

Steering the drone towards the left, Peter slowly made it approach the southern cliffs of the center part of the Melas Chasma, until it flew parallel to them from a distance

of a mere ten kilometers. By then, the pictures they were getting were of unprecedented detail and definition, making the scientists ecstatic.

‘’These images are superb!’’ exclaimed Yves Dorval, a Canadian geologist and prospector slated to be part of the Mars landing team. ‘’This is like reading an open book on the geological history of Mars.’’

One of the other geologists, Thor Vaslung, suddenly raised his voice in excitement while pointing at a feature visible on his screen.

‘’I see the entrance of a cave or tunnel, about two-thirds down the slopes!’’

‘’I see it too!’’ said Steve Larkin, the senior geologist. ‘’It looks like the entrance of a lava tube.’’

‘’It definitely does look like a lava tube.’’ said Denisovich after examining the feature for a few seconds. ‘’It also opens up at the level of what is clearly a volcanic strata. From the field of hydrated soil at the feet of the cliff, under that opening, I would venture that water once circulated inside that lava tube, washing out all that volcanic dirt. Too bad that this tube is situated so high in the cliff. I would have loved to explore it. With luck, we will see more lava tube entrances, hopefully near or at ground level. Keep your eyes open, guys!’’

The other scientists didn’t have to be told twice and glued themselves to their viewing screens, commenting each feature of interest between them as Peter Walsingham kept flying his drone westward. By now the drone was about to go lower than the nearby top of the cliffs and he was doing his best to minimize as much as possible its descent rate. In that he was greatly helped by the helium balloon attached to the drone’s parachute. If not for it, the drone would have hit the bottom of the canyon already. More excited comments shot up fifteen minutes later, as the drone was flying just below the top of the cliffs.

‘’I see the entrance of another possible lava tube. It is nearly at ground level, just above a cone of dirt formed by a landslide. Could we launch one of the mini-rovers now to explore that opening?’’

‘’Don’t forget that the drone carries only four mini-rovers, gentlemen.’’ cautioned Peter. ‘’Make sure that we use them wisely.’’

‘’This actually looks more than interesting enough to rate a mini-rover.’’ replied Denisovich, who was gleefully examining the cave opening now visible on a screen. ‘’You may launch a mini-rover now, Mister Walsingham.’’

‘’One mini-rover, coming up!’’ said cheerfully Peter before looking to his right at Frey Thorvalson, one of the two rover drivers slated to go down to the surface of Mars. ‘’Be ready to drive mini-rover number one once it will have landed, Frey.’’

‘’I am ready, Peter.’’ replied the big Icelandic technician.

‘’Alright, launching mini-rover number one now!’’

A small, wheeled vehicle the size of an all terrain vehicle was soon dropped from the gliding drone, to have its fall nearly immediately braked by a large parachute. Being designed to be as light as possible, the mini-rover flew down at a moderate speed, its impact on the ground being further diminished by the last second firing of a set of small solid propellant rockets. The four oversized, low profile wheels and their independent suspensions easily absorbed the remaining downward velocity, with the parachute detaching itself from the mini-rover after touchdown. Frey Thorvalson then took control of the small robotic vehicle, scanning first around its landing point with the help of its swiveling camera head mounted atop a short mast, before making the mini-rover start rolling towards the wide cone of dirt under the lava tube’s opening. Having landed less than a kilometer from that opening, the mini-rover took only five minutes to get to the bottom of the landslide mound, while the reconnaissance drone continued gliding westward overhead. Driven expertly by the big Icelander, who had spent much of his life driving vehicles around the rough, denuded landscape of Iceland, the mini-rover slowly climbed the mound, which was fortunately free of large rocks on its slopes, arriving at the intersection with the vertical rock wall formed by the cliff. There, Frey was faced with a problem: the opening of the lava tube was about four meters above the top of the mound, forming an apparently insurmountable obstacle for the small robotic vehicle. However, the designers of the mini-rovers had planned for the need to possibly have to effect short jumps around and had incorporated to the vehicles a system of low thrust rocket thrusters with directional capability. The low gravity on Mars, which was only 37% that of Earth, had facilitated the design of those thrusters. Still, those thrusters had fuel for only a few seconds, something Thorvalson was well aware off. Calculating carefully his jump, Frey then lit up the thrusters of the mini-rover to half power, making the vehicle rise at once at the vertical. Just before getting level with the opening, he oriented the thrusters to create a horizontal acceleration. The moment that the mini-rover was inside the lava tube, he cut the thrusters, saving the leftover fuel for later.

‘’I’m inside the lava tube! I am now going to plant a radio transmitter relay box near the entrance and will start winding out its fiber optics cable, plus will switch to low light cameras and headlights.’’

‘’Great job, Mister Thorvalson!’’ said Denisovich, pleased. ‘’Now, let’s see what we will find inside that lava tube. Steve, you concentrate on the view from our mini-rover while I keep watching around the drone.’’

‘’Got it! You may roll, Frey.’’

Frey didn’t have to be told twice and made his mini-rover roll slowly forward inside the lava tube, which had an internal diameter of at least forty meters.

‘’This lava tube could easily house the prefabricated modules of our fixed base and will certainly protect it from the radiations showering Mars’ surface. The one thing left that we need would be water.’’

‘’How much radiation is the mini-rover detecting now, Frey?’’ asked Jason Terlecki, whose main job would be to build a fixed base on the surface. One glance at his instruments made the Icelander smile.

‘’In contrast with when the mini-rover was still in the open, it now can barely detect any radiation. The counter registers a mere 0.0009 milligrays per hour and it is still close to the entrance.’’

‘’That’s to my liking.’’

Larkin and Terlecki kept their eyes glued to their viewing screens as Thorvalson made the mini-rover advance further inside the tunnel. As it went deeper in the lava tube, the diameter decreased very slowly but it was still over 34 meter wide after the vehicle had rolled a good hundred meters inside the dark tunnel. After rolling for about 230 meters, Frey stopped his mini-rover as his vehicle’s cameras suddenly saw a dramatic increase in the tunnel diameter. Switching to white light headlamps, which had more range and power than the infrared lights, he and the two specialists contemplated the image of a vast underground rotunda, in which walls they could see the openings of two other lava tubes, respectively to the right and ahead.

‘’My god! A lava chamber! It must have a diameter of at least 150 meters and a maximum height of sixty meters.’’ said Terlecki. ‘’It would be a perfect place to build our base.’’

‘’Yes, but we still need to find some water.’’ Larkin reminded him. ‘’Frey, go take the larger tunnel, the one to the right of the rover.’’

‘’On the way!’’

Piloted by the Icelander, the mini-rover started rolling on the dusty surface of the rotunda's floor, heading towards the larger lava tube. At one point, as he steered to avoid a large rock that had apparently fallen from the ceiling, his rover made a sideways motion, as if it had slid on a slippery floor.

''What the…? The rover slipped on something!''

Braking his rover made it slide again, this time forward. Now truly mystified, he decided to try something and put his rover in high gear, then went for maximum acceleration for a second. The result left him stunned.

''The wheels: they spun on the spot! It's as if…''

Making the camera head of the rover look down, he then made the vehicle turn around, so that he could look at the tracks left in the dirt by its wheels. A white, shiny surface reflected at once the light from the headlamps, making Frey's heart skip a beat.

''ICE! THE ROVER SLIPPED ON ICE!''

His excited shout immediately attracted all the scientists present to the screens showing the images from the mini-rover. Roman Denisovich felt blood rush to his brain when he saw that Thorvalson was right.

''It does look like ice! The question is now: how deep is that ice crust? Could there be another lava tube below this lava chamber, a tube filled with ancient water? Frey, power the seismic radar of your mini-rover.''

All eyes went to one of the side screens of Thorvalson's station, on which the radar picture was due to show up.

''Switching the radar now.''

Everyone in the compartment held their breath as the first radar wave travelled downward from the mini-rover. More than one of the geologists felt exhilaration on seeing the radar return picture now on the screen.

''It's nearly bottomless!'' exclaimed Sergei Krulov, one the geologists and prospectors due to land on Mars. ''The rover is sitting on top of a vertical lava tube filled with ice.''

''Not all ice!'' replied Denisovich while pointing at a barely visible change in the picture some twenty meters under the rover. ''The ice seems to become liquid around that level. This is truly a sensational find. Maybe that water and ice-filled lava tube is going down all the way to a deep aquifer layer, in which case we just found more than

enough water for our base, or even for a colony. Maybe the other tunnels will also lead to ice. Mister Thorvalson, get into that tunnel you were heading for when you slipped.''

''With pleasure, Doctor.''

As Denisovich excitedly called up Janet Larsson to give her the good news, Frey piloted his mini-rover into the right-side tunnel, which was about as wide as the one that led outside. Still dispensing a thin fiber optics cable behind it, the vehicle started following a gentle downward slope, surrounded by walls made of dark volcanic rock. The tunnel proved to be mostly straight, while the downward slope became gradually more severe, to the point where Frey started worrying about having enough traction to climb back up. He then decided to use another special feature of the rover.

''I am going to plant a peg now, so that I can winch my way back up afterwards.''

''How much cable length does your winch has?'' asked at once Terlecki.

''A hundred meters. Once at the end of it, I will have no choice but to come back up: the fuel cell of the rover will be good for another hour at the most before it will need to electrolyze its waste water back into hydrogen and oxygen. The rover thus must be back at the entrance before that, so that its solar panels can supplement its isotopic generator.''

''Understood!''

Pressing a button, Frey made the mini-rover fire down a thin steel peg attached to a thin cable spun around a winch drum. The peg planted itself solidly in the ground, allowing Frey to resume the rover's advance with more confidence. However, to his disappointment and that of Jason Terlecki, the rover came at the end of its winch cable without finding anything than more of the dark tunnel.

''Damn! I wish we could have gone all the way down to whatever is there at the bottom.''

''Don't feel too bad, Frey.'' said Jason while patting his shoulder. ''Your rover already found plenty and we still have another tunnel to explore.''

''You're right! I'm going to winch my way back up, so that we could go back to the rotunda and go inside that second tunnel.''

All the while, Peter Walsingham and the scientists in the compartment were not idle, as the reconnaissance drone continued its glide path westward, scanning the floor of the canyon and the cliffs on both sides as it went. They saw the openings of a few

more lava tubes along the southern cliffs but, unfortunately, all of them were situated at least a few hundred meters above the canyon floor, making them inaccessible to the rovers of the drone. Then came the time for the drone to turn around to fly eastward while skirting the northern cliffs of the Melas Chasma. What the scientists saw of the northern cliffs at first was quite similar to the southern cliffs. That changed all of a sudden as the drone was approximately 150 kilometers west of the junction of the Melas Chasma with the Melas Labes, a region of landslides connecting with the tormented terrain of the Candor Chaos region. The scientists were in fact already hopeful, as the drone was level with a part of the canyon where a number of old river beds connected with it. Geologist Tim Garland was the first to exclaim himself while pointing at his viewing screen.

‘’I see a lava tube opening right under the extremity of that surface top dried river bed: it is level with the surface of the floor of the canyon, thus will be accessible to our rovers.’’

‘’Excellent!’’ said a smiling Denisovich. ‘’Mister Walsingham, get ready to launch a second mini-rover. Mister Olunov will drive it once on the surface.’’

‘’Wait! I see a second opening at the base of the cliff under the river bed.’’ nearly shouted Sergei Krulov. ‘’And there’s a third one nearby.’’

‘’My god! This sounds like Christmas gift giving. Mister Walsingham, launch rover number two now.’’

‘’Launching Rover Two now! Be ready to drive it, Sergei.’’

‘’You’re kidding? I’ve been waiting just for that for the last two hours.’’ replied the Russian technician, his hands already on the controls of the rover.

A second mini-rover was then ejected from the drone, with its parachute deploying nearly at once. The sighting of more lava tube openings at ground or near ground level then prompted Denisovich into ordering the launch of a third rover, with Yves Dorval then assigned to drive it. The next hour went by like a flash, with the scientists and technicians either piloting rovers or watching the views from both the drone and the three deployed rovers. If anything, mini-rovers number two and three ended up being at least as successful as mini-rover number one in finding features of high interest. In fact, by the time that the reconnaissance drone finally landed in the middle of the Melas Chasma, at its deepest point, mini-rovers two and three had found out that the multiple lava tube openings that they entered proved to be part of an

elaborate system of interconnected tunnels, empty lava chambers and deep vertical lava wells, many of the later filled with water ice covered by a relatively thin layer of dust. It was well after suppertime, as night descended on the region of the Melas Chasma, when an ecstatic Roman Denisovich told his tired but happy and proud team to take a break and go eat.

‘’Well, I believe that we just found the perfect site for our future Mars Base One, guys. These cave complexes at the foot of the northern cliffs will provide us plenty of safe space to protect our habitat modules from space radiations, on top of having more than enough water to support a full-fledged colony. I will thus counsel our commander to designate that area as the chosen landing spot for our Mars Lander. Now, go eat and rest: you amply deserved it.’’

CHAPTER 8 – A FRUSTRATING DELAY

08:04 (GMT)
Thursday, February 25, 2044
Northwest section of the Melas Chasma
Valles Marineris, Mars

The large, conical ship, floating down under its huge directional parachute topped by a helium balloon, further slowed down its descent by firing up briefly its main rocket engine as it was only twenty meters above the dirt floor of the Martian canyon, landing softly on its multiple landing wheels and bouncing slightly once before coming to a rest on the Martian dirt. The ship, with a maximum width at its base of 26 meters and a height of 34 meters, soon started to roll towards a group of lava tube openings at the base of the northern cliffs of the canyon, some seventeen kilometers away. The ten wheels of the ship, far from simply supporting the ship, were also motorized, each of them incorporating an electric drive motor connected to the small nuclear reactor plant of the ship. Motoring along at fifteen kilometers per hour, the ship arrived after 75 minutes beside the group of lava tube openings, then parked itself as close as possible to the foot of the ten kilometer-high cliff wall, in order to enjoy as much radiation protection as possible from the rocky wall, which in effect cut down by half the amount of radiation showering this part of the surface of Mars.

Up in orbit, aboard the H.S.S. FRIENDSHIP, the team led by Doctor Roman Denisovich exchanged high fives and handshakes inside the remote control center of the ship, with Denisovich happily patting the shoulder of Denise Wattling, who had remotely piloted the Mars Cargo Lander Number One down into the Melas Chasma canyon.

‘’That was some really nice piloting on your part, Denise: we could barely have asked for a more precise landing near our intended future base location.’’

‘’Well, you really should praise the engineers who designed our landers, Roman. They conceived a truly ingenious and effective design. This combination of parachute, helium balloon and retro-rocket, plus the motorized landing wheels, make it easy to reach our intended landing point. So, when do we launch our three other cargo ships?’’

‘’We will launch Cargo Lander Number Two in about one hour, when our ship will be back in the proper launch position. Mister Walsingham will pilot it. Then, Mister Brown will pilot our Cargo Lander Number Three down to the Melas Chasma after an another hour. Finally, you will pilot down our Cargo Lander Number Four. Once all of our four cargo ships will be safely parked near the entrances of the lava tubes that will house our base, we will then be ready to send down the ground exploration team, with you at the commands of the Mars Manned Lander. If all goes well, you will be able to walk on the surface of Mars in two days, Denise.’’

The tall, blond ex-fighter pilot grinned while imagining that moment.

‘’That will certainly be the highest point in my life to date, Roman: to be the first person to walk on Mars…’’

‘’Well, you will have fifteen companions with you on the surface, Denise, so you will still have plenty of company.’’

‘’Damn, I hope that anticipation and excitement will not stop me from finding sleep until then.’’ said wistfully the American woman.

03:45 (GMT)

Saturday, February 27, 2044

Cabin 014, Ring Carrousel ‘A’, main disk section

H.S.S. FRIENDSHIP, in low Mars orbit

Denise Wattling was sound asleep when the buzz from her wrist’s videophone woke her up. Chasing away with difficulty her fatigue, Denise pressed the ‘open link’ button of her videophone, speaking in a tired voice in its microphone.

‘’Yes?’’

‘’Denise, this is Roman! I am sorry to have to wake you up at such an early hour, but we may have something serious to contend with: a major dust storm is in the process of forming up at the surface of Mars, near the Valles Marineris.’’

Those words acted like a shot of adrenaline on Denise, who promptly sat up on her bed.

‘’Aw shit! What are the chances for us that this dust storm may avoid our landing zone in the Melas Chasma, Roman?’’

‘’Not good, Denise. My team is already discussing our scenario options for such a thing but I am not optimistic at all. You better come here quickly.’’

‘’On my way!’’ said Denise before closing the link and jumping out of bed in order to get dressed. Putting on her ship’s service two-piece uniform and her magnetized slippers took only a minute. She however took another minute to go comb her hair in front of the mirror of her dresser before running out of her cabin. Going up one level to the Promenade Deck of the ‘A’ ring via the nearest set of stairs, she crossed the promenade strip and entered one of the transit compartments of the fixed median section. There, she went up along one of the six communication tubes linking the rings and the core section of the ship. Since she was now in a zero gravity environment, she was able to float along the tube, using its padded hand rails to propel herself quickly and covering the fifty meters length of the tube in less than half a minute before arriving at the airtight door giving access to the core section of the ship. Planting her feet back down on the floor of the tube and making her slippers’ magnetized soles stick lightly to the thin steel sheet coating the aluminum floor, she unlocked and opened the door, then stepped into the core section and closed the door behind her. Walking normally this time, despite the core being also a zero gravity environment, Denise went to the surface monitoring center, where the data and images of all the ship’s sensors pointed at the surface of Mars were collated and studied. There, she found Roman Denisovich looking at a large display screen showing a view of the surface of Mars taken by a surveillance camera. On it, more than half of the surface being viewed was blanketed by an impenetrable giant cloud of red dust that was advancing westward. The planetologist and geo-physicist was surrounded by a number of other people also looking at the screen and discussing between them, including the mission commander, Janet Larsson, and her deputy, Alexei Primakov, plus five other members of the Mars Manned Lander crew. They all turned around when Denise walked in, with Roman Denisovich nodding to her.

‘’Aaah, good to have you so quickly, Denise. Unfortunately, it appears that this dust storm is heading straight towards our designated landing zone and will completely cover it in a few hours. It also is a major dust storm that will cover at least half of the tropical band of Mars, possibly for days or weeks. The question we have to face now is whether we still launch our manned lander or we wait for the dust storm to subside.’’
Janet Larsson then jumped in, speaking in a sober tone.

‘’The problem I see with launching our manned lander despite of this storm is that normal visibility on the ground will be close to zero, making orientation very difficult. Even thermal cameras and infrared sensors will have their range affected by the dust

storm. With the crew of the manned lander needing to go out in their spacesuits in order to start exploring the lava tubes and go to our four cargo landers to take out equipment and supplies, one or more of our people could very well get lost and walk away in the wrong direction. Remember our collective training back on Earth, when we were in Antarctica and went out during a blizzard that created a whiteout condition.''

''Oh, I certainly remember that, Commander. It was a bit scary then and we had to use our safety lines to find back the entrance to the base. We could still navigate through that dust storm, using our rovers' radars and thermal sensors, but I agree that working in such an environment would be very demanding and stressful. I say that we should wait for that dust storm to subside before launching our manned lander.''

''Don't forget that such storms are known to often persist for weeks and months at a time.'' cut in Steve Larkin, the ship's chief geologist. ''Do we want to potentially waste so much of our mission time by waiting for this storm to die out? We do have a lot of work to be done on the surface.''

Denise shook her head at once on hearing that.

''I'm sorry, but the safety of our people should be placed above any consideration of time or workload. As pilot and commander of the Manned Lander, I still say 'wait for the storm to subside'.''

''I concur with and support your assessment, Denise.'' said Janet Larsson, to Larkin's obvious annoyance. ''We will wait for this dust storm to die down before launching our manned lander. You may now return to bed, my friends.''

The small crowd then broke up, with most of them leaving the surface monitoring center to return to the rotating carrousels. Denise was also in the process of going back into a radial circulation tube when she stopped, indecisive. The adrenaline shot of learning about the dust storm, allied with the decision to postpone the launch of her manned lander, had chased out her sleepiness, leaving her fully awake and needing to expend some energy. She toyed for a moment with the idea of going to the Promenade Deck of 'B' Ring, to run along its exercise track and use the various exercise machines there, but she decided otherwise, as she already had been doing that nearly every day since their departure from Earth orbit. An idea then made her smile: since she was already in the core section of the ship, why not use one of the facilities in it? Staying in the core section but going up by three levels, she ended up in a relatively small rotunda-like compartment with four airlocks attached to it and with four solid, large acrylic

windows along its walls. The rotunda was actually inside the forward anti-radiation shield protecting the core section. That shield was in turn shaped like a thick disk situated forward of the core and filled with water, making the core insensitive to even the most violent solar storms ever recorded. A similar water shield protected the bottom of the core, while a water jacket surrounded its sides, completing its anti-radiation protection. If a truly violent solar storm ever submerged the ship with penetrating charged particle radiation, then the crew of the H.S.S. FRIENDSHIP would be able to find safety inside the core section, where seats and facilities for the whole crew were available. As an interplanetary ship that was going eventually to travel to places as far as the Jupiter and Saturn systems, such anti-radiation protection was not only desirable: it was also essential. However, the designers of the ship had followed a philosophy of making as many of its components as possible fill more than one role. In the case of the forward core water shield, they had decided to use it as a giant scuba swimming tank. With a diameter of twenty meters and a height of five meters, that had provided a huge volume to play with, a volume which the designers had further made even more suitable for its secondary role by adding false surfaces mimicking a sea bottom and an illuminated sea surface. Giant circular screens covering the lateral walls of the tank projected pre-recorded views of fish and other marine life swimming around, enhancing the illusion effect of the tank. Denise had already used the scuba tank a few times and she positively loved the sensation of freedom of movement and wide spaces it gave, in contrast to the comfortable but still enclosed space found in other ship's sections. Going to one of the personal effects lockers of the rotunda, she quickly undressed, ending up completely naked. Stuffing her clothes inside the locker, she then went to the racks supporting the pressurized air scuba bottles used by swimmers, selecting a full tank and putting it on her back. Buckling the retaining belt of the tank and testing that her regulator was functioning correctly, Denise then put on a scuba mask and a pair of fins before walking backwards towards one of the four small airlocks of the rotunda. Entering the airlock, she closed its hatch, then went through another hatch, entering an inner airlock. Closing that hatch as well, she pressed a large button and heard air whistle in as the pressure in her secondary airlock increased slightly. Pinching her nose and blowing air with her mouth closed, she equalized the pressure on her eardrums. Only then did she open a third hatch, stepping in a small adjacent compartment and closing the hatch behind her. She was now in a small but tall space half filled with an elevated platform with a large hole on top of it. Climbing the short set of stairs leading to

the top of the platform, Denise then jumped down through the hole, splashing into the water of the tank one meter down. When time would come to leave the tank, she would then simply swim back to the hole and climb a short ladder to find herself back into a breathable air space. Swimming out of the access well, which had been camouflaged as an underwater cave with the help of molded and painted plastic surfaces, Denise gave a few vigorous strokes of her fins, ending in the middle of the flooded volume of the tank. Looking back at the airlock rotunda complex, she saw the fake underwater section of a small reef going up all the way to the faked sea surface. Now feeling as free as a fish, Denise started swimming lazily around the tank, savoring her surroundings and feeling the lukewarm water flow over her naked skin.

She ended up spending a good forty minutes swimming around the tank before she returned to one of the four access wells and exited the water. As Denise was putting on her uniform, she heard her stomach growl.

‘’Looks like the exercise opened up my appetite. It could be a good time to go visit the cafeteria for an early morning breakfast.’’

Returning to the level of the core that connected with the radial circulation tubes, she took one tube and floated down towards the contra-rotating carrousel rings, soon ending in the ‘A’ Ring and walking along the promenade strip towards the ship’s cafeteria. There, she found Jack Sommers manning the hot service counter and preparing a batch of sausages and bacon. The growls inside Denise’s stomach redoubled as she smelled the meat cooking on the hot plates, while Jack smiled to her.

‘’Hello, Denise! You are early, this morning.’’

‘’I sure am! I was awakened by a call two hours ago, only to have my scheduled departure for the surface postponed for an indeterminate period because of a giant dust storm on the surface.’’

‘’Oh! And how long could this dust storm last?’’

‘’Nobody knows! It could be days, weeks, even months. We will wait for the time it takes to have good visibility again on the surface. And Xiulan, how is she doing?’’

‘’She is well, thank you. Her pregnancy is progressing just nicely and all the tests show that the fetus is viable and has no deficiency or anomaly.’’

‘’Aah, that’s good! Well, while I’m here, I will have some scrambled eggs, along with hash brown and bacon.’’

‘’Scrambled eggs, hash brown and bacon, coming up!’’ replied Jack, smiling, while turning face down two strips of bacon on the hot plate with his spatula.

Denise’s hopes that the dust storm on Mars would go on for a few days only were quickly replaced by growing frustration as days, then weeks passed by without signs of the storm abating. It took close to two months before the dust started to settle down, to the immense relief of the whole crew of the H.S.S. FRIENDSHIP. Then, the last verifications and checks to the manned lander were ordered by Janet Larsson and the crew of the lander was finally able to board their craft.

CHAPTER 9 – A WALK ON MARS

09:56 (GMT)
Tuesday, April 26, 2044
Cockpit of the Mars Manned Lander
Lander Hangar Number One, H.S.S. FRIENDSHIP
Mars low orbit

Denise Wattling, wearing her spacesuit and strapped into her pilot's seat, looked around her in the cramped cockpit of her manned lander.

''Alright, last chance! Did you bring everything you needed? Toothbrush? Spare underwear?''

Viktor Ponichnikov, sitting behind and to the left of her, made a face at those words.

''Oh shit! I forgot my vibrator!''

''Don't worry about that, Viktor,'' replied Denise as giggles went around the cabin, ''we have alternatives.''

The giggles turned into laughter, both in the lander's cockpit and in the command center of the H.S.S. FRIENDSHIP, where their communications and data links were monitored. Janet Larsson then spoke on the radio.

''Alright, you bunch of perverts. Your hangar dome is fully open. You now have a go for launch. Good luck and have a good stay on Mars.''

''Thank you, Commander!'' replied Denise, now serious. ''Releasing mooring clamps.''

With her 470 ton lander now freed from its hangar pad, Denise fired a short burst from her attitude rockets, making the big, squat conical craft rise from the pad. Once well clear from the H.S.S. FRIENDSHIP, she fired again her attitude rockets to pivot her lander in the correct axis to start its deceleration and descent towards the surface of Mars. With its 35 meter-wide base heat shield pivoted forward, Denise then fired her main rocket engine to start decelerating and dropping out of orbit. That main engine, a smaller variant of the PHOENIX 2000 nuclear rocket engines of the FRIENDSHIP, apart from having a much better specific impulse by far than any existing chemical rocket engine, would also be turned into their craft's nuclear power plant once on the surface of

Mars. Another advantage was that it used liquid hydrogen as fuel, which could be used as extra anti-radiation protection for the crew spaces of the lander. Burning for long minutes at maximum power until its four external drop tanks were empty, the nuclear rocket then shut down, with its protective base cover closing over its nozzle. By now, the lander had lost enough velocity to drop down low enough to start feeling the drag from the rarefied atmosphere of Mars. That was when Denise jettisoned the now empty four hydrogen external fuel tanks and deployed the four giant, petal-like airbrakes of the craft, which helped to further slow down the lander and lose more altitude, on top of helping stabilize the lander along its longitudinal axis. That part of the deceleration phase took quite a while, something Denise and her crew had expected in view of the very thin atmosphere of Mars, which had only one percent of Earth's atmospheric pressure at ground level. The manned lander had time to complete a full orbit of Mars before it had slowed down enough to safely deploy its first big braking parachute. That first parachute was replaced over a minute later with an even bigger one. That parachute was however of rectangular shape and was steerable. It was also topped by a huge balloon that filled with low pressure helium gas, which helped further in supporting the mass of the lander. The craft was now falling slowly at a near vertical angle and was at an altitude of 14,000 meters. Denise consulted her instruments and her navigation display screen and nodded her head while putting her right hand around the small flight control stick that controlled the steerable parachute.

''Everything is going well up to now, folks. I am now starting to steer our craft towards our designated landing spot. Peter, retract our airbrakes and deploy our wheels. Viktor, you can now switch our nuclear engine to power production mode. Put it at thirty percent power.''

''Airbrakes retracted and wheels deployed!'' announced Peter Walsingham, the copilot of the lander. Viktor Ponichnikov spoke up next some seconds later.

''Nuclear engine now in power producing mode at thirty percent power. External radiators deployed and online.''

''Excellent! Let's see how close we can get to our target zone.''

While the lander was slowly descending and flying westward over the canyons of Valles Marineris, Denise admired the majestic view given by the ten kilometer-high cliffs of the geological fracture.

‘’It may be a dead planet now, but Mars certainly has some incredible visual features. It should make for an interesting thirteen months stay on the surface.’’

‘’It also should be a busy thirteen months.’’ added the chief geologist, Steve Larkin. ‘’There will be a lot to do and much to explore on the surface.’’

‘’That as well.’’ agreed Denise before falling silent and concentrating on her piloting. The rest of the sixteen person crew also fell silent as they eyed the gigantic northern cliffs of the Melas Chasma. Some fourteen minutes later, as the lander was very close to the ground, Denise fired briefly her chemical rocket thrusters to slow down her descent to a mere 0.6 meter per second, landing smoothly her big craft without even a single bounce. She then beamed a proud smile at her team members.

‘’Descending from orbit and touching down only eleven kilometers from our target zone: I would rate that as not shabby at all, wouldn’t you say, guys?’’

‘’I have seen worse.’’ replied Peter Walsingham, a malicious grin on his face, making Denise’s eyes open wide.

‘’Seen worse? That’s it! No chocolate for you for dessert tonight!’’

‘’While you discuss your respective piloting performances, could I take the commands and drive us to our designated base area?’’ asked Steven Merrick, a 42 year old Australian who had driven for years through the deserts and hills of the Australian Outback and who was one of their two designated rover drivers and mechanics. Denise gave him a warm smile in response.

‘’Be my guest, Steve. Just don’t get a speeding ticket.’’

‘’HA! Back in the Outback, the fuzz were never able to catch me while I was carrying contraband alcohol.’’

Merrick then switched on the geared electric motors integrated into the twelve large wheels supporting the manned lander and started it rolling towards the lava tube openings and four cargo landers visible at the foot of the northern cliffs. The ground being relatively flat, he was able to make an average speed of twenty kilometers per hour while keeping the ride smooth.

As the manned lander was less than a kilometer from the northern wall of the Melas Chasma, Jason Terlecki, the mining engineer charged with building the future base of the mission, seemed to notice something and looked at Denise.

‘’Denise, could I check on something outside once we are parked, before we do anything else?’’

‘’Uh, depends! We have a lot of things to do at first. What do you want to check?’’

‘’The exact size and depth of the most eastern lava tube entrance of this group of tubes. It appears at first sight to be big enough to let all of our landers roll inside, which would give them complete cover from the radiations. It also happens to have a smooth, low inclination ramp made of washed up dirt and rocks that our landers will be able to climb.’’

Denise, like the others, was left stunned by those words. Looking at the said lava tube entrance, then at one of the 35 meter-high cargo landers, she realized that Terlecki was right.

‘’God damn! I believe that you are right, Jason. If we could do that, then we could all work much more safely in the long term.’’

‘’We would only need to place one communication antenna unit outside, to ensure continued communications with the FRIENDSHIP and Earth.’’ added Roberto Calderon, their flight engineer. ‘’I can take care of that.’’

‘’Excellent! Jason, you and me will be the first to walk out once we are parked near that lava tube. Just make sure that you have a laser rangefinder with you.’’

‘’Don’t worry, Denise, I always have one handy in my pocket.’’

‘’Just make sure that you take it out of your pocket BEFORE you seal your suit, Jason.’’ Said sneakily Yves Dorval, a Canadian mining prospector and geologist, making Terlecki make a face and slap his forehead with one hand.

‘’DOH!’’

That triggered a few short laughs, followed by silence as they rolled closer and closer to the northern walls of the canyon. All sixteen occupants of the manned lander, wearing their spacesuits and sitting in crashworthy seat, were now examining closely via the cameras of the craft the three lava tube entrances which they were going to explore. All of them were very large, as nearly everything on Mars seemed to be, but one entrance in particular dwarfed even the 35 meter-high cargo landers parked near it in dispersed order. Denise was now pretty sure that Terlecki’s idea would work. In fact, the only thing seemingly to be done would appeared to be to have to smoothen a bit the surface of the gentle slope of washed out debris and dust connecting the entrance of the lava tube with the floor of the canyon. Thankfully, they had something in one of the cargo landers that would be perfect for that job: an electric-powered bulldozer.

Steven Merrick finally parked the manned lander some forty meters from the entrance of the largest lava tube, being careful to leave that entrance unblocked. Getting out of her pilot's seat, Denise then gave a few quick orders around her.

''Alright, time to start the serious work! Peter, Roberto, Viktor, Masaki and Jing, you stay in the lander for now. Be ready to assist outside if needed. The rest is going out with me. Peter, lower the hangar platform for our two all terrain vehicles.''

''Lowering the ATVs' hangar platform now.'' replied the British copilot while pressing a button and checking a status light. ''Platform lowered.''

''Good! Surface exploration team, grab your tools and instruments once at the base level locker room.''

The ten astronauts, already wearing their spacesuits but with their visors opened, went down the vertical communication tube linking the cockpit, situated nearly at the summit of the 27 meter-high manned lander, with the living and working facilities, situated around the wide base of the conical craft. Once on the lower deck, they took a variety of tools and equipment from storage lockers next to the airlock, then entered the airlock after sealing and checking their spacesuits. Roberto Calderon, who had followed down the ten members of the surface exploration team, closed the large hatch of the airlock behind them, then spoke on the radio to them.

''Ready to depressurize the airlock.''

''All our suits are confirmed sealed and pressurized. Go ahead, Roberto.'' replied Denise. Calderon then pressed a few buttons on the command panel of the airlock and watched the pressure gauge as the air was pumped out of it.

''Airlock pressure now at near zero. Am deploying the access ramp. External temperature is presently minus 53 degrees Celsius. You may now walk out.''

Denise, on hearing those last words, unlocked the exit hatch of the airlock and opened it, then stepped out and took a step to one side, to let her nine companions come out on the top of the access ramp. She closed back and locked the exit hatch once they were all out in the thin, 0.01 bar Martian atmosphere, then returned at the head of her group. She couldn't help feel a growing emotion inside her as she walked down the ramp and got closer and closer to the moment when she would step on the Martian surface. Stopping just a few centimeters short of the foot of the ramp, she looked left and right at her companions, who also had stopped close to the end of the ramp.

‘’Ready to take a giant leap, my friends? On the count of three: one…two…THREE!’’

The ten astronauts leaped forward as one and landed nearly all at the same time on the dry, dusty surface of Mars. Denise then spoke on the radio, knowing that her words were being relayed to both the H.S.S. FRIENDSHIP and to the mission control room on Earth.

‘’Humans are now walking on the surface of Mars. May this be the start of a new chapter in Human space exploration and in the building of a second home for Humanity.’’

She took a few seconds to savor that moment, then ordered her team into action.

‘’Frey, Steven, you go check out our ATVs and roll them off their platform. The rest will accompany me to the opening of the largest lava tube opening.’’

With seven astronauts at her back, Denise walked calmly towards the said tube opening, already appreciating how large it was: Jason Terlecki’s idea to roll the landers inside appeared to be a very promising one indeed. Since remote-controlled mini-rovers had already explored the three lava tubes near them, she already knew pretty much what to expect inside them: long, dark and wide tunnels which eventually merged together into a vast underground rotunda with two further tunnels going down until a thick crust of water ice filled and blocked them. If they could really drive their five landers all the way to that rotunda, then the mission would indeed be up to a very good start.

When she arrived close to the opening of the lava tube, she made a grimace on seeing that the slope of washed out rocks and dirt outside the tube stopped about seventy centimeters lower than the floor of the tube’s mouth.

‘’Jason, do you think that our landers could step over that vertical ledge and enter the tunnel by themselves?’’

‘’Our landers, maybe, but our ATVs may need some help. I will thus go to the Cargo Lander Number One with Teerapat and take out our bulldozer. I should be able to build an adequate ramp in a couple of hours. But let me first measure this entrance.’’

Using the weak gravity of Mars, which was 37% that of Earth, Terlecki easily jumped up past the ledge, landing on the floor of the tube. Denise and the five geologists in her group imitated him and lit their helmets’ front lamps to look down the dark tunnel.

‘’Steve, you and your prospectors may start exploring this tunnel. I will stay here with Jason and Teerapat for the moment.’’

The chief geologist nodded his head inside his spacesuit's helmet, then walked away with his four prospectors/geologists, soon disappearing down the tunnel. Jason Terlecki, using a small, handheld laser rangefinder, soon spoke up on the radio, triumph in his voice, as he called from inside the tunnel.

''It will work, Denise! The tube's entrance is a full 63 meter high and stays that high for at least the first fifty meters. The entrance's width is 87 meter wide, with the maximum width staying the same for a good hundred meters.''

''Excellent! I will come join you, so that you can give me your laser rangefinder. I will then continue measuring the tunnel while you go get our bulldozer and start building an access ramp for our landers.''

The two of them met halfway inside the tunnel, with Terlecki giving to Denise his rangefinder before leaving with Teerapat for Cargo Lander Number One, parked some 250 meters away at the foot of the cliffs. Taking frequent measurements and examining carefully the surfaces of the lava tube as she walked down it, Denise covered a full 900 meters before arriving at a vast underground rotunda and dome, where the openings of four more tubes connected. She felt triumph when she took an ultimate measurement of the section of tube she was in just next to its connection with the rotunda: it was still large enough to let both the cargo landers and the manned lander roll in all the way to the rotunda and park inside it. This was a truly significant and positive development for their mission, as their landers will be both fully protected from the strong radiations bathing the surface of Mars and also be handy and close by while her team started building the first Martian base. The only thing they would need to do as an extra was to position a communications antenna unit outside the lava tube entrance and connect it to the landers inside via a fiber optics wire, so that they could stay in permanent contact with the FRIENDSHIP and Earth. Thankfully, all that they needed to build that base was already here on Mars, inside either the manned lander or the four cargo landers.

Walking to the approximate center of the obscure rotunda, Denise then took some time to roughly map it with the help of her handheld laser rangefinder, as her helmet front lamp was not powerful enough to see the opposite walls of the cavern. The dimensions she calculated actually left her quite impressed: the rotunda, while not a perfect semi-spherical dome, had an average width at floor level of 460 meters, while the maximum height reached up to 210 meters, with an average ceiling height of 170 meters. Just this one cavern could shelter a whole city, if built of multi-level buildings.

She could even imagine sealing the entrances of the lava tubes with large airlocks and then pressurize the rotunda with air at normal Earth atmospheric density to turn it into a large Human habitat. If such rotundas turned up to be common on Mars, then such a way to build Martian cities could certainly prove most viable in the near future, once more construction equipment could be brought from Earth. Seeing from the movement of the headlamps of Steve Larkin and of his four prospectors in the distance that they had gone down one of the two tunnels leading to an ice plug, Denise decided to go back outside, to pass the good news by radio to the manned lander and the H.S.S. FRIENDSHIP. When she emerged from the lava tube, Denise was pleased to see that their two mini-rovers, with Frey Thorvalsson and Steven Merrick sitting at the commands of the ATVs, were already parked near the mouth of the lava tube. As for Jason Terlecki, he was approaching the entrance aboard their bulldozer, a big four-wheeled vehicle, while Teerapat Batrang was apparently driving the Cargo Lander Number One, approaching it closer to the lava tube. Things were definitely looking up.

Showing a level of experience and expertise at using a bulldozer that truly surprised Denise, Jason Terlecki managed to build in less than two hours a wide, low inclination access ramp between the tube's lower ledge and the floor of the Melas Chasma. Then, using light but tough molded Lexan surface mat plates and assembling them end-to-end with the help of Frey, Steven and Teerapat, Jason covered the newly-built ramp with a hard, load-distributing surface that could easily support the mass of the landers. By the time that Steve Larkin and his four prospectors came back with ground and ice samples from inside the lava tubes and rotunda, the first lander was ready to roll inside. Denise decided to have the cargo landers roll in first in order of their assigned numbers, so that her team would have time to install a mobile communications antenna unit outside before the manned lander would also roll inside. That mobile antenna unit was actually mounted on a trailer and was taken out of one of the four cargo landers, then towed by their bulldozer to an adequate position some 140 meters from the entrance to the lava tube. Its fiber optics wire was then rolled out and its portion exposed to outside radiations was buried in a shallow trench dug by the bulldozer, which had multiple tool appendages on top of its dozer blade and digging shovel. Then, less than five hours after landing the manned lander, the surface exploration team was able to roll inside in quick succession the four cargo landers and the manned lander, driving them down the lava tube and all the way to the large rotunda, where they were parked

side by side along the walls, near the junction of the lava tube with the rotunda. While four astronauts started at once to lay down and connect sections of optical fiber wires along one side of the tunnel connecting the rotunda with the outside, Denise and her remaining companions deployed and extended transparent, 2.5 meter diameter circulation tubes between the five landers, which had been designed and built to be able to link up and form quickly a basic surface base. Once that was done, and with the outside communications antenna plugged to the manned module parked inside the rotunda, Denise called a halt to the work, so that they could have supper together and discuss the progress they had made. The thirteen men and three women of the exploration team, having taken off their spacesuits and having washed up, assembled in the fairly cramped crew lounge of the manned lander, where they chose their respective suppers from the reserve of ready rations stored in the cold pantry. Denise chose for herself a meal of chicken fried rice, with milk as beverage and fruit salad as dessert, then went to sit at a table with Viktor Ponichnikov, Jason Terlecki and Teerapat Batrang. As she was about to take her first bite, she smiled to her three table companions.

‘’Quite a productive day today, wouldn’t you say, guys?’’

Viktor, who had chosen like Jason a chunky goulash soup, nodded in approbation.

‘’Quite, Denise! Jason’s idea to roll our landers inside was a stroke of genius, I must say.’’

‘’Bof!’’ said Jason dismissively, ‘’If not me, someone else would have thought about it. It is just that, as a mining and infrastructure engineer, I am accustomed to think of tunnels as structures to be used for many purposes and not only as a passageway. So, what do we do after supper, Denise? Go back out and start emptying the cargo landers?’’

‘’No! This day of work was hard enough and we did accomplish a lot. I will want all of us to relax and rest after supper and, at the most, write down notes or reports on what we did today. Tomorrow, while our geological team will continue exploring and prospecting around the tunnels, the rest of us will start taking out the building modules for our base and will start assembling them. Once the main cargo holds of our landers will be empty, we will then be free to pressurize them and convert them into large hydroponic gardens, for the greatest pleasure of Masaki.’’

Tomonaga Masaki, the Japanese agronomist of the exploration team, who was eating at the next table and had heard Denise, gave a thumbs up and a big smile in answer.

Denise then decided to pass her decision about the evening's occupation to her whole team and got up from her bench.

''IF YOU WILL PLEASE LISTEN UP FOR A MOMENT, FRIENDS. We did a lot today and I believe that we all need some time to relax and rest before we continue our work tomorrow morning. I suggest that you use your time after supper to write notes or reports as needed, then go to sleep. Any questions?''

For some reason, Steve Larkin, the chief geologist of the team, didn't seem to like her announcement, shaking his head before speaking up.

''Denise, I was planning to go back in the tunnels with my team after supper, to collect more samples and better map the underground complex of caves and tunnels. I am sorry, but I still feel the need to go out for a few more hours.''

Denise did her best to hide her displeasure at Larkin's objection: the geologist, while a very competent man, tended to be a bit abrasive and often went his own way, too often in fact for Denise's taste. She thus replied in a calm but firm tone.

''Our team has been up for nearly twelve hours already. Our mission on the surface is due to go on for thirteen months, so I don't see the necessity to overwork our team members right from the start.''

''Well, I am the chief geologist and I believe that more samples need to be collected today. I…''

''Mister Larkin, I believe that we need to speak in private…now! Follow me!''

With the other astronauts watching them go, Denise left the crew lounge, a seething Larkin at her back, and went to a storage compartment on the opposite side of the lounge, where she closed the door behind the geologist before pointing an index at him.

''Mister Larkin, you may be the chief geologist, but I am the team commander on Mars. I believe that our people worked hard enough today, including spending a full six hours out in spacesuits, and need some rest. There is absolutely no need for us to burn ourselves out right now. Your extra samples can wait until tomorrow.''

The disdainful expression that came to Larkin's face then irked Denise to no little degree, but not as much as the words he said next.

''Well, I still disagree with that opinion and I intend to refer the matter to Doctor Denisovich, on the FRIENDSHIP. We will then see what he thinks about this.''

''WHAT I SAID WAS NOT AN OPINION, LARKIN, BUT AN ORDER! IF YOU START PLAYING IN MY BACK, THEN IT WILL BE COMMANDER LARSSON WHO

WILL BECOME CONCERNED ABOUT THIS. YOUR GEOLOGISTS WILL STAY IN THE LANDER TONIGHT! UNDERSTOOD?... IS THAT UNDERSTOOD, LARKIN?''

''Yes!'' said the geologist in a less than convincing tone before brushing past Denise and storming out of the storage compartment, leaving behind a fuming Denise. In her opinion, this was no place or time for inflated egos and uncooperative attitudes, not while stuck on Mars for months. While she didn't like having to do it, she now saw no alternative but to send a private report of this incident to Janet Larsson, lest Larkin started to badmouth her in her back.

08:48 (GMT)
Wednesday, April 27, 2044
Main cargo bay, Cargo Lander Number One
Underground rotunda, Melas Chasma

Having entered the main cargo bay of one of the four cargo landers now parked inside the huge underground rotunda that would become the first permanent base on Mars, Jason Terlecki looked around the still unpressurized compartment, which was packed nearly full with base prefabricated modules. The main cargo bay formed a doughnut-shaped compartment wrapped around the nuclear rocket engine of the lander. That nuclear rocket engine was presently functioning in power plant mode and providing a steady six megawatts of electrical power, power that was already being used for multiple purposes. Like the three other cargo landers, this lander had its external floodlights lit and oriented in various directions and was helping to illuminate the more than 460 meter-wide rotunda, thus facilitating the job of the astronauts from the manned lander, parked in line with the cargo landers and now connected to each other by pressurized flexible, telescopic circulation tubes. On top of illuminating the rotunda, each cargo lander also had a high capacity cryogenic fractional distillation unit, which had been activated automatically once on the surface of Mars. Those cryogenic distillation units were now busy pumping in the rarefied atmosphere of Mars, to then cool it down until it turned into a cryogenic liquid under a pressure of six bars, so that the CO2 in the Martian atmosphere, which accounted for 95.3% of it, wouldn't simply turn into dry ice. Then, that liquid Martian 'air' was slowly heated up, so that each basic element in it would be distilled via evaporation and collected into separate tanks. Apart from the liquefied CO2, which was then further treated chemically to separate part of its

oxygen from it, the process wielded as well the two percent of argon and 1.9 percent of nitrogen gas contained in the Mars atmosphere. The nitrogen, once mixed with oxygen extracted from CO2, would provide fresh air for the astronauts. It was also going to be used as a fertilizer component, mixed with the treated, sterilized feces and urine from the astronauts. As for the argon, which was to be kept in its liquid, cryogenic form, it would be stored away for future use, when cargo shuttles would be available to bring that liquefied argon to Mars orbit, where it would be available to refuel the fuel tanks of the magneto-plasma engines of interplanetary spaceships like the H.S.S. FRIENDSHIP.

Walking onto the sole wide surface not packed with modules, which was actually the floor of the lift platform used to lower cargo components down to the Martian surface, Jason eyed the nearest pile of modules, stacked three-high in the 5.5 meter-high cargo bay: they did not appear to have been damaged or even disturbed by the landing on Mars. Jason smiled to himself when he remembered an episode on Earth, when discussing with other engineers and space administrators the best way to build a Mars base out of prefabricated elements. One young engineer had argued that disassembled module elements would save a lot of precious space in the cargo landers, compared to fully assembled but collapsed modules. Jason had then made the group buy a number of standard commercial shelving sets requiring assembly and had told the group to put on spacesuits before they tried to unpack and assemble the pieces, which included lots of small screws, nuts and bolts. It had taken less than half a hour before the group members had given up in frustration, unable to manipulate properly the smaller parts with their spacesuits' gloves. That had closed for good the debate about assembled versus disassembled modules. Consulting his electronic data pad and comparing the serial numbers painted on the sides of the modules frames with his list of base components, Jason then moved off the lift platform and went to the cargo bay command panel, where he punched a command for the lander's computer. As robotic arms came alive and started undoing the tie-down straps fixing the modules to the floor, Jason called by radio Denise Wattling, who was waiting outside with Roberto Calderon and four other astronauts, ready to start assembling their base.

''Denise, this is Jason: I am going to start unloading the base modules out of Cargo Lander One. Once each module is out and on its wheels, push it in temporary position, with one meter between the sides of each module and with about ten meters between the double rows of modules. That will leave us more than enough space to

then roll and deploy the central hallway modules between the double row of unitary modules. Please keep to our master base building plan when rolling the unitary modules in their respective places.''

''Don't worry about that, Jason: when I was a young girl, I was very good with Lego building blocks.''

''Hey, I also loved playing with Lego blocks when I was a kid. In fact, I still do! Well, I am now going to move the first module. Please stand by!''

Punching another command on his control panel, Jason made the overhead traveling crane of the cargo bay roll along its circular ceiling rails, positioning it over the first module to be taken out. The crane's manipulator arms and clamps then grabbed solidly the module and raised it a bit before rolling sideways to then put it down on the lift platform. On Jason's command, the lift platform went down smoothly, until its bottom rested on the thick layer of dust, sand and rocks covering the floor of the rotunda. Denise' building team then moved into action at once, deploying the wheels of the module by simply pressing a button that sent compressed air into the pneumatic pistons supporting the wheels, making the telescopic tubes extend and lock in place, thanks to spring-loaded stops. Rolling the lightweight modules off the lift platform was then easy, the six astronauts being enough to push the aluminum alloy and flexible plastic structure, which weighed less than 500 kilos despite being eight meters long, five meters wide and 1.5 meters high in collapsed state. The module was next hooked to the towing A-frame at the back of one of their two ATVs, which then moved it to a predetermined spot designated by Denise. That module was in its planned location, with the ATV unhooking from it, as the second module was already coming down on the lift platform of the cargo lander. The second ATV of the expedition took charge of that new module as the first ATV rolled back to near the cargo lander.

With little more to do for the moment but simply unloading the module out of the lander and rolling them into place along two long parallel rows of modules facing head-to-head, the work went quickly, astonishing even Jason. With the main cargo bay of Cargo Lander One emptied of its 21 base modules in less than three hours, the crew took a one hour break for lunch. Then Jason moved to the second cargo lander and also emptied it, taking out the five last unitary modules of the base before unloading the three assembly packs that would form the central hallway section of the complex. The last items inside that cargo lander, a number of pallets supporting various equipment,

furniture and fittings for the modules, were unloaded and put aside for the moment. That allowed Jason to close and seal the cargo bays of those two cargo landers, which were then pressurized with breathable air and with their air recycling and conditioning units being switched on. Their agronomist, Tomonaga Masaki, then started reconfiguring the now empty cargo bays into vast hydroponic gardens, and this simply by unfolding down already assembled hydroponic basins lining the walls of the cargo bays on two ring levels. With the necessary pumps, tanks, fertilizer mixers and injectors needed by the basins already built-in, Masaki would now only need some water to start growing plants inside those two cargo landers.

Coming out of Cargo Lander Two, Jason calmly walked down the double row of unitary modules, checking carefully with the help of his data pad that each module was in the correct position. Once at the end of the double row, Jason looked at Denise and smiled to her.

‘’Every module is in its place, Denise. We may now roll up and extend the modules of the central hallway.’’

‘’Excellent! I will have Steven use one ATV to both roll in place and extend the hallway modules. Should we inflate the central hallway assembly before connecting the unitary modules to it, Jason?’’

‘’Definitely! We want the hallway to be fully deployed, leveled and rigid before connecting the modules to it. If not, we risk putting stresses on the connector sections when inflating the hallway assembly and unitary modules.’’

‘’OKAY, PEOPLE, YOU HEARD THE MAN: LET’S ROLL OUT AND DEPLOY THE CENTRAL HALLWAY ASSEMBLY, THEN WE WILL INFLATE IT.’’

That part of the job went even faster than the unloading of the modules, taking a mere fifty minutes. Denise left to Jason the honor of inflating the hallway modules, using the compressed air bottles integrated into the floor framing of the modules. That compressed air made the tubular walls of the modules fill up and expand, taking their planned, semi-circular section final shapes and stretching out the central hallway to its full length of 120 meters and a continuous width of two meters, with roundabout mini-rotundas every four meters. Another thirty minutes was spent carefully adjusting manually the telescopic support legs of the assembly, so that its floor would be as level as possible all along its length. Four astronauts, including Denise, then went by pairs

inside the assembly, with one pair starting at each extremity, to unfold the floor and wall panels and then fix them in place. At the same time, the rest of her team moved the unitary modules into their final place one by one, connecting one end to the airtight door of the central hallway's roundabout rotunda that was in line with it, then unfolding the floor and wall panels inside the short transit tunnels of the modules. Seeing that the work was really progressing well and with her companions agreeing enthusiastically to continue on and delay supper, Denise pressed on with the building of their Mars base. The last touch, once all the modules were interconnected and inflated, was to connect the base complex to the landers by deploying a flexible circulation tube between Cargo Lander One and the southern airlock of the base complex, then sealing it in place. At the end, a bit before 20:00 hour (GMT), Denise proudly looked down the 120 meter-long central hallway, fully connected to all its modules and with its lighting system on. Their base, covering roughly 4.2 hectares of ground inside the underground rotunda, now offered a total of a bit over 1,900 square meters of habitable floor space, including the central hallway section and its mini-rotundas. However, the complex was still unpressurized and that important work, involving careful checks and monitoring, would take place only once the various pallets of fittings, furniture and equipment meant to turn the base into a fully functioning entity would have been transported inside their respective modules. That, however, was going to be done another day. Right now, it was time to go back to the manned lander, wash up, eat and then rest for the night.

Having taken a shower and wearing fresh clothes, Denise was about to enter the crew lounge when she saw light filter from under the door of their small biochemical lab. Intrigued, she knocked on the door, getting a response from Kwang Tse Jing, their small Chinese biochemist.

''Come in!''

Pushing the door open, Denise stuck her head inside and smiled to Jing, who was sitting in front of a powerful microscope.

''You are still working at this hour, Jing? Did you have supper yet?''

''Uh, no, Denise.'' replied the tiny Chinese woman in her early fifties, sounding timid. In fact, Jing always sounded timid and was the kind of person who couldn't hurt even a fly, something that made her even more liked. ''I was too engrossed in studying those samples of salt water ice our prospectors have brought back from one of the two inundated tunnels connecting with our underground rotunda.''

‘’And have you found something interesting about that salt water?’’

That was when a big smile came to Jing’s face.

‘’If I can confirm my findings, yes! Don’t jump to the ceiling yet, but I believe that I found what looks furiously like a microbe.’’

Blood rushed at once to Denise’s brain, making her a bit wobbly for a second.

‘’A microbe? THERE IS LIFE ON MARS?’’

‘’Shhh! Not so loud! I saw only one possible organism up to now in those samples. It was frozen in ice and appeared to be dead. However, I want to find more such organisms before shouting victory out loud. This could still be some contamination brought by us to Mars. If truly a local microbe, I suspect that I would probably find lots more of those organisms once we get samples of unfrozen water from those inundated tunnels.’’

‘’Damn, I hope so! Finding life on Mars would be a scientific coup of the first order. Well, you still haven’t had supper, Jing, and your water samples won’t disappear in the next few hours. Why don’t you come have supper with me now?’’

Jing hesitated only for a second before nodding her head and smiling to Denise.

‘’That would please me, Denise.’’

‘’Then, put away your samples and come with me to the crew lounge. I believe that we still have a few unfrozen packs of shrimp noodles.’’

15:09 (GMT)

Friday, April 29, 2044

Gymnasium Module, Mars Base One

Underground rotunda, Melas Chasma

Closing and locking the airtight access door of the module behind him, Jason Terlecki, wearing his sealed spacesuit, examined carefully the inside of the gymnasium module, with its weightlifting and exercise machines. Then, he looked twice at his external pressure gauge, with a good minute between the two readings. He smiled with satisfaction when he saw that his gauge didn’t register any pressure drop at all: this module was leak-free, like all the other modules and sections of the base complex that he had just visited and checked. His ultimate check was to cautiously open his helmet faceplate and sniff the air inside the module, then going back in the central hallway and doing the same there. He did not smell any trace of chemicals in either places. Now

fully satisfied, Jason went to the nearest intercom box, hooked to a wall of the mini-rotunda he was in now, and called Denise Wattling, who was on duty inside the manned lander today.

‘’Denise, this is Jason.’’

‘’Go ahead, Jason.’’

‘’I am pleased to announce that I am officially declaring Mars Base One ready for permanent occupation. Our people can start moving in right now.’’

‘’SUPER!’’ exclaimed Denise, truly happy. ‘’I will pass the word around right away. Nice job, Jason!’’

‘’Bof! I simply did my job, Denise. No need to praise me to Heaven.’’

‘’Well, better that than curse you to Hell. Still, you did a bang up job with the base. We will have to celebrate the base’s opening tonight at supper time with a couple of bottles of Champagne.’’

‘’I certainly will be there for that.’’ replied Jason before cutting the link. He then walked down nearly the whole length of the central hallway to go to the spacesuits locker room, where he took off his suit and stored it in its assigned suit cubicle, plugging to it the electrical and compressed oxygen feeds of the cubicle, so that it would be fully recharged for the next time he would need it. Now wearing only his two-piece internal ship uniform, he unhooked from inside his spacesuit’s cubicle what the crew of the H.S.S. FRIENDSHIP jokingly called a ‘fat suit’ and put it on over his uniform. The ‘fat suit’, whose technical designation was ‘Felt Weight Compensation Suit’ or FWCS in short, was actually the simplest and most economical solution by far that had been imagined to solve a difficult problem: how to insure that future ‘Martians’ would still be fit to travel to Earth and visit it after years of living on a planet with only 37% of Earth’s gravity. One obvious solution would have been to install giant rotating carrousels inside Martian installations, so that their occupants would work and live while feeling the same weight than on Earth. However, that solution was both a complicated and costly one. One NASA lowly secretary then had an idea after watching a colleague who was particularly fanatical about his physical fitness run around the exercise track while wearing numerous bags full of metal pellets that added substantially to his weight, thus forcing him to spend more energy during his run. That secretary had then sent a memo to one of the engineers working on the Mars mission, who turned her idea into the ‘fat suit’. The FWCS that Jason was now wearing looked like a simple coverall with numerous small pockets distributed all around the garment. Those ‘pockets’ were

actually compartments which contained flat, flexible but fairly heavy pads that, added together, nearly tripled the mass of its wearer. However, within the weak gravity of Mars, the wearer ended feeling simply being his or her normal weight, thus expended the same effort than on Earth when doing a specific task or movement. Now that Mars Base One was officially opened for occupation, the team members were going to wear their ‘fat suits’ whenever they worked inside the pressurized environment of the base or of the landers. The only time the members would not be wearing them would be when in spacesuits or when sleeping in their underwear. If all went well and if the team members didn’t cheat by not wearing their FWCS as required, then they hopefully will not have problems returning to the 0.9 gravity of the FRIENDSHIP’s carrousels in some thirteen months. Walking up and down the spacesuits lockers module to test his fat suit, Jason smiled when he felt as if walking on Earth: this was yet again a demonstration that the simplest solutions were often the best ones as well. Content, he then left the module and walked up the circulation tube linking the base and the landers, intent on packing his personal stuff and bringing it to his assigned room in one of the modules designated as crew quarters.

CHAPTER 10 – A HUGE FIND

11:03 (GMT)
Monday, May 2, 2044
Biochemistry laboratory module
Mars Base One, Melas Chasma
Mars

Alerted via intercom, Denise nearly ran down the central hallway of the base to get to the biochemistry lab module, some eighty meters down from the command and control module. When she entered the lab, it was to find Kwang Tse Jing standing with Nadia Gorushkova and Tomonaga Masaki beside a large sterile work box. All three present were harboring happy smiles, helping Denise guess what had happened.

‘’You found traces of Martian living organisms, Jing?’’

‘’Yes, I did, Denise, but this time I am positive. Look through the microscope of this sterile box.’’

Sitting at the chair placed in front of the said microscope, Denise looked through the binocular lenses of the powerful optical instrument, her heart beating faster now. Her heart accelerated further when she saw in the lenses a sort of assemblage of small globes with tinny short ‘hair’ around the surface of the globes. Then, a group of globes moved while staying glued to each other. Fascinated, Denise examined the globes move for a few seconds, then gave an awed look at Jing.

‘’The first living organism to be found beyond Earth… This is big, Jing!’’

‘’More than big, Denise.’’ said Nadia Gorushkova, the medical doctor and surgeon of their team. ‘’It makes us wonder what other forms of life could be found on this planet. Since this multi-cellular organism was found in an underground aquifer layer, maybe that same layer houses fish-like creatures that we may encounter in the near future. We will also have to be even more careful now not to contaminate the local fauna with our own microbes.’’

‘’Er, right! Jing, prepare quickly a preliminary report on your discovery, then transmit it to the FRIENDSHIP, which will then retransmit it to Earth.’’

‘’My report is already written, Denise. I just need to transmit it.’’

‘’Then, do it! This is the kind of news that can’t wait.’’

As Jing sat down at her nearby computer, Denise looked at Nadia, this time with a sober expression.

‘’Nadia, could this Martian microbe be toxic for us?’’

‘’The possibility is always there, Denise, but I will have to run some extensive tests and analysis before I could give you a definite answer.’’

Denise’s next question was for Tomonaga Masaki, their agronomist.

‘’Masaki, how salty exactly is the Martian water? Can we use it to grow plants in our hydroponic gardens?’’

‘’The Martian water is nearly like brine, but this was expected on Earth and we thankfully have aboard our landers a number of water osmosis separation units that are easily able to extract pure potable water from Martian brine. In fact, we have been separating potable water from Martian brine since yesterday and have already stored over 4,600 liters of potable water in our tanks, enough to cover the basic needs of our base. Teerapat told me that, now that we have been able to analyze in detail the Martian brine and have found no component in it that could damage or clog our water plants, he was going tomorrow to put online all of our osmosis separation units. Then, I will have plenty of water to start operating our hydroponic gardens.’’

‘’And what about the salt separated from the brine?’’

‘’We are storing it for the moment in large canvas bags kept outside of our base, until some use can be found for it. About that, Jing told me that this extracted salt, once cleaned and refined, could be safely used by us as table salt, if you don’t mind using pink salt. It has the same chemical composition than sea salt on Earth, except for a tinny proportion of iron particles in it.’’

‘’Pink salt?’’ said Denise, smiling. ‘’Well, we will have to find a brave volunteer to try it at supper time, I suppose.’’

18:41 (GMT)

Lounge/cafeteria module, Mars Base One

Denise, seeing Viktor Ponichnikov already seated at one table of the lounge/cafeteria module, decided to go sit opposite him at that table. Denise liked the Siberian nuclear engineer for his jovial attitude and honest, open mind. He was also a

fit, vigorous man who took his fun seriously, like Denise did. Putting down her food tray on the table, she sat across from him while giving him a big smile.

‘’Hi! Do you mind if I ate with you, Viktor?’’

‘’And why would I be dumb enough to refuse a place at my table to a nice blonde like you?’’

‘’Well said! So, any problems yet with our nuclear power plants?’’

‘’None, thankfully. With luck, we should be able to go back to the FRIENDSHIP in thirteen months before we start glowing in the dark.’’

Denise strangled a giggle before throwing an amused look at him.

‘’Wow! I really like your optimism, Viktor.’’

‘’Hey, Russian nuclear engineers are known for their bad, sinister jokes. I can’t help it!’’

Shaking her head in amusement, Denise was about to attack her meal when Kwang Tse Jing came to their table and put down a salt shaker in front of Denise’s food tray.

‘’Here, Denise! I couldn’t find a single ‘brave volunteer’, so you’re it! Call it ‘command privilege’.’’

Denise, like Viktor, eyed with curiosity the salt shaker: the grains inside were white, but with a slight pinkish color to them.

‘’That’s Martian salt?’’

‘’It sure is! I purified and ground it myself. You just need to tell us now how it tastes.’’

Despite Jing’s assurances, Denise hesitated for a moment, long enough to have Viktor grab the shaker with fake frustration.

‘’Come on, Denise! I thought that you were more adventurous than that.’’

Viktor then put a fair dose of salt on one piece of his pork cutlet before grabbing his fork and putting the piece of meat in his mouth. Denise and everybody else present in the lounge stared at the Russian as he chewed on his piece of meat.

‘’Hum, not bad at all! There is definitely a difference in taste compared to Earth’s sea salt, but it is actually a pleasant one. Maybe we should…’’

Viktor suddenly stopped speaking and chewing, while his eyes opened wide. His hands then started to shake and he reacted like someone choking on something. An alarmed Denise, getting up from her chair, was about to call for medical help when Viktor’s expression changed completely and he broke out into laughter, prompting an indignant remark from Denise.

‘’You clown! You scared me for a moment!’’

‘’Just for a moment? I was going to play the stomach burster scene from that old horror science-fiction film if this didn’t work.’’

‘’So, seriously, how does this Martian salt tastes, Viktor?’’ asked Jing, who was still going over her momentary fright.

‘’It is actually really good, Jing. You all really should try it. Go ahead, Denise: have a bite!’’

Sitting back down, Denise salted one piece of her fish, then tasted it. Jing also tasted the salt, using a small piece of vegetable from Denise’s plate. The six other team members present then came to their table to also try the Martian salt, putting a few grains on a fingertip and licking it. All of them nodded their heads in approval after a few seconds.

‘’Not bad at all!’’ said Steven Merrick. ‘’In fact, it has a small aftertaste that is quite interesting.’’

‘’Hey,’’ exclaimed Viktor, waving his arms around, ‘’we just found the first Martian export item for interplanetary commerce. We are all going to get rich!’’

What he couldn’t know then was that Martian salt would effectively become a prized import commodity on Earth in the years to come, with most rich snobs insisting on having Martian salt served to them in restaurants.

10:05 (GMT)

Wednesday, May 4, 2044

Lava tube connected to underground rotunda of Mars Base One

Jason Terlecki, looking through the ice covering the top of the water filling the nearly vertical part of this lava tunnel, estimated its thickness at about no more than two meters: a workable thickness to deal with this morning. He, Frey Thorvalson and Sergei Krulov had driven an ATV to the end of this lava tube, some 700 meters away from the underground rotunda containing their base, with the goal of drilling a hole in the ice. They then intended to sink a small mobile sonar unit down the inundated part of the lava tube, which twisted down to near vertical at this point, to map the inundated tunnel and see how far down it went. As a mining engineer, Jason had plenty of experience dealing with water-logged tunnels and underground chimneys on Earth.

‘’Alright, guys, be ready with the heating rods: I am going to activate our thermal cutting shield.’’

Taking a few steps back first as a precaution, he then pressed the button at the top of the small command box he held in his gloved right hand, lighting up the pyrotechnic mixture contained in the round shield-like thermal cutting board he had put down on top of the ice surface. The mixture, quite similar with the old thermite powder, ignited with a short flash, then burned fiercely with temperatures high enough to melt steel in a few seconds. The thermal cutting board quickly melted the top of the ice and started sinking down through the ice as it melted it. When the thermal board was down past one meter of ice, Jason looked at his two companions.

‘’Start approaching your heating rods from the hole: we don’t want to give a chance to the ice to reform.’’

Both geologists nodded their heads and grabbed the semi-circular frames they had brought with them, which supported vertical heating rods connected to a portable fuel cell power unit transported on the trailer towed by their ATV. Walking up to the edge of the 1.2 meter-wide hole now formed in the ice, the two men started dipping the ends of the heating rods in the water, holding their support frames high and keeping the rods close to the edges. After going through approximately three meters of ice, the thermal cutting board finally reached liquid salt water and sank quickly out of sight. Frey and Sergei then lowered their heating rods until they were completely submerged in salt water and turned their rheostats to maximum, making the rods heat up to their maximum. Now pretty sure that the water in the hole was not going to freeze on them while the sonar fish was down, Jason went to pick up the small, torpedo-like device, which was resting on the ATV’s trailer, and picked it up with some effort before walking back to the hole in the ice. Normally, he would probably not have been able to carry alone the 170 kilo sonar fish but, here on Mars, it felt like a 63 kilo object to him. Putting down the sonar unit near the edge of the hole, Jason then went back to grab the command and display unit, while Sergei unrolled in advance a long section of command and power wire from a large spool sitting on the trailer. This was all part of a long planned experiment conceived on Earth and was no improvised system. If all went well, the sonar fish, swimming around the inundated lava tube, was going to tell them how far and deep it went and, hopefully, tell them as well how large this underground aquifer layer was.

Jason was about to slide the sonar fish in the water when he hesitated and gave a sudden order on the radio.

‘’Quick, guys, switch off your helmet lamps!’’

He did so himself at once, with his two companions obeying after a slight hesitation.

‘’Is there something wrong, Jason?’’ asked Sergei Krulov, concerned. Jason shook his head in response.

‘’No, but I believe that I saw a kind of tiny light down in the water.’’

‘’A tiny light? Could it be a remaining particle of thermite mix still burning?’’

‘’I don’t think so. THERE IT IS, SOME FOUR METERS OFF THE HOLE AND DOWN. IT IS MOVING, FOR GOD’S SAKE!’’

‘’Moving? But, that’s impossible!’’ said Krulov. However, after looking down the melted water of the hole for a few seconds, the Russian had to agree with Jason.

‘’You are right: something is moving down there and it is emitting a faint glow.’’

‘’It still could be a particle of hot thermite mixture floating around in a water current.’’ suggested Frey Thorvalson. Again, Jason shook his head in denial.

‘’If it would be pushed around by a current, it would go mostly in a straight line, Frey. Instead, it just did a complete ‘U’ turn.’’

A sudden thought then came to Krulov, who opened his eyes wide.

‘’A fish? Could this be a Martian fish?’’

‘’Hell! That is one possibility that we can’t dismiss without more investigation. Let’s put our sonar unit in the water: with luck, its frontal camera could capture pictures of whatever is down there.’’

The three men then joined their efforts in sliding the sonar fish into the melted water of the hole in the ice, where it stayed afloat thanks to its dorsal air bag. Grabbing the remote control unit of the sonar rover and setting it on its folding, telescopic tripod, Jason powered on the rover while talking to his two companions.

‘’Be ready to feed the rover’s control wire into the hole, guy: I am about to make it dive down.’’

‘’We are ready.’’ said in response Frey. Doing a short initial check of the rover’s systems first, Jason then made its dorsal air bag deflate, a pump inside the rover transferring its air into a small pressurized tank. As the rover started sinking down the inundated lava tube, Jason powered the high frequency, high definition sonar transducer of the rover while also switching on its frontal camera and its positional red blinking beacon. He however selected the low light mode of the camera and lit the infrared

projectors of the rover instead of the white light ones, not wanting to scare away whatever there was down there by using bright light beams.

‘’You have put the rover’s sensors on ‘recording’ mode, Jason?’’ asked Sergei, making Jason nod his head inside his helmet while he kept his eyes and hands on the remote control unit of the rover.

‘’That was one of the first things I did, Sergei: we sure want to have recorded proof if we see anything down there. This could be our biggest find yet on Mars.’’

The three men then kept silent while Jason piloted the sonar rover down, concentrated on the visual and sonar pictures he was getting back. The inundated lava tube, which started with a steep down angle from their position, quickly became vertical, while it gradually widened in diameter. A sonar depth reading soon made Jason exclaim himself.

‘’Hell, the rover is now reading a depth of 460 meters! The tube is also widening with the increasing depth and has a diameter of about 55 meters at a depth of 35 meters… Now at a depth of sixty meters, with a tube diameter of seventy meters. At that rhythm, we are…WOAH!’’

The shout on the radio by Jason made both Frey and Sergei hurry to him to look at the display screen of the rover’s camera. What they saw made their blood rush to their heads: a sort of semi-transparent fish with an enormous mouth and big teeth was attacking the rover, apparently targeting its blinking red beacon light.

‘’It is attracted to our beacon light.’’ said Frey. ‘’Switch it off, quickly, before that thing could cut off the rover’s wire!’’

Jason did so, which seemed to either calm down or confuse the Martian fish. That gave the camera of the rover a chance to film in detail the creature as it took some distance and swam around the rover.

‘’Look at that sort of appendage with a glowing dot attached to the head of that…fish.’’ said Jason. ‘’That is the light I saw through the ice. This thing actually looks a lot like the fish found in abyssal trenches at the bottom of Earth’s oceans.’’

‘’Yes!’’ approved Sergei. ‘’Same function and conditions, nearly same forms. HEY, I SEE ANOTHER LIGHT DOT APPROACH!’’

The three men, fascinated, watched on as another Martian fish, this one radically different in shape to the first one but also semi-transparent and with a glowing appendage, approached the rover. It actually had a long, heel-like shape but its long, pointy mouth and rows of sharp teeth clearly marked it as a predator. The first Martian

fish decided to try to swim away at its approach. However, the newcomer was apparently a faster swimmer and caught it in its jaws before it could escape. The heel-like fish then proceeded into devouring the unfortunate first fish, right on camera.

‘’Gee! That thing looks murderous as hell!’’ exclaimed Frey. ‘’It also looks to be quite big.’’

‘’Well, the short range Lidar[8] makes it to be about ninety centimeters long, while the first fish measured about thirty centimeters in length. This video will be like dynamite when we will show it to the others. Well, the heel has finished its feast. I will resume the rover’s dive now.’’

Piloted cautiously by Jason, the sonar rover resumed its descent, soon passing a depth of 120 meters. By then, the lava tube’s diameter had grown to over 170 meters, with the tube apparently getting even larger deeper down. That was very encouraging for the astronauts of the Mars mission, as this meant that they had access to an abundant source of water for their base. How abundant became even clearer when the rover passed a depth of 340 meters. The sonar readings then made Jason exclaim himself on the radio.

‘’Guys, the rover’s sonar is now showing what I can only call an underground lake, or even a sea: this lava tube connects with a salt water aquifer that measures over 200 meters from top to bottom. While our rover can still detect rock walls on three sides, those walls form a sort of ‘V’ and the opposite wall of this underground lake is too far to be detected by our sonar. This means a minimum width of 5,000 meter for this lake.’’

‘’Holy!… I can see a number of glowing dots swimming around this underground lake. This place is actually full of marine life!’’

‘’Frey, how much control wire do we have left loose?’’

‘’Uh, I am afraid that we are down to our last fifty meters of loose wire, Jason. Unfortunately, our rover designers were not expecting such vast underground water bodies on Mars. A completely new rover type, maybe even a manned mini-sub, will be needed to fully explore this underground aquifer. We never know: maybe all those inundated lava tubes interconnect with underground lakes or seas. This is all an extraordinary find.’’

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[8] Lidar : Laser radar. A sensor type that uses laser beams (often invisible to the human eye) to scan a space like a radar would. A Lidar has a very high definition but its range would be less than a radar and would be dependent on meteorological conditions.

‘’Agreed! Let me twist the rover around, to scan with its sonar the closest portions of this underground lake. Then, I will make the rover come back up. Damn, I can’t wait to show this to Jing!’’

Three minutes later, as Jason was making the rover go back up the vertical lava tube, something became visible, floating slowly down. His heart nearly stopped when he understood what it was.

‘’GUYS, I SEE WHAT MUST BE THE UNEATEN REMAINS OF THAT FIRST FISH, GOING DOWN TO THE BOTTOM. I WILL TRY TO CATCH SOME PARTS WITH THE ROVER’S MANIPULATOR ARM.’’

Now concentrated as he had rarely been before, Jason made the rover glide towards the biggest fish part while deploying its manipulator arm. Praying silently for success, he finally managed to solidly grab that fish part, then put it inside the samples box under the chin of the rover. He nearly yelled in triumph when he closed the cover of the box.

‘’YES! WE NOW HAVE A SAMPLE OF MARTIAN FISH! WE HIT THE JACKPOT TODAY, MY FRIENDS!’’

The three men exchanged high-fives, then Jason finished piloting the sonar rover back to the surface. The three astronauts teamed their efforts to pull the rover out of the water and put it back on their ATV’s trailer, then rewound its thin control wire in its dispenser drum, also laid on the trailer. The heating rod assemblies were also put back on the trailer. Their last act was to dip a long section of electrically heated flexible hose down the hole in the ice, anchoring one end to the rocky shore. They would now be able to come back in the near future to connect a heated water pipe linking the base’s desalinization plants with this inundated lava tube. They were jubilant as they started rolling back towards the base: due to the distance and twists in the tunnel, those at the base could not have heard their radio conversations, thus their fantastic discovery would let them spring one huge surprise and good news on their fellow astronauts.

13:26 (GMT)

Commander’s office, Ring ‘A’, Middle Deck

H.S.S. FRIENDSHIP, low Mars orbit

Janet Larsson was studying a productivity report concerning the hydroponic farms of the ship when her intercom buzzed, making her extend an arm and push a button.

‘’Yes?’’

‘’Commander, this is the communications room. We have a Priority One transmission from Mars Base One.’’

Janet stiffened at once on hearing that: it could be to announce some problem or even tragedy on the surface.

‘’Transfer the link on my work computer please.’’

‘’Right away, Commander.’’

Two seconds later, the face of Denise Wattling appeared on the screen of Janet’s computer. Her relaxed, even joyful expression put Janet at ease at once.

‘’Aaah, Denise! How are things going down on Mars?’’

‘’Better than we could have imagined, Janet. We now have proof that there is marine life on Mars.’’

‘’WHAT?’’

‘’Exactly!’’ replied Denise, grinning from ear to ear. ‘’A three-man team went this morning to plunge our sonar rover down one of the inundated lava tubes connecting with our cavern and saw at least two different kinds of Martian fish, one of which proceeded to eat the other one on camera. Our rover was later able to recuperate an uneaten part of that unlucky fish and bring it back to the surface. That biological sample is now being examined by our bio-chemist, Kwang Tse Jing. That is not all: our rover went down to a depth of 380 meters and found a huge underground lake to which the lava tube connected. That lake was too big to be measured by the sonar of our rover, but is over five kilometers wide and over 200 meters deep, from bottom to ceiling. Our base thus has access to more water than we could ever had hoped for. If such an underground lake proves to be a common feature on Mars, then the colonization of Mars will prove to be a viable project.’’

‘’But, that is fantastic news, Denise!’’

‘’It certainly is, Janet. I am now going to download a number of video and data files collected by our sonar rover, plus a preliminary report by Jing on the fish part we recuperated. Please confirm to me when you will have received all four electronic files.’’

Janet watched and waited as the said files appeared one by one as attachments to the transmission link.

‘’I now have your four electronic files, which are now saved on my computer and on the master computer server of the ship. I will have our experts here study them at once.’’

‘’Before we end this link, I would have a couple of requirements for your attention, Janet. From being mostly a geological survey mission, my team is now redirecting most of its efforts towards the study of life on Mars and on ramping up the local food production via full exploitation of our hydroponic gardens, thanks to the huge reserves of water we just found. However, most of my surface team composition is geared towards geological prospection and I have only one bio-chemist and one agronomist to deal with biology and agronomy work, plus one life support engineer and one medical doctor who can give them some limited support. I will need more people here on Mars if we want to fully develop and use our base. I discussed this with my team members and we agreed that we would need at a minimum one extra agronomist, two hydroponics technicians, one bio-chemist or biologist, one life support systems technician and one spacesuits maintenance technician. If they could be sent down to us via shuttle, I would be truly grateful.’’

‘’Well, with what you found down on Mars, finding volunteers to add to your team shouldn’t be much of a problem, Denise. You should be getting them in two to three days, at the most. If you have a need for some specialized equipment or supply that you don’t have, we will send it down at the same time. Anything else?’’

Denise’s expression then changed, becoming sober.

‘’Yes! Apart from sending up some of the Martian salt we extracted from the water here, I would request that one present member of my team be replaced and sent back to the ship.’’

‘’Let me guess: you want to get rid of Larkin, right?’’

‘’Correct! He has proved to be abrasive and uncooperative right from the start and shows little team spirit. Concerning my requests for more personnel, he was the only one to disagree with me and the rest of the team, asking instead for more geologists and survey equipment. We have been on the surface for barely a week and a few of my team members already want to knock his ass around, and this includes his own geologists! I frankly don’t understand how this guy managed to pass through the psychological selection tests back on Earth. If he stays down on Mars much further, he is liable to create some major friction within the team.’’

‘’Very well! I will talk with his boss on the ship, Doctor Denisovich, about his case. To return to your request for extra personnel, how many more people can you accommodate without problems down at Mars Base One?’’

‘’We could easily accommodate six more people in the visitors’ quarters module of the base. They would however need to bring with them fat suits and some extra reserves of rations.’’

‘’I will take care of all this, Denise. You should get everything within three days. In the meantime, I believe that I will have a pretty full day passing on your bombshell to our ship’s staff and to Earth.’’

‘’I can’t imagine why. I will call you if anything new happens down here.’’

Denise then cut the link, leaving a thoughtful Janet to prioritize in her head all the things she now had to do at once.

21:31 (GMT)

Saturday, May 7, 2044

Spacesuits dressing room module, Mars Base One

Underground rotunda, Melas Chasma, Mars

Denise was surprised to see eight figures in spacesuits walk in via the base’s main airlock, rather than the seven persons she expected. She was even more surprised when she recognized the supernumerary person in the group.

‘’Commander Larsson? I was not expecting you to come down on Mars.’’

The tall blonde, still looking young for her age of 51, made an apologetic smile in response.

‘’I am sorry if I surprised you with my visit, but I thought that we really needed to speak in private, face to face. Don’t worry, it’s not about your performance on Mars, which has been exemplary to date, but rather about the giant steps your team accomplished in so little time. As a result, I intend to counsel to Earth to accelerate the program and jump to Phase Two as quickly as feasible. But, before we speak in private, let me present you your new team members.’’

Janet then half turned around and patted the arm of a big man wearing a short, well-trimmed beard sprinkled with gray hair.

‘’First, here is the senior addition to your team: Doctor Roman Denisovich, our chief planetologist and geo-physicist. He will be replacing Mister Larkin here on Mars.

Talking of Larkin, where is he? Shouldn't he be here, in his spacesuit and ready to leave?''

Denise made a pinched expression at that question: Larkin had been less than fun to deal with during the last three days.

''He is in his room, playing sulky. I told him a half hour ago to get ready but he has still not showed up to the dressing room.''

''This is childish! If he doesn't show up here in a minute or so, then I will go get him and will drag him out if need be.''

''Let me do that, Janet.'' then said Roman Denisovich. ''He is part of my planetology department, thus is my responsibility.''

The big Russian, his two pieces of luggage still in his hands and still wearing his spacesuit, then walked out of the module to go down the central hallway. Both Denise and Janet followed him with their eyes for a moment before Janet pointed another new arrival, a fairly young and also most pretty woman of apparent Middle East origin.

''Well, let's forget Larkin for the moment and let's continue with the presentation. Here is your new biologist, Doctor Layla Shapour.''

''Pleased to have you here on Mars, Doctor Shapour.'' said Denise while shaking hands with the newcomer, who was in her mid-thirties.

''And I am certainly please to be here and have a chance to study firsthand samples of alien biology.'' replied the Iranian biologist. Next, Janet presented a medium-built man with short black hair who looked to be close to his fifties.

''This is Antonio Verdi, the extra agronomist you asked for. He will be assisted as well by Jodi White, a hydroponics specialist and agronomist, and by Pedro Alvarez, another hydroponics specialist and also a botanist.''

Denise shook hands with the two men and one woman before Janet presented the last two newcomers, both women.

''And, finally, this is Gita Sukarno, your extra life support technician, and Winnie Bosango, your new spacesuits maintenance technician.''

''Pleased to have you as part of my team, ladies.'' said Denise while shaking their hands. Gita Sukarno, an Indonesian if she went by her name, was young, graceful and beautiful, all attributes that should attract the incorrigible Viktor Ponichnikov to Gita. As for Winnie Bosango, Denise, who was already tall by female standards, had to crank up her head to look into the eyes of the 186 centimeter-tall African woman.

‘’Miss Bosango, you could easily fit into a professional female basketball team, if I may say so.’’

The tall Kenyan woman, who seemed to have a lean but fit body, smiled at her remark.

‘’You are not the first one to say that to me, Miss Wattling. However, I never had much interest in basketball and am instead more attracted to technical work.’’

‘’Were you able to get a fat suit that fitted you before leaving the ship?’’

‘’Find, not really! However, we were able to modify in a hurry a fat suit so that it could fit me.’’

‘’Excellent! Well, if you will all take off your suits, I will then lead you to your respective rooms. In the meantime, our ATV drivers will load a cargo of Martian salt and bottles of liquid argon aboard your shuttle at the same time that they will unload the supplementary reserves of rations that were brought down with you.’’

While the newcomers were getting out of their spacesuits and then donned their ‘fat suits’, Janet went with Denise to the nearby command and control module, where they spoke alone for a few minutes before coming back to the spacesuits lockers module. There, they saw that Steve Larkin was also in the module and in the process of putting on his spacesuit under the watchful eye of Roman Denisovich. Janet gave a thankful nod to Denisovich, who nodded back: the last thing that Janet had wanted to have to deal with on this mission was with a case of problematic crew member.

‘’You may take off your suit, Roman: I will take it from here.’’

‘’Thank you, Janet.’’

The commander of the H.S.S. FRIENDSHIP didn’t miss the resentful quick look Larkin threw at her then and promised herself to put the geologist back into his proper place once back on the ship. Whether Larkin would acknowledge it or not, the fact was that he was his own worst enemy, as he had shown that he was utterly incapable of controlling his giant ego.

CHAPTER 11 – PHASE TWO

13:14 (California Time)
Monday, May 16, 2044
Headquarters of the Mars Home Project
Vandenberg Space Center, California
U.S.A.

Robert Lithgow, Chief Manager of the Mars Home Project, warmly shook the hand of Wang Lao Xi, the head of the Chinese Space Agency, when the latter arrived in the main conference room of the headquarters.

‘’Xi, it is a pleasure to see you here. I hope that things are going well now at your own space center?’’

‘’Well, we were scared for a moment that our space center could end up under water after that barrage broke but, fortunately, a second barrage downstream held and stopped the flooding from spreading. We are now effecting some urgent, major work to repair and reinforce the barrage that broke and are also digging a diversion canal that will make any future excess flow detour past our space center.’’

‘’I am happy to hear that, my friend. I must say that we had our own share of water trouble in the United States in the last few months.’’

‘’Yes, I heard about the demise of the Saint-Lawrence Seaway locks, when the rising seas overflowed part of them.’’

‘’Well, enough said about natural disasters! Let’s sit down and talk about some good news concerning our project.’’

Walking Xi to his designated seat, Robert then went to his own seat and sat down before looking at the six other persons sitting around the table.

‘’I believe that you all had ample time to read and view the reports and video recordings sent by our surface team on Mars, so I won’t waste time talking further about them. Instead, we are here to decide our next actions in the project. You all know what the preplanned phases of the project were and I believe that we are now at the point when we could launch Phase Two of the project, meaning the expansion of our initial surface base on Mars and of its crew. Phase Two also meant the sending of the first

permanent residents for our Mars base, astronauts that would stay and live there for the next few years on Mars and would help develop true production facilities on the surface, facilities which would start to make our base self-sustaining. Now, this Phase Two was planned to take over four years at a minimum before we could jump to Phase Three, but our initial team on Mars has accomplished miracles, helped with a large dose of good luck I must say. However, their quick progress outstripped the construction of our second interplanetary spaceship, the H.S.S. MIR, which means that we have to think about alternate solutions to send extra equipment and supplies to the surface of Mars. The floor is now yours.''

The six national heads of space programs looked at each other for a moment as they thought about the problem presented to them by Lithgow. Misha Borisovich, the head of Roskosmos, finally spoke up in a careful tone.

''The cargo landers for the H.S.S. MIR are already built and waiting on the ground to be sent to the ship once it is completed in orbit. Why not put them on top of dedicated vertical boosters and launch them directly from the ground? Since they are not inhabited, their carrying boosters would not need to have such luxuries as giant rotating rings and food supplies. Also, by not having a human crew, they would only need conventional rocket engines, rather than nuclear and magneto-plasma engines, and would thus be much more economical and quick to launch, albeit their trip to Mars would take longer.''

Lithgow, like the others, nodded his head in approbation on hearing the Russian's proposal.

''A nice, practical idea indeed, Misha. I like it!''

''I like it too,'' said Maria Cardona, of the NASA, ''but I believe that, with what we know now about the surface of Mars and the conditions there, that we should start designing new, purpose-built cargo landers that could help enlarge our base by rolling into the underground rotunda that shelters our Mars Base One. I know that our present cargo lander design allows that already, but if we could produce something larger but still able to roll inside the rotunda, then connect it to our present base, then it would open some fantastic new possibilities to us.''

''That also sounds like a nice idea to me.'' said Wang Lao Xi. ''We could design quite quickly a new type of cargo lander with a body section of thirty meters or less but with a length much greater, then launch it from Earth using conventional rocket-ramjet boosters.''

‘’Decidedly, this meeting is proving quite fruitful already, lady and gentlemen.’’ said Robert while typing notes furiously on his computer. ‘’I am buying all of this but we now have to decide exactly what to send, when and how. Like the old saying goes: the devil is in the details.’’

‘’Tell me about that!’’ replied Michel Dupré, of the European Space Agency, while rolling his eyes.

16:08 (GMT)
Wednesday, September 14, 2044
Command and control section, H.S.S. FRIENDSHIP
In low Mars orbit

Janet Larsson smiled with satisfaction as she read the latest message received from Earth: it announced the launch earlier in the afternoon of the fourth cargo lander carrying Phase Two modules and equipment. Three more cargo landers had been launched during the earlier months and were on their way to Mars, carried by automated transport ships. The first of these Phase Two landers was in fact due to arrive in two months, while the one just launched would take a full seven months to do the trip from Earth, due to the fact that it used only conventional chemical rocket propulsion and because the position of Mars in relation to Earth was not optimal at this time. A lot more cargo landers were due to be launched during the months to come as part of Phase Two of the Mars Project, which had as its main goals to expand the original Mars base and to add to it fuel production and refining facilities that would help refill the shuttles visiting the base, as well as refueling the various minor craft to be used by the base. At the end of Phase Two, Mars Base One was going to be ready to expand its program of surveying the surface of the planet, in order to find other locations which would be adequate to build other bases and to find and inventory the various mineral resources that could be exploited on the planet.

Janet was about to switch to reading the daily routine internal ship reports when her intercom started beeping insistently, its red light denoting an urgent call. Switching that channel on, she saw the face of the ship’s chief medical officer and surgeon, Doctor Alexander Cranston, appear on the screen.

‘’Yes, Doctor Cranston! What is happening?’’

‘’Nothing actually grave or critical, but I thought that you would like to know that Misses Xiulan Sommers has just been admitted at the infirmary: she is showing the first signs of labor.’’

That piece of news made Janet give her full attention to Cranston: this was after all the first instance ever of a birth about to occur in deep space. The media outlets on Earth were going to have a field day with this.

‘’has her pregnancy been normal up to now, Doctor?’’

‘’I have to say that, contrary to what I was fearing, this pregnancy is totally normal up to now and has gone as well as any that I saw on Earth. Thankfully, this ship is fully equipped to deal with obstetric cases.’’

‘’Er, what about baby supplies and baby-related equipment? We did store some baby supplies before leaving Earth, if I remember well, didn’t we?’’

‘’Yes, we did, Commander. We should be okay in that aspect.’’

‘’Well, I will have our good quartermaster, Mister Kurt Müller, do an immediate check of what we are carrying in terms of baby supplies, baby food and baby clothing and various equipment. Hopefully, we will have aboard enough diapers to last at least a year or two. If not, we will be in deep shit.’’

‘’Definitely, Commander!’’ said Cranston while laughing at Janet’s joke. ‘’I will advise you the minute that Misses Sommers will have given birth.’’

‘’Please do, Doctor. Thank you again for keeping me informed.’’

Janet then closed the video link and sighed. Another four women on the ship were already known to be pregnant, while a first female member of the surface team, Gita Sukarno, had missed twice her due periods. Unfortunately, nobody had thought of packing pregnancy kits, or even condoms, as part of the supplies sent down to Mars Base One. That may just come back to bite them in the ass in the months to come.

20:39 (GMT)

Bar-lounge area, Promenade Deck of Ring ‘A’

Janet had just ordered a drink at the bar of the ship’s lounge when her wrist phone started beeping. Hoping that this was the call she had been expecting for a few hours already, she opened the link and spoke in her phone.

‘’Commander Larsson speaking!’’

‘’Commander, this is Doctor Cranston. I am happy to announce to you that Misses Sommers has given birth to a healthy baby boy at 20:32. Both the mother and the baby are doing fine.’’

‘’YES! That is great news! Talking of news, if Earth starts in the days to come to harass you in order to get details on how Misses Sommers and her baby are doing, transfer their calls to me and I will deal with them.’’

‘’That is much appreciated, Commander, as some medical specialists on Earth seemed to treat this pregnancy like some laboratory experiment. Do you intend to come visit the baby and his parents soon?’’

‘’I certainly will! By the way, what is the baby’s name?’’

‘’John, John Sommers.’’

‘’Thank you! You can expect me in the next few minutes.’’

Closing the link, Janet then turned around to face the other crewmembers present in the bar-lounge and shouted out loud.

‘’PEOPLE, I AM HAPPY TO ANNOUNCE TO YOU THAT WE JUST HAD OUR FIRST BABY BORN ABOARD THIS SHIP. JOHN SOMMERS IS HEALTHY AND IS DOING WELL, LIKE HIS MOTHER, XIULAN SOMMERS. LET’S DRINK TO THIS!’’

She immediately got a resounding roar of approval on that from the other customers.

The next birth aboard the H.S.S. FRIENDSHIP happened barely two weeks later, on October 2, with Sean and Mary McGregor becoming the proud parents of a beautiful baby girl they named Diane. Then, a mere eight days later, Miki Nakamura was born on October 10. While these births added to the list of worries that Janet Larsson had to deal with, the atmosphere and morale on the ship, which were already high, increased further, with the three babies being pampered wherever their parents brought them. As a direct consequence of the births, Janet had one private interview room on the Promenade Deck of Ring ‘A’ remodeled and refurnished to become the ship’s daycare center, all the while hoping fervently that she was not going to face a population explosion while in orbit around Mars. Her hopes were however dashed when Suzanne Bonnet came to the World on November 28, with little Xu Ling Lee following on January 19 of 2045. With three baby girls and two baby boys now growing up quickly, the new daycare center soon became quite crowded. Thankfully, that problem was partly resolved by various crewmembers volunteering to play nanny at the cabins of the parents when both parents worked.

Then came the birth on Mars of the very cute May Batrang-Sukarno on April 25 of 2045, the same day that Mars Base One received the last scheduled cargo lander of Phase Two of the Mars Project. By then, two other women of the surface team, Denise Wattling and Nadia Gorushkova, were visibly pregnant and proud to be so.

14:16 (GMT)
Sunday, April 30, 2045
Ares Park, Mars Base One
Underground rotunda ('The Nest'), Melas Chasma
Valles Marineris, Mars

Teerapat Batrang, like his wife Gita Sukarno and the other members of the Mars surface team, looked around with an enchanted smile at the fifty meter-diameter dome of 'Ares Park'. Little May, all of five days old, however missed the excitement, being asleep in her makeshift baby stroller, built out of a used rations containers and a few metallic parts recuperated from one of the nineteen cargo landers now lining the sides of the giant rotunda which had been named 'The Nest' by the astronauts. The dome of Ares Park was like many parts of the base an inflatable structure made of transparent plastic, which had made its installation and erection a cinch. Teerapat then looked and nodded at Frey Thorvalson, Jason Terlecki, Roberto Calderon and Peter Walsingham, who were finishing to distribute and install the few pieces of furniture and potted plants meant to make the new park a relaxation place for the astronauts.

''This is really great, guys. Thanks for all the work you have put into this.''

''Hey, I did it partly for selfish purposes, Teerapat.'' replied Jason Terlecki with a smile. ''I myself wanted badly such a large volume place where we could feel more at home.''

His reply made Gita Sukarno stop and think for a second.

''Well, isn't this our new home now? Me and Teerapat have discussed about that subject and agreed that we will want to stay on this planet at the end of this tour, which is due in barely a month.''

The four men who had been working on the dome's facilities all stopped working for a moment then, Gita's words having touched on a subject that had been discussed with passion during the last few weeks. Jason then spoke up, a dreamy expression on his

face, while leaning on the shovel he had been using to distribute Martian dirt around a children's playground.

''You know what? I think that I will also stay here at the end of our official tour. There is so much building and landscaping to do here in order to create a Human colony on Mars. Also, I can't think of a better professional accomplishment than the building of our colony. Besides, conditions on Earth, despite all the efforts to reverse the effects of this catastrophic global warming crisis, keep getting worse, not better. Gdansk, my home town, is already under water and uninhabitable. No, my life is now here, on Mars.''

The others present mostly nodded in agreement at those words. Roberto Calderon then looked down at May in her stroller, admiring the Asian baby girl as she slept. May was wearing one of the purpose-made baby outfits that had been sent from Earth on the last cargo lander, along with a whole lineup of spacesuits/portable space shelters of varied sizes designed to accommodate children from the ages of one month to five years. May was now wearing a royal blue, one piece baby coverall decorated with embroidered patches of the Mars Project Mission, including one marking her as a 'mission specialist in child space studies'.

''And what about your cute little May, Gita?''

''We intend to raise her here, at Mars Base One. As the first 'Martian' born here, this is her natural home. Me and Teerapat will however make sure that she wears regularly her own fat suit, so that she will be physically able to visit Earth one day. Thankfully, Viktor and Thor did their part in helping to get two future playing companions for May on the way. In a couple of years, this park should be crawling with kids.''

CHAPTER 12 – PHASE THREE

10:18 (GMT)
Tuesday, November 21, 2045
MCC (Mars Colony Craft) 001 flying rover transport craft
On approach to Olympus Mons
5,800 kilometers west-northwest from Mars Base One

‘’We are on final approach to Olympus Mons, guys. Do you want me to land in a specific region of the volcano or do you want us to first overfly it, Roman?’’
Roman Denisovich, who was leading this prospecting expedition, thought for only a short moment before pointing the ridges marking the south and southeast limits of the huge extinct volcano to the pilot of their craft.

‘’Land at the western extremity of those southern cliffs, Peter. They mark the limits of where the crust sank below the mountain’s base due to the weight of all that old lava. The cliffs should tell us a lot about the kinds of minerals that are contained in Olympus Mons. Also, our unmanned drones indicated that there was a significant magnetic field emanating from that area.’’

‘’You’re the boss, Roman.’’ replied Peter Walsingham, who played with the flight controls of his craft to both slow it down and to cut their descent rate. Their flying rover transport craft could have been mistaken for a simple but large wheeled rover vehicle if not for the chemical rocket engine with pivoting gas exhaust nozzles and large fuel tanks attached to its back. It couldn’t be said to be aerodynamic for one penny and overall was rather ugly, but it was in Walsingham’s opinion a well-designed and eminently useful and versatile vehicle for the Mars astronauts. The two recently-delivered craft had quickly received the nickname of ‘grasshopper’ from the colonists, because of their ability to both roll on the ground for long distance, thanks to their ten large wheels, and for their ability to rocket their way around Mars in elongated ballistic trajectories with the help of their rocket engine with vectoring exhaust nozzles, which made possible vertical takeoffs and landings. With Mars Base One facilities now including operational chemical production plants using only local minerals and water for the local production of N_2O_4 oxidizer and of MMH rocket fuel, the colonists could now refuel at will their new vehicles

without having to wait for rocket fuel coming from Earth at tremendous transportation cost and time. With such vehicles now at hand, along with a number of much smaller flying scooters, the colonists were now free to roam most of the planet in order to find mineral deposits that could ensure the long-term viability and self-sufficiency of the colony. Mars Base One was already self-sufficient in terms of potable water and oxygen extracted from Martian brine and could already provide for a sizeable proportion of its needs in vegetal foodstuff, on top of having a very productive poultry farm that now provided a steady supply of fresh eggs. The one area where the colonists were still having problems was with the production of fresh milk and meat. The two attempts to date to bring to the surface of Mars at least a couple of dairy cows had ended in failure, with the poor beasts dying during transport due to the rough conditions during shuttle atmosphere reentry.

Checking his descent rate via his instruments, Peter Walsingham made his craft perform a ninety degree turn eastward, then rotated downward his rocket engine nozzles to slow down his craft's fall. Two minutes later, the ten large wheels of his vehicle, mounted on independently sprung suspension arms, touched down on the thick dust and sand surface of the planet. Peter didn't lose a second and switched on at once the geared electric motors incorporated into each of the ten wheels, making the rover roll forward at a speed of about twenty kilometer per hour. As the rover rolled past the six kilometer-high cliffs, keeping a rough separation distance of 500 meters with them, Roman and his three geologists eagerly examined the rocky walls of the cliffs with the help of their binoculars and of the powerful optical telescope attached to the swiveling camera mount fixed above the crew compartment, in the nose of the rover. Roman spoke with near glee as he looked at the near vertical walls of the cliffs they were passing by.

''With so much lava having flowed and accumulated over and under the slopes of Olympus Mons, there should be a treasure trove of useful ores here, ready to be exploited by us. In fact, much of this planet's surface is made of igneous material disgorged by old volcanoes like this one. While we already found numerous large deposits of aluminum, magnesium and titanium ore around our base and Melas Chasma, we should find here plenty of iron ore deposits worthy of exploitation.''

Peter Walsingham, who was periodically checking the sensors readings of the rover, then made a remark that made the geologists glanced at the rover's magnetometer.

‘’Well, I would say that we are getting close to one big deposit right now, Roman: our magnetometer is starting to become crazy.’’

Excitement mounted suddenly in Roman as he looked at the magnetometer’s readings.

‘’That magnetic field seems to come from around our ten o’clock. Turn in that direction and get as close as you can to the base of the cliffs, Peter.’’

As the pilot obeyed him, all the geologists pointed their binoculars in the said direction.

‘’That part of the cliffs stands at the end of a large trench complex formed on the volcano’s slopes by a collapsed network of underground lava tubes.’’ said Yves Dorval while scanning visually the surface of the cliffs dead ahead. ‘’This would be the ideal kind of terrain to find big ore deposits. From the strong magnetic signature we are getting now, my bet is that we are heading towards a significant deposit of magnetite.’’

‘’I concur!’’ replied Frey Thorvalsson, who was a volcanologist on top of being a geologist. Being highly concentrated on visually examining the rocky cliffs ahead as the rover kept approaching them, he was the first to notice a particular area at the base of the cliffs. It appeared to be the denuded end of an old lava tube filled with solidified magma and it was huge, measuring a good three kilometers in width and over two kilometers in height in its part emerging from the dusty ground at the base of the cliffs. It was distinguishable mostly thanks to its deep black color. What was however truly attracting Frey’s attention was the fact that the low Sun’s rays reflected on many parts of the rock surface with a kind of metallic luster. A big grin then came on his face.

‘’Guys, I believe that we are now approaching one hell of a huge deposit of magnetite ore filling that old lava tube dead ahead.’’

The three other scientists, on hearing him, immediately concentrated their attention on the said lava tube, taking only seconds to agree with him.

‘’Damn, you are right, Frey!’’ said Tim Garland. ‘’From the color and degree of light reflection, I would add that this looks like an ore vein with a very high concentration of magnetite. If so, this could become a prime location to mine iron for our nascent colony. I can’t wait to go collect samples from that rock face and analyze them.’’

‘’Well, we came here to do just that, Tim.’’ replied Roman, sounding happy. ‘’Peter, get us to the foot of that lava tube. We will then go out to take samples of those rocks. Let’s start selecting and unpacking our equipment, guys.’’

Some twelve minutes later, the big rover stopped and parked a mere forty meters from the rock cliffs. Peter felt relief when he saw on his instruments that the cliff

overhang above him now masked the rover from much of the cosmic radiations showering constantly the surface of Mars.

‘’Good news, guys: the cliff overhang we are under has cut the cosmic radiations we were receiving in the open by 74%. This spot could actually be a good one to eventually locate a mining base.’’

‘’That’s to my liking, Peter.’’ replied Roman, who was about to enter the airlock of the rover with his three geologists. ‘’It will also help cut on the amount of radiations we will absorb while working outside.’’

Peter nodded grimly to that: radiation exposure was a constant danger on the surface of Mars, the lack of a magnetosphere around the planet and the thin atmosphere allowing the constant rain of charged particles from cosmic radiations and from solar wind to bathe Mars with little or no attenuation. Scientists studying that problem via explorer drones and satellites had calculated that astronauts exposed to typical levels or radiation on Mars and in space during a 880 day mission would receive a total radiation dose of a bit over one sievert, enough to increase by five percent the risk of developing a fatal cancer. For the colonists on Mars who were going to spend their whole lives on the planet, finding ways to decrease their exposure to radiations was not only important, but also vital to their survival.

Carrying a variety of prospecting tools, instruments and sample boxes, the four geologists, led by Roman Denisovich, eagerly walked to the nearby base of the cliff, which was partially covered with dust, sand and fallen rocks. Spreading out first, in order to collect as varied a set of mineral samples as possible, the four men then started eagerly chipping away at the black rock face with their prospector picks. It took them only a few minutes before attaining a consensus.

‘’That’s magnetite ore alright.’’ said Frey Thorvalsson on the radio. ‘’Judging by the size of this vein, I believe that we have here at the minimum a few million tons of high grade iron ore, my friends.’’

‘’I believe that you can add some appreciable quantities of chromite ore to that, Frey.’’ added Yves Dorval. ‘’My laser spectrometer is reading a magmatic differentiated layer here as being made up of chromite.’’

‘’Hum, finding sizeable ore sources for producing both iron and chromium this early in our prospecting expedition is certainly a very encouraging thing.’’ said Roman, feeling most happy. ‘’If this vein does go deep, like for more than a few kilometers, then

we will have found a most valid site for our first planned mining center. I can't wait until cargo ships could deliver our first mining equipment set. Okay, collect and tag a few samples here, then we will get back in the rover and continue exploring the base of Olympus Mons. With luck, we should find plenty more ore deposits, both around and at the top of the volcano.''

The next five days of prospecting around and on Olympus Mons proved Roman correct, with multiple large ore deposits of the various forms of magnetite, including ulvinospinel, an ore containing titanium, plus many deposits of chromite and of olivine, or magnesium iron silicate, found. The prospectors also stumbled on a vein containing the gemstone form of olivine, better known as peridot, a green, translucent crystal. At the end of those five days of hard work, the team was ready to fly back to Mars Base One, where they were going to be able to make more complete analysis of their samples.

After landing on the open canyon floor of Melas Chasma, outside Mars Base One, the team's flying rover rolled up the access ramp built a year and a half ago and drove down the tunnel leading to the rotunda sheltering Mars Base One. However, the rover had to first cycle through a giant airlock before it could enter the rotunda. The recently completed airlock, along with four more airlocks plugging the ancient lava tubes connecting with the huge underground dome of the rotunda, was designed to be large enough to let pass craft as big as cargo landers, manned landers and heavy orbital shuttles. With those multiple airlocks in place, it had then become possible to fill and pressurize the rotunda with breathable air, which had been heated to a most tolerable 22 degrees Celsius. Now, the Martian colonists were finally free to walk around the wide rotunda without having to wear a spacesuit. That had constituted a vital, crucial step in making the colony more livable in the long term. To help fully take advantage of that huge step, the colonists had brought in from the outside large quantities of Martian soil, then had spread the soil in a thick layer over the rocky floor of the rotunda. In about a month, a number of cargo landers were due to bring in hundreds of young trees, which were then going to be carefully planted around the rotunda, where they would grow to eventually become the first forest on Mars.

After emerging out of the entrance airlock of the base, the flying rover turned left and followed a wide paved surface roughly following the southern wall of the rotunda,

until it stopped on the refueling pad of the base. There, four technicians who had been waiting for the MCC 001 came forward and, using electrical elevating chariots, plugged two liquid transfer hoses to the tanks of the flying rover: one for the N2O4 oxidizer tank and one for the MMH fuel tank. Refilling the tanks of the rover took only minutes, after which Peter Walsingham made his vehicle roll to its assigned parking spot along the southwest wall of the rotunda, next to the already parked MCC 002. Yves Dorval couldn't help hesitate for a second before opening the visor of his spacesuit, once he was out of the rover with his five companions: the time when you had to go around the rotunda with a sealed spacesuit was only a month ago. He then looked around and up at the powerful floodlights installed around the upper levels of the rotunda in a manner to provide indirect light to reflect against the ceiling of the cavern. Also installed around the rotunda were water sprinkler systems meant to wet and irrigate the new soil cover, which had been planted with grass seeds and a number of potted plants, berry bushes and small fruit trees.

''I hope that we will find a lot more such underground caverns that we could pressurize and landscape like this one: they make the perfect locations for our future cities. Too bad that we found up to now only one similar cave with access to water.''

''Oh, I am confident that we will, Yves.'' replied Roman. ''The morphology of Mars points to the probable formation of many such underground domes and I would in fact not be surprised at all if we found an underground rotunda under the slopes of Olympus Mons, or under one of the three volcanoes of the Tharsis Rise. Well, let's hop on that electric cart and go to the main habitat: I am getting quite hungry.''

''I'll second that!'' added the big and powerful Frey, who had a legendary appetite. Acting on that, the five men put their precious samples boxes in the back of the cart, then sat in it, with Peter then starting to drive it towards the original complex of pressurized habitat modules built some eighteen months ago.

Their first concern after taking off their spacesuits in the dressing room module of the base and putting on their 'fat suits' was to go secure their sample boxes inside the geology lab module. As soon as that was done, Tim Garland excused himself with the others while walking out of the lab in somewhat of a hurry.

''Please excuse me for leaving this quickly, guys: I really missed my little Jason during those five days.''

His companions smiled in comprehension at that: Tim was the proud father of a six week-old baby boy, which he had conceived with the pretty Jodi White, a New-Zealander agronomist who had arrived at the base some ten days after the initial surface team.

‘’Smooch him for me, Tim!’’ nearly shouted in response Peter Walsingham before thinking out loud to himself. ‘’Damn, I better get myself a nice woman before I become too old to make kids. Maybe I should start using my charms on Layla.’’

‘’Naah! Too late!’’ retorted Frey Thorvalsson. ‘’She is already taken.’’

‘’Taken? By who?’’

‘’By me, of course!’’ said Frey with a big grin. ‘’You think that I would have let such a pretty woman walk around without noticing her? More importantly, she noticed me: us Nordic hunks always have a big effect on women.’’

‘’Yeah, the old Viking effect indeed: they invaded other countries and took women there because their own women were tired of their big hunks.’’

While Frey made a falsely indignant face at Peter’s retort, the three other men burst out into laughter at that barb from the British pilot.

CHAPTER 13 – VACATION TIME

07:25 (Jakarta Time)
Sunday, June 19, 2050
Soekarno-Hatta International Airport
Jakarta, Island of Java, Indonesia

The Indonesian customs and immigration officer working at one of the international arrivals control booths of the Soekarno-Hatta International Airport gave back to the Australian tourist his passport after stamping it.

‘’Thank you and have a good time in Indonesia, sir. NEXT!’’

The couple in their mid to late thirties with a young preteen girl could easily have passed as Indonesians at a quick look. The woman, a very pretty and graceful one, proved effectively to hold an Indonesian passport, which the officer quickly sifted through, before stamping it.

‘’Welcome back to Indonesia, Miss Sukarno.’’

Next, the officer took the man’s passport, a Thai one, and opened it.

‘’Are you married to Miss Sukarno, Mister Batrang?’’ asked politely the customs and immigration agent, making the man smile.

‘’Yes, I am, Officer. We came with our daughter May to visit my wife’s parents.’’

The officer nodded his head and stamped Teerapat Batrang’s passport, giving it back to him before smiling to the young Asian girl holding the hand of her father.

‘’Hello, May! May I have your passport for a moment, please?’’

‘’Here you are, mister.’’ replied the girl, who had to be around five or six but who also was quite tall for her age, with long, fine legs. The officer took the passport she presented to him and was about to open it to stamp it when he froze in confusion and surprise before looking up with some irritation at her father.

‘’Is this some kind of a joke, Mister Batrang? A Martian passport?’’

‘’Look, Officer, this may appear strange and most unusual to you, but our daughter was actually born on Mars and has lived there for all of her five years. Me and my wife are astronauts and are part of the Mars Home Project. This is the first time that we have returned to Earth since the start of our mission in 2043 and we are on a three-

month vacation, at the end of which we will be returning to Mars. Three other children were born on Mars, like May, and Mars is their official place of residence, as certified by the United Nations.''

''Uh, just give me a moment, please.''

The Indonesian official then picked up his telephone and did a quick call before looking again at Gita and Teerapat.

''My supervisor is coming to this booth and will bring you to a private interview room with your daughter. Don't worry: it will not be the kind of interview room where they bodily search you.''

Another Indonesian customs and immigration officer, this one with graying hair, effectively showed up within a minute and smiled to the couple after a quick glance at little May.

''If you may follow me please.''

Still a bit worried, the couple followed the official while both holding the hands of May. Passing through a glass door marked as reserved for airport staff, they finally ended up in a small, windowless room, where they sat on chairs opposite a table, behind which the official sat. Teerapat's eyes didn't miss the discrete camera fixed to one corner of the room's ceiling. However, the official kept a polite, friendly tone then.

''Could I see all of your passports, please?''

Teerapat quickly collected the three passports of his family and then put them on the small table.

''Here you are, sir.''

''Thank you!''

The official scrutinized the passports for a moment, then started punching the keyboard of the computer integrated to the table. He apparently visited a couple of Internet sites and read a number of articles online, then looked up from his computer screen and smiled to Teerapat and Gita.

''Well, it seems that your story is a true one. To be frank, while I heard before about children having been born on Mars, I was kind of expecting those children to show some visible differences, due to the different environment of Mars.''

''Oh, Mars is certainly quite different from Earth, sir.'' said Gita, who was secretly blowing air in relief. ''However, we did everything to make sure that May stayed as similar as Earth children while growing up. The astronauts and their children living and working on Mars routinely wear what we call 'fat suits', coveralls weighed down with

weights in order to make them exert the same physical efforts they would have to on Earth, despite the weak gravity of Mars, which is equal to 37% of Earth's gravity. As a result, May has the same muscular strength, bone resistance and cardiovascular capacity than any other child of her age. The only difference noted up to now is that she, like the other Martian children, has a bit longer legs than usual, probably due to the fact that we take off our fat suits before going to sleep, thus spend seven to nine hours a day in reduced felt gravity.''

''Fascinating! Well, I see no reasons to further delay your vacation. I will now escort you back to the entry registration booth, so that your daughter's passport could be stamped.''

''Thank you very much for your understanding, sir.'' said a pleased Gita. ''We are so anxious to bring May to a beach, so that she could swim in the sea for the first time.''

''I can understand her: not being able to enjoy the natural beauties of Earth for so long must be hard.''

''True, but how long will we be able to enjoy those natural beauties at the present rhythm?'' replied Teerapat, most serious.

Some 25 minutes later, after collecting their luggage and clearing the customs checks, where the official that had interviewed them made sure that they went through without further delay, the small family took place in a taxi in order to get to downtown Jakarta, twenty kilometers away to the Southeast. All three sighed with relief as the vehicle's air conditioning system helped them cool down a bit. The oppressive humidity and heat of the local climate had hit them like a hard slap in the face when they had walked out of the controlled environment of the airport's terminal building. Even Gita, who was born in Java, vented herself.

''Ooof! I didn't remember Jakarta being this hot and humid.''

The taxi driver, on hearing her, smiled to her via his rear view mirror.

''How long has it been since the last time you visited Jakarta, miss?''

''Over six years. Why?''

''Well, the local average temperature has climbed by nearly two degrees Celsius in the last six to seven years, miss, and they predict that it will continue to rise at the same rate in the next few years.''

''A rise of two degrees in six years?! But, Indonesia will quickly become too hot to live in, if this is allowed to go on.''

Those words made the taxi driver nod his head grimly.

‘’That is what many people around here are afraid of, miss. With the rising seas and increasing temperatures, Indonesia may just end up like Bangladesh within a few decades. Fortunately, Jakarta is situated high enough to avoid for the moment the fate of New York, which had to surround itself with flood protection walls.’’

Gita and Teerapat exchanged a quick, silent glance then: if they needed a reason to believe in the Mars Home Project, this was certainly a good one.

Some 25 minutes later, the taxi dropped them at the foot of a residential tower surrounded by similar towers and situated in an apparently well-to-do district of Jakarta. Leaving with regret the air-conditioned environment of their taxi, the small family hurried inside the reception lobby of the residential tower, where they found themselves back into fresh air. Little May wiped away with one hand the sweat running down her forehead and looked up at her mother.

‘’Is it always this hot here, Mother?’’

‘’I am afraid so, darling.’’

Holding May’s hand, Gita went to the banks of elevators of the condo tower and called a cabin, watched by a private security guard sitting at the reception desk of the lobby. Teerapat noticed the man’s pistol before entering the elevator cabin behind Gita and May. The ride up to the eight floor proved smooth and quick and they soon were knocking on a door along the main hallway. A man in his sixties opened the door after a few seconds and, on seeing Gita, shouted with joy.

‘’GITA!’’

The man then pressed her in his arms while she also hugged him. They finally separated, with the man looking at Teerapat and May.

‘’And this must be your husband, Teerapat, and your daughter May. May is absolutely adorable, I must say. Can I hug her?’’

‘’Of course you can, Father! May, this is your grand-father Angga.’’

May timidly approached the graying man and shared a hug with him before Angga straightened up and shook hands with Teerapat.

‘’So, you are the man who had the luck and good taste to marry my daughter?’’

‘’Guilty as charged!’’ replied Teerapat, grinning. Angga then showed them inside his condo.

‘’But come in, please! I am going to get my wife Shinta: she was so anxious for your visit.’’

Once inside, Angga closed the door first before opening the folding doors of a closet, so that they could store their luggage in it, then disappeared towards the kitchen. He came back a few seconds later with an equally graying but still very pretty woman who opened her eyes wide at the sight of her visitors.

‘’GITA, YOU’RE HOME AT LAST!’’

Gita took the time to share a hug and kisses with her mother before replying to her remark.

‘’Well, it is only for a relatively short visit, Mother. We intend to go visit a few more places after Jakarta, then will fly back to Mars in three months. Let me now present to you my husband Teerapat and our daughter May, your grand-daughter.’’

Shinta briefly hugged her son-in-law, then pressed May in her arms, covering her with kisses.

‘’May, you are so cute! I hope that your mother will allow me to spoil you a bit before you leave.’’

‘’A bit but not too much, Mother. I want her to be able to fit back in her spacesuit once back on Mars.’’

‘’She has been wearing a spacesuit already?’’

‘’Of course, Mother! She made her first walk outside the base at the age of three, with me and Teerapat, of course.’’

‘’What a fantastic story! You are indeed very special, May. But let’s go sit in the lounge: we have so much to talk about. Would you like some tea?’’

‘’Me and Teerapat will certainly accept your tea with gratitude. As for May, would you have some papaya juice for her?’’

‘’I certainly do, Gita. Just give me a minute.’’

As Shinta disappeared back in her kitchen, Angga led Gita, Teerapat and May to the lounge, where they sat in opposite sofas.

‘’So, Gita, how was your trip back to Earth?’’

‘’It was actually very comfortable, Father. The H.S.S. MIR’s facilities are excellent. In fact, I used our trip back to Earth to start teaching to May how to swim.’’

‘’How to swim? On a spaceship?’’

‘’It’s true! The MIR being a sister ship to the FRIENDSHIP, it had the same kind of water-filled anti-radiation compartment than the one on the FRIENDSHIP, which was

routinely used to do scuba diving. Mind you, May still has a lot to learn about swimming, but I intend to bring her to the beach as often as possible during our vacation. Another thing me and Teerapat hope to do is to show her about the animal life on Earth. As you know, Mars is nearly empty of life, apart from us astronauts, our farm animals and Martian fish.''

''Ah yes, those Martian fish. I saw pictures of them, back when their existence was revealed. Quite ugly creatures, I must say.''

''I won't dispute that, Father. Talking of animals, is the Ragunan Zoo still in business? I would love to be able to bring May to it.''

''Of course it is still in business, Gita!'' replied her father, smiling. ''It is still the second largest zoo in the World and has been open for nearly 200 years now. However, it is closed on Mondays, so I would counsel you to go visit it today. That should start your vacation on the right foot.''

''Will there be insects in that zoo, Grandfather?'' asked May in her little voice, making Angga smile to her.

''Of course there will, my sweet May! They have about any animal species in Ragunan Zoo, except for large sea mammals. Do you like insects?''

May shook her head at that, confusing a bit Angga.

''No! We don't have insects on Mars, but here they keep biting and buzzing me.''

''Hum, I didn't think about that. Well, I do have insect repellant cream here: we will be able to apply some of it on you before you go visit the zoo.''

Angga then looked at Gita and pointed a firm index at her.

''And I insist on going with you to the zoo! There is no way that I will let you selfishly keep this little treasure just for you during your time in Jakarta.''

16:08 (Irkutsk Time)

Friday, June 24, 2050

The Great Baikal Trail, near Listvyanka, Irkutsk Oblast

Western shores of Lake Baikal, Siberia

Russian Federation

''Here you are, my son: natural beauty at its best!''

Five year-old Michel Ponichnikov looked slowly around him at the huge lake, at its densely wooded shore and at the thick forest extending beyond the horizon, obviously

liking what he saw. The boy then sniffed the fresh air, which was at a temperature of fourteen degrees Celsius.

‘’I smell something in the air, something that tickles a bit the nose but is pleasant, Father.’’

Viktor, standing on one side of his son while Denise stood on the other side, smiled down to Michel.

‘’What you smell is the perfume of the firs and pines we are walking by, my Son. That is the smell of the Taiga, the smell of life. You can’t smell the animals and birds living in the forest, but these woods are full of them. This region is where I grew up, where I did much of my geological prospecting before going to Mars. As for this lake in front of us, you are looking at the largest volume of fresh water on Earth, covering 31,722 square kilometers and with a maximum depth of 1,642 meters.’’

‘’Are there fish in it, Father?’’

‘’Of course! Lake Baikal, like the region surrounding it, is full of life. There are even seals in the lake. Thankfully, it was mostly spared the ravages of pollution and its waters are still pure enough for us to drink from…if you stay away from the few villages and resorts along its shores.’’

‘’Could we swim in the lake, Father?’’

That question made Viktor laugh.

‘’Of course you can…if you like cold water. Right now, the temperature of the water along the shore must be turning around twelve degrees Celsius, not exactly warm for a dip. But, if you are brave enough, then I will accompany you for a swim. What about you, Denise?’’

Denise repressed a shiver as she looked at the clear waters of the lake.

‘’Twelve degrees, you said? That’s pretty cold.’’

‘’Come on, you’re a tough girl! Beside, would you chicken out in front of our own son?’’

Denise sighed after a moment of hesitation.

‘’Alright, let’s try this!’’

The trio then left the trail, which followed closely the shoreline at this point, and walked past the last few trees before stepping on the pebbles of a narrow beach. The beach was part of a small cove surrounded by thick woods, so afforded good privacy to the site. Viktor then chose a corner where trees were very close to the water and put down

his big backpack and semi-automatic shotgun behind a bush, where they would be hard to spot. Denise noticed that and gave him a worried look.

‘’Are you afraid that someone could attack or rob us here, Viktor?’’

‘’Well, let’s say that the Taiga is full of rugged, independent-minded individuals, Denise. Most of them will be decent, honest people, but you always have a few who harbor few scruples, while others are not too sociable. However, we haven’t seen anyone along the trail all day, so we are probably alone on this part of the shore.’’

Viktor then quickly undressed, imitated by Denise and little Michel. Viktor smiled when he saw Denise’s nipples become hardened and erect from the fresh wind blowing from the lake. He however didn’t comment on it, since his young son was near him. With their clothes also hidden in the bushes, the small family walked the few steps to the water, holding hands together and with Michel in the middle. He, like Denise, squirmed when the first waves of cold water washed over their feet.

‘’EEEEK! THAT’S COLD, FATHER!’’

‘’Of course it is, my Son : we’re in Siberia after all. Come on, you can do it!’’

‘’Is it better to go in gradually or to dive in it, Viktor? asked Denise, already shivering. Viktor’s answer was to launch at a run, diving in the lake after a few steps while screaming with joy.

‘It is now official: my husband is nuts!’ thought Denise before arming herself with courage and running herself into the water while holding her son’s hand. The shock of entering the cold water made her and Michel scream out loud, something that made Viktor grin to them as he swam on the surface.

‘’Welcome to Lake Baikal! You will feel much reinvigorated after this.’’

‘’What I feel like is ‘frozen’, Viktor.’’ replied Denise. Viktor smiled at that and came to her, hugging her tight while putting little Michel between the two of them.

‘’One lesson from Siberia: use others’ body heat to keep warm when needed…or when you’re having fun.’’

‘’Living around here in Winter must be really tough, no?’’

‘’Oh, I certainly won’t deny that, Denise. In the past, whole armies froze to death while trying to cross the open expanses of the lake in Winter. However, if you know what to do and use experience and common sense, you can survive and even make a fair living around here. The lake is full of fish, the woods are full of animals and you could engage in fishing, hunting, fur trapping and the like to earn a living.

‘’Could we come out of the water now, Father?’’ asked Michel, his teeth chattering together. Viktor nodded his head at that and grabbed his son by one arm.

‘’Yes, my son: you passed the test like a man.’’

‘’And me? Am I a man now?’’ asked Denise in jest and making her husband grin.

‘’Of course not! Thank God for that! I like too much this beautiful female body of yours.’’

Viktor then walked out of the water, Michel under one arm. The trio then took towels out of their backpacks and started drying themselves, with both parents first toweling their little boy dry before toweling themselves. Once they were clothed, Denise took the time to admire the view they had of the lake from the small cove they were in.

‘’This is a nice place, Viktor, and the Sun is starting to come down. What do you say that we spend the evening and night here?’’

‘’I would say that it is a fine idea, my dear wife. That will give me a chance to show some of my survival skills to Michel. Start unpacking our tent while I make a small clearing among the trees near the shore. Michel, you come with me.’’

Entering the forest but staying close to the shoreline while being able to see the water through the trees, Viktor looked around for a moment before selecting a space between five fir trees.

‘’Well, this looks like a good spot for our tent, Son: large enough to accommodate it and a small camp fire but also sheltered enough from wind and rain. Just stand aside for a moment while I swing my machete around to cut away the few bushes and young trees, to clear a spot for our tent.’’

As soon as little Michel was safely out of the way, Viktor then started vigorously swinging his machete, cutting the long grass and few bushes down to ground level. After three minutes of work, he used his son’s help to gather the cut vegetation and dump it out of the small clearing he had just created. Seeing that Denise was standing ready nearby with their dismounted dome tent, Viktor then signaled her to bring the tent to one corner of the new clearing.

‘’Okay, let’s erect our tent in this corner here. We want to leave enough free space in the clearing to be able to light safely a camp fire: we don’t want to start a forest fire by accident.’’

‘’Right!’’

Putting up their dome tent was the matter of a few minutes only. Viktor then pushed it as close as he could to one corner of the clearing, stopping only when one side touched two of the trees surrounding the clearing. To help that, he used again his hatchet, this time to cut off the lower branches of the two adjacent fir trees. Gathering the cut fir branches, Viktor showed them to Michel.

‘’Lesson number one, Son: fir branches make excellent ground mats and help keep you warm while sleeping, by reflecting your body heat. I will now show you how to spread them over the floor of our tent.’’

Crouching down, Viktor threw the branches inside the tent, then went in on his knees and hands and spread the branches around. He actually went out to cut more low branches and bring them inside the tent, making the floor mat thicker.

‘’Now, if we would be in Winter in this forest, without a tent, fir trees will again be your friend, Son. In Winter, snow will accumulate around the base of fir trees but will form a sort of donut around it, with an empty space around its trunk. If you choose a big fir tree as shelter, that empty space around the trunk will be big enough to allow one or two persons to rest in prone positions in that space. You can also cut low branches from other fir trees around to cover the ground of that empty space. You then finish the job by building a small snow wall to stop the wind from directly entering your shelter, with more cut branches to help further isolate it.’’

‘’Those branches smell good, Father.’’ Said Michel, sniffing inside the tent. ‘’Can they be used for other things as well?’’

‘’Yes! The resin from fir trees can be used as a sort of glue or to help caulk a hole in a boat. You can also boil fir needles as well as pine needles to make a hot drink. Well, now that our tent is up and ready, let’s take care of our future campfire.’’

Using again his hatchet, Viktor beat up a particular spot in the opening, a couple of meters from the tent, in order to cut the tangle of roots under the surface. Once that patch of ground was softened enough, he ripped and threw away the mixture of top soil and roots, forming a shallow cavity in the ground with a diameter of about fifty centimeters and a depth of maybe fifteen centimeters. His next move was to enlist the help of both Michel and Denise to go pick up medium-sized stones along the shoreline, with which they ringed the hole dug in the clearing, in order to make a stone firewall around the fire pit. At the end, Viktor contemplated his work, smiling.

‘’Well, I will now see if I can catch something for our supper, while you two gather dead wood for our campfire.’’

‘’Is there a lot of fish in this lake, Father?’’

‘’Oh yes, my dear Michel! Let’s just hope that I haven’t lost my touch at fishing during those six years on Mars. If I did, then we will be down to canned food.’’

Viktor was back at the tent a mere forty minutes later, a grin on his face and two big trout hooked to a stick.

‘’Well, it’s official now: I haven’t lost my touch as a fisherman. It’s going to be grilled trout for supper. I see that you have already started our campfire, honey. Well done!’’

‘’Gee, Viktor, I may be from California but I still know how to light a fire.’’

‘’Could I go fishing with you tomorrow, Father?’’ asked little Michel while looking with big eyes at the two trout. Viktor gave him a proud smile in return.

‘’Son, I will be happy to teach you how to fish. Furthermore, I intend to show you how to hunt as well before we have to leave for our next vacation location. I will make a good Siberian out of you, my Son.’’

16:55 (Irkutsk Time)
Thursday, July 14, 2050
The ‘Lake Baikal Lodge’, village of Listvyanka
Southwest shores of Lake Baikal, Irkutsk Oblast
Siberia, Russian Federation

Denise was tired but happy as she, Viktor and little Michel marched in the local lodge, their backpacks still on their backs. The three weeks of living in the woods along the shores of Lake Baikal had been a bit rough at times but having contact again with nature at its purest had been a delight after six years spent in space and on Mars. Furthermore, those three weeks had been a perfect occasion to show to her son what Earth’s nature was all about, while Viktor had reveled in diving back into a part of his past life that he had loved and cherished, while he had also enjoyed greatly teaching his nature survival skills to Michel.

The Lake Baikal Lodge, being by far the largest touristic establishment in the village of Listvyanka, on the shores of Lake Baikal, combined the functions of an inn with those of a general store, a bar-lounge and a restaurant. As such, it was pretty much the center of the social life in Listvyanka and the little family found a good thirty people in the bar-lounge of the lodge, most of them adult men, with a sprinkling of women and teenagers mixed in. Viktor went first to the reception desk of the lodge, to rent a room for the night before leaving for Irkutsk and its regional airport the next day. The room they got was the quintessential picture of what you would qualify as 'rustic' but, after three weeks spent in the woods and on the trail, it was more than adequate for their needs. Most importantly, it had a bathroom where the three of them were able to shower before changing into fresh clothes. Once that was done, the family went down to the ground floor and walked into the general store, where Viktor called up to the manager in a friendly tone.

''Hey, Sergei, we're back!''

The store manager, a medium-built man with clear Mongol blood in his veins, smiled back to Viktor.

''So, how did your three weeks in the Taiga go? Did you catch anything?''

''We sure did, Sergei. Apart from catching dozens of fish, we were also able to catch quite a few hares, ducks and even one fox. Your two rifles you rented to us worked just fine, by the way. Here they are, cleaned and oiled, along with our remaining ammunition.''

Sergei quickly inspected the semi-automatic shotgun and the .22 caliber rifle Viktor put on the counter of the store, along with three partially used boxes of 12 gauge shells and one box of .22 caliber rounds. Finding the two guns well cleaned and oiled, Sergei put them back in the rack of weapons he rented to passing tourists and visitors, then stored away the ammunition before filling a bill for their use, presenting it to Viktor.

''It will be a total of 382 rubles for the guns rental and for the used ammunition, Viktor. By the way, you said that you caught a fox. Did you save its fur?''

''Of course I did! My little Michel was very proud of his catch.''

Sergei smiled down at Michel, standing on the other side of the counter with his father and mother.

''He shot a fox? Bravo! So, would he be ready to sell its fur to me?''

''Uh, I don't know! What do you think, Michel?''

‘’I want to keep it as a souvenir, Father.’’ answered the boy without hesitation, making Sergei nod his head in approval.

‘’Exactly the answer I would have given at his age. I tell you what, boy: you can keep your fox fur, while I will give you another souvenir for you of your time in Siberia.’’

Watched by Viktor, Denise and an expectant Michel, Sergei went to a wall display behind the counter that supported a number of fur products. He then unhooked a small red fur hat with a tail hanging from its back, à la Davy Crocket, and presented it with a grin to Michel.

‘’Here is a nice red squirrel hat that you will be able to wear to show to others that you’re a true Siberian boy.’’

‘’Oh, thank you so much, mister!’’ said happily Michel while taking the hat presented to him. As Michel went to a nearby full length wall mirror to admire himself with the hat on his head, Sergei smiled to Viktor and Denise.

‘’Since squirrel skins are quite small, I use them mostly to make kids hats out of them: they are actually very popular with youngsters.’’

‘’That was very kind of you, mister.’’ said Denise, happy for her son. ‘’Are you sure that you don’t want us to pay for it?’’

Sergei shook his head vigorously in response.

‘’No need to! First, Viktor is an old friend of mine and I am most happy to be able to make his son happy. Second, business has been very good during the last few years, what with all the people wishing to escape for a while the climatic conditions and disasters plaguing their respective parts of the World. Siberia, from a land synonymous with ‘forced exile and labor’, is in the process of turning into a sought-after natural spa area, and rightly so. More and more rich people are having retirement houses and lodges built around the region, with many choosing the shores of Lake Baikal as spots to build their new homes. The problem now is to ensure that all those newcomers don’t end up polluting and ruining the lake and nature around it.’’

‘’A problem too often encountered these days, my friend.’’ said Viktor, thoughtful. He then shook hands with Sergei, imitated by Denise.

‘’It was nice to see you again after all these years, my friend. I wish you continued prosperity and a long life.’’

‘’Thank you, Viktor! Do you intend to return from Mars one day and establish yourself around here?’’

Viktor had to think over his answer for long seconds as Denise watched on.

‘’As much as I would love that, I intend to make Mars my permanent home and that of Michel. I will however be most happy to come back for more family vacation time in the years to come.’’

‘’Living on Mars… That is going to be a pioneering experience indeed.’’

‘’Indeed! Talking of pioneering experience, I have a little something for you, Sergei.’’

Watched by his now curious friend, Viktor took a small transparent bottle containing pink grains out of a cargo pocket of his hunting vest and gave it to Sergei.

‘’This bottle contains Martian sea salt, extracted from the underground lake situated under Mars Base One. We actually use some of that Martian sea salt to spice up our food, as it proved to be safe for human consumption. That salt has actually turned to be Mars’ first export item and is said to be very popular on Earth, both to season food and for therapeutic baths for people suffering from arthritis or from skin diseases.’’

‘’I know: it sells for a fortune actually, due to its rarity. This is great! Thank you, my friend! When are you leaving for Irkutsk?’’

‘’Early in the morning, by train. We will take a plane in the next evening to go to Japan, our next vacation spot.’’

‘’Well, I wish you a good vacation in Japan, you and your little family. Have a good evening!’’

‘’You too, Sergei!’’

They then parted after a last round of handshakes, with the family walking out of the general store to go to the bar-lounge/restaurant of the lodge.

On entering the bar-lounge/restaurant, a large-sized room built of wood logs, the family saw two dozen people in it, most of them having drinks at the bar or at tables near the bar counter. Since it was still a bit early for supper, Viktor led Denise and Michel towards the bar counter. A grizzled man sitting on one of the high stools of the bar saw them approach and immediately jumped off his stool to nearly run towards Viktor.

‘’VIKTOR, YOU OLD RASCAL! YOU’RE STILL ALIVE? WHERE HAVE YOU BEEN?’’

‘’On Mars!’’ replied Viktor before exchanging a manly hug with the newcomer. He then smiled at the surprised Denise. ‘’Denise, this is an old friend of mine, Piotr. We

spent many years together in the Taiga as young men growing up. We however lost track of each other decades ago, when I moved to Moscow to study nuclear physics.''
Denise nodded her head at that, then offered her hand to Piotr.

''Hi! I am Denise, Viktor's wife, and this is our son, Michel. Pleased to meet you, Piotr.''

''Pleased to meet you as well, Denise. Did you say Mars? That's a joke, right?''

''I was serious, Piotr.'' replied Viktor. ''Me and Denise have been working on Mars for nearly six years now, while my son Michel was born on Mars. You should have heard about us. Where have you been in the last few years?''

''Prospecting for gold and living in the Taiga mostly. Some would call me a hermit, since I disappear into the Taiga for months at a time in order to search for gold. But enough about me: you have to tell me about you and your family, Viktor. Let's go sit at the bar: I am paying.''

''Are you sure that you don't want me to pay? You must not have found much gold, if you are still forced to live like a hermit.''
Piotr lowered his voice to a near whisper then, speaking close to Viktor's right ear.

''Keep this to yourself, but I found a very nice little stream with lots of gold nuggets in it.''
Viktor nodded his head at once, his expression most serious: gold prospecting in Siberia, or anywhere else for that matter, was a cutthroat business where fair play didn't count for much. Finding a good gold deposit often attracted quickly some unsavory characters to the prospectors who bragged too much about it.

''You can count on my silence, Piotr…but only if you let me pay the second round of drinks.''

''Deal!''

They had time to sit down at the bar and order their first drinks, with Michel getting a non-alcoholic wine cooler, when the television set fixed on the back wall of the bar started showing the six o'clock news on RussVision. Having been mostly cut off from the outside world for three weeks, Viktor and Denise listened to it while chatting with Piotr. Their level of attention suddenly went up sharply when pictures of hard urban fighting started showing, while the newscaster spoke in a grave voice.

''In Saudi Arabia, the forces of General al Fahd are now in full control of Riyadh and Medina. The Saudi royal family, which had been living mostly abroad in the last few

years because of the volatile popular climate in Saudi Arabia, has now fled the country or has exiled itself for good in the various countries of Europe and Asia where they are said to have stashed tens of billions of dollars in secret bank accounts. General al Fahd has vowed to use all the means available to recuperate and repatriate those billions to Saudi Arabia, which he claims were stolen by the Saudi royals while the Saudi people was left to suffer in a country devastated by both nearly unbearable heat waves and by a national economy severely crippled by the drying out of Saudi oil fields. However, the remaining supporters of the royal family, mostly followers of the main Wahhabite religious preachers who had relied on the support of the royals to keep their influence on the population, are still resisting the forces of General al Fahd in a number of cities and towns. The United Nations Security Council…''

Pyotr mostly resumed out loud the thoughts of Viktor and Denise as the reporter went on.

''Always the same scenario: first, the big people get big by exploiting the small people and by stealing the riches of the country. Then, when things sour up, they flee with their stolen money and leave the small people to deal with the mess they created.''

''That's certainly a scenario I have read before in history, many times.'' added Denise, somber as she watched the scenes of urban fighting. ''The worst part is that, most of the time, those big people end up living the rest of their lives in luxury, hiding behind corrupt local officials and guarded by armies of bodyguards.''

''And what kind of political system do you have on Mars, if I may ask?''

Viktor took on him to answer Pyotr on that.

''Simple: we don't have any political system on Mars. The Mars colony is and will stay a special territory under the control of the United Nations, until it is declared self-sufficient. Until then, the various countries which participate in the Mars Project finance it and make sure that, on top of supervising the planned development of the colony, the needed equipment and supplies are sent to Mars in a timely fashion. They also guarantee that no one country or group of countries will be able to claim parts of Mars for themselves. The one special political provision concerning the Mars Project is about the children born on Mars or in Mars orbit, like in the case of our son Michel, who was born in Mars Base One: they became at birth certified citizens of Mars, with distinct passports and with their rights as such guaranteed by the United Nations. Me and Denise, having elected to live permanently on Mars, have requested our own Martian passports, which should be ready for us before we leave back for Mars.''

‘’Martian citizens… Wow!’’ said Pyotr before raising his glass high and raising his voice as well. ‘’TO MARS!’’

‘’TO MARS!’’

10:11 (California Time)
Tuesday, August 16, 2050
Space passenger terminal, Vandenberg Space Center
California, U.S.A.

The few reporters, press photographers and cameramen present in the space passenger terminal at Vandenberg to cover the latest departure for Mars smiled on seeing little Michel Ponichnikov, walking with his parents towards the last access control post: while he was wearing a custom-fitted spacesuit, like Viktor and Denise, he also wore proudly his red squirrel fur hat on his head, inside his opened helmet. Close behind the Ponichnikovs came the Batrangs, also wearing their spacesuits, with five year-old May holding hands with her parents. Two more families returning to Mars followed: Thor Valsung and Nadia Gorushkova, holding the hands of their five year-old daughter Ingrid; and Tim Garland and Jodi White, with Tim carrying four year-old Jason. Completing the group of passengers headed for space where sixteen new astronauts, all mining or metallurgical experts and technicians, accompanied by the young wives of three of the technicians.

Once past the last access control point, the 31 astronauts and dependants took place in a large, specially designed bus with seats large enough to accommodate persons wearing spacesuits, with the bus then rolling out of the garage of the terminal. As the bus drove towards a waiting orbital shuttle, Denise Wattling gently patted the gloved hand of one of the wives of the mining technicians, who was sitting across the aisle from her. The young woman was clearly nervous, close to fearful.

‘’Don’t worry, Misses Sotomayor: space travel is now quite safe, compared to forty years ago. May I ask in what capacity you will work on Mars?’’

‘’I am going to fill a new position as executive secretary for the colony’s resources manager. With the opening of our first mines and metal smelters and foundries on Mars, managing the colony’s growth will become increasingly complex. Anticipating the future needs of the colony and organizing their delivery will also mean a

growing administrative load. While my husband worked in a mining complex in Amazonia, I was in charge of the day to day ordering and delivery of supplies for the complex. I suppose that the job on Mars will be quite different, however.''

''Indeed! If anything, anticipating the needs in advance will be even more critical than in your mining complex in Brazil: filling orders and shipping them from Earth takes months, literally.''

Angela Sotomayor then glanced at little Michel, who was chatting enthusiastically with May Batrang-Sukarno, exchanging vacation stories with her.

''Was raising your boy more difficult than usual because of the environment of Mars?''

''Well, I would lie if I said that Michel didn't suffer from time to time from severe cases of 'cabin fever'. However, the building of a pressurized dome inside the cavern containing Mars Base One did a lot to alleviate that problem. Also, when he became really restless, I then took him out on a walk outside of the cavern, or on an ATV ride around Melas Chasma, something that he really likes. Our poultry, rabbit and dairy cow farms and our fish ponds do a lot as well to distract our children at Mars Base One. Did they tell you if you are going to work at Mars Base One or at our new mining base at the foot of Olympus Mons?''

''At first, I will be going down to the Olympus Mons magnetite mine with my husband. Then, whenever I get pregnant and give birth to a child, I will be moved to Mars Base One, where I will continue my work online.''

''Sounds like a plan! I sincerely hope that you will enjoy your job on Mars: the planet may be arid and next to lifeless, but the vistas are simply grandiose.''

Angela nodded at those words, hiding her remaining anxiety: she was still not sure if she had made the right decision by accepting to follow Paulo to Mars. The noises of the shuttle's systems powering up to prepare for takeoff then made her forget temporarily about her worries. Those noises changed six minutes later to a titanic roar, accompanied by a strong acceleration that pushed Angela hard in her padded seat as the shuttle took up speed along the runway, finally taking off after a 2,100 meter run and climbing towards space and the waiting H.S.S. FRIENDSHIP.

CHAPTER 14 – OLYMPUS MONS

14:43 (GMT)
Tuesday, May 28, 2057
Control cabin of 'Mole 04' tunnel digging machine
20,170 meters under the slopes of Olympus Mons
18.7°N, 133.8°W, near Mars' equator

Paulo Sotomayor, sitting in the driver's seat of Mole 04, smiled to his coworker, Sarah Weiss, who was monitoring the exact position and orientation of their tunnel digging machine, and nearly shouted over the din and vibrations produced by the teeth of their machine's contra-rotating excavator heads.

''NOT EXACTLY A QUIET JOB, ISN'T IT?''

''DAMN RIGHT! YOU WOULDN'T NEED A VIBRATOR HERE TO GET AROUSED. IT IS NOT FOR NOTHING THAT THEY CALL THIS 'THE DICK' OR 'THE VIBRATOR'.''

''SO, IF I AM AT THE COMMANDS OF THAT DICK, DOES THAT MAKE ME A DICKHEAD?''

Paulo briefly laughed with Sarah at his own joke, then reviewed again the readings on his instruments panel to make sure that everything was functioning properly. The nickname of 'Dick' given to his tunnel digging machine was quite appropriate when considering the general shape of the Mole: it had a massive, conical rotating drilling head with a maximum diameter of twelve meters at the front, followed by a twenty meter-long cylindrical body. That cylinder, with a diameter of ten meters, incorporated a total of ten separate steel tracks mounted on variable height suspensions which made the machine forcibly advance in a chosen direction while the machine's excavating head dug through solid rock. The rock and ground debris cut by the excavating head was then further crushed and ground by a series of small but powerful grinding screw rollers positioned around a ring situated just behind the excavating head. As the machine dug its way and advanced slowly along the newly dug tunnel, the crushed and ground rock was evacuated towards the rear of the machine, where other machines, a mix of mechanical shovels and dump trucks, scooped up the debris and carried them out of the

tunnel, to be sorted out and to have the various ores in it, if any, processed. Such a digging machine of course demanded a lot of power but Mole 04 had plenty of it, since it incorporated not one, but two compact nuclear power plants. Such digging machines, built by the Caterpillar Corporation, had been in use on Earth for decades already and were both efficient and reliable. With Mole 04 necessitating a crew of only two persons, and with the dump trucks being robotic vehicles with no human crews, the whole process required very few human workers, while producing an impressive daily volume of crushed ore. Since the tunnel being dug was not pressurized, being linked to an open entrance at the foot of the southern cliffs of Olympus Mons, Paulo, Sarah and the operators of the mechanical shovels wore spacesuits, with their visors opened while they worked from inside the small pressurized driving compartments of their machines.

Sarah Weiss, a 32 year old mining technician with a degree in geology, watched carefully her attitude and position displays as Mole 04 worked to dig a tunnel destined to link Mars Mining Base 01, or MMB-01 in short, a magnetite iron ore mine under the southern outer slopes of Olympus Mons, with the recently established Mars Mining Base 02, an iron, chromium and titanium ore mine under the northeastern slopes of the extinct volcano. Once completed, that tunnel was going to provide a quick way to travel between the two mining complexes, which were 612 kilometers away from each other in a straight line, via an underground suspended monorail system, thus saving a lot of time and resources for the mining crews. Three more tunnel digging machines were also at work under the slopes of Olympus Mons, engaged in ore extraction rather than simple tunnel digging. Their machine being technically blind in its forward aspect, which was another reason for calling it a ‘Mole’, Sarah had to rely on a series of gyroscopes, ground penetrating radars and laser alignment beams to check where their machine was at any time. Right now, their Mole was about halfway between the two mining bases, at a depth of 20.2 kilometers under the surface of the volcano slopes and nearly under its summit, heading in a northeasterly direction at the blazing speed of fifty meters per hour. The close to 320 kilometer-long tunnel they had dug during the past year or so had in turn revealed a number of very promising ore deposits, as the tunnel they were digging went through those mineral veins. If anything, Olympus Mons had quickly proved to be a rich nest of many types of very valuable metallic ores, helping to provide the fledging Mars colony with locally produced steel, titanium, chromium and copper, on top of the aluminum and magnesium extracted and smelted in the Melas Chasma. Sizeable

deposits of other ores had also been found but would have to wait for the reception of more mining, ore processing and metal smelting equipment on Mars before they could be exploited.

Paulo was about to pour himself a mug of hot coffee from the thermos bottle he had brought with him for his shift when the Mole's vibrations suddenly increased dramatically, while an alarm started ringing in their small control cabin.

''What the…?''

''WE HAVE REACHED AN EMPTY POCKET IN THE GROUND!'' shouted Sarah. ''STOP THE DRILLING HEADS, NOW!''

Grumbling about their bad luck, Paulo shut down at once their rotating head, along with the side grinding rollers and their propulsive tracks. Encountering underground cavities during the digging of tunnels or mines was not unprecedented, far from it. When that happened, the crew of the mole involved would have to stop at once, assess the situation and measure the dimensions of the cavity before deciding whether to continue straight on or to backtrack a bit and dig around it. Either way, this was going to cost them precious hours in tunnel digging work. With the drilling heads and rollers grinding to a stop, Paulo was then able to speak to Sarah without needing to raise his voice.

''Our sidescan penetrating radars still show solid rock on our flanks and over and under us. Only the tip of our drilling nose appears to be in the open. I am going to extend our nose sensor mount to assess that cavity.''

Flipping a few switches, Paulo made the forward-most drilling crown open up like the petals of a flower, exposing a small steel hatch that then opened up as well. Next, a small, twenty centimeter sensor ball mounted on a telescopic, articulated arm, came out of the well covered by the hatch and started 'looking' around it, controlled by Paulo. That sensor ball incorporated a small microwave radar, a laser rangefinder, a day/night camera, a forward-looking infrared camera, a thermometer and an atmosphere analysis probe, all sending data and images back to Paulo's and Sarah's work stations. While the day/night camera and FLIR camera showed only darkness, the picture painted by the radar and laser rangefinder was another thing entirely.

''HOLY SHIT! WE EMERGED ON ONE SIDE OF A CAVERN WITH A MAXIMUM DIAMETER OF 5.7 KILOMETERS!''

Sarah, also awed by that measurement, then made their sensor ball scan up, then down, to have a complete picture of the cavern they had encountered. The data she got made her eyes open wide.

‘’Paulo, this cavern goes down to 2.8 kilometers below us, while it rises to 10.3 kilometers above us. Furthermore, the radar echoes from the bottom are not consistent with solid rock, but rather with ice or water.’’

Paulo’s mind nearly flipped on hearing that: this was by far the biggest underground cavern they had found to date on Mars, and this in a place rich with metallic ores. The possibilities that this cavern could offer to the Mars colony were truly mind-boggling.

‘’My God! We could build a whole city here and even pressurize this cavern to facilitate living. If there is truly water or ice at the bottom, then we will have everything we would need for such a city. Sarah, contact at once the mine’s control center and send them the data from our sensors ball. This is big!’’

‘’I’m on it!’’ replied the Israeli woman while punching keys on her command panel.

At the control center of Mars Mining Base 01, Yves Dorval, the manager of the mining complex, was floored when he received the message and sensors data from Mole 04 and saw the possible implications once he made a quick mental calculation.

‘’But, this represents a volume of about 105 cubic kilometers! And if there is truly water at the bottom…’’

Yves then sent back a message in return.

‘’Mole 04, from MMB-01 Control: Dig a few meters further to open up the breach giving on that cavern, then backtrack by 600 meters and veer true northeast to resume tunnel digging towards MMB-02. Make sure to put warning markers and beacons before the breach on the cavern and keep a minimum of 200 meters between your new tunnel towards MMB-02 and the sides of that cavern.’’

‘’Mole 04 understood!’’

With that taken care of, Yves then called his old friend Jason Terlecki at Mars Base One, to pass to him this sensational piece of news. The Polish mining and infrastructure engineer was now the head of the colony’s infrastructure department, with 23 engineers and scientists working under him to plan, design and organize the building of facilities and infrastructures on Mars. Yves could already salivate at the thought of what his friend could do with close to a hundred cubic kilometers of space which could possibly

be pressurized with a breathable atmosphere, like what they had done on a much smaller scale with the cavern sheltering Mars Base One.

17:06 (GMT)
Friday, May 31, 2057
Ledge of hole dug through the southern wall of newfound cavern
20,170 meters under the summit of Olympus Mons

Since its discovery a mere three days ago, many things had been done already about the giant cavern found under the summit of Olympus Mons. Powerful floodlights had been brought from MMB-01 and had been positioned on the ledge of the hole dug by Mole 04, so that the interior of the cavern could be better inspected visually. Then, a flying drone had been sent down to the bottom, some 2,800 meters below the level of the tunnel, to confirm the nature of the bottom's surface. The results of the analysis of the bottom samples had quickly shown that a layer of thick salt water ice covered the bottom, forming an icy lake with a surface of about thirteen square kilometers. Furthermore, that layer of ice covered a liquid salt water body that filled the old main lava vertical tube of Olympus Mons past a depth of seventeen kilometers, where a bend in the lava tube prevented the sonar probe used by the astronauts to look further down. Radar and lidar soundings had also confirmed that the cavern's ceiling was hermetically sealed by old lava, with the tunnel dug by Mole 04 the only opening that connected with the outside. Standing on the ledge of the opening in their spacesuits and with safety lines attached to their belts, Yves Dorval, Jason Terlecki, Frey Thorvalsson and Denise Wattling were visually scanning with growing emotion what they could see of the inside of the cavern with the help of the floodlights. Frey Thorvalsson was the colony's head volcanologist, while Denise, now 53 years old, was the official head of the Mars colony, having been named two years ago to that post by the Mars Home Project executive board on Earth, and this after being commander of Mars Base One for ten years.

''What an incredible find!'' said Denise, her eyes glinting. ''This could be turned into an ideal Human habitat for us.''

''It WILL be turned into a Human habitat if I have anything to say about it, Denise.'' replied Jason Terlecki, who then looked at Frey Thorvalsson. ''The only thing that I need to know is: what are the chances that Olympus Mons could awake again and

fill this cavity with hot magma. If that ever happened in the future, we would then lose everybody and everything based here. What do you think, Frey?''

''That chances of having Olympus Mons become active again are about zero.'' answered at once the big Icelander. ''All our studies and prospecting data show us that all surface volcanic activity on Mars ended millions of years ago, with the most recent signs of such activity having happened two million years ago in the Arctic region. The youngest lava flows from Olympus Mons that we found dated back from about twenty million years ago. Tectonic activity on Mars is also very low and is limited to a few regions only.''

''Then, we shall build a great city here in the next few decades.'' said Jason, his mind already boiling with ideas. ''With a number of important mines and metal smelting complexes close to it under Olympus Mons, it should become a major industrial and residential center for our colony.''

Those words suddenly made Denise think about something and she looked at Frey to ask him a question.

''Frey, what are the chances that we could find similar giant cavities under the summits of other extinct Martian volcanoes?''

''After seeing this one, I would be surprised not to find more such cavities, Denise. The three volcanoes of the nearby Tharsis Montes in particular would in my mind make good candidates to find similar cavities. Once we will have thoroughly mapped this cavern and its various lava tubes, I will put a geological team on doing a detailed survey of the underground of those three volcanoes and of their surrounding plateaus.''

''Well,'' said Yves Dorval, now looking a bit worried, ''let's hope that we will be allowed to build up and transform this cave and others we may find.''

That attracted at once a sharp look from Denise.

''And what makes you think that we may not be allowed to do so, Yves?''

''What makes me think that is the ever worsening situation on Earth, Denise. Yes, up to now the project's executive board has supported fully our needs and requests by procuring and sending us all that we requested to continue building this fledgling colony, but how long will they continue to do so? The cost of fighting against rising sea levels, floods and droughts keeps rising constantly, while more and more territories are rendered unlivable due to floods or intense droughts and extreme temperatures. Shoring up anti-flood defenses and relocating and supporting the refugees created by

this climate change crisis costs a fortune and uses huge amounts of resources and manpower. The Mars Home Project has to compete with those Earth demands. How long before public pressure forces governments to redirect the funds used by the Mars Home Project towards Earth rehabilitation or resettlement projects?''

His question was met at first by collective silence as his friends thought their answer over. Jason Terlecki was the one to speak first.

''Well, I can only work with what I have and do the best possible job with it. We now produce on Mars a limited but growing list of primary construction material, like steel girders, plates and pipes, aluminum structural components, ceramic parts and glass. I will try my best to design what we need to transform this cavern into a livable place in a way that will use to the maximum what we can already produce on Mars. Hopefully, Earth will continue to fully support our colony long enough to let us develop more our local industries and resources. Each extra year of support provided to us will be crucial for the long-term success of this colony.''

''You are quite correct on that, Jason.'' replied Denise, thoughtful. ''I will thus move up to the top of our priority list of requests to Earth our machine tool plant, to have its parts and machinery delivered as quickly as possible. Once we will have that machine tool plant up and operating, we will then be able to produce ourselves a much larger variety of components and metal parts for our various building and expansion projects. Ten years… Just give us at least ten more years…''

CHAPTER 15 – A NEW HOPE FOR HUMANITY

11:19 (Boston Time)
Tuesday, October 18, 2061
C.E.R.N.[9] research complex
Near Zurich, Switzerland

The Italian physicist sitting at one of the control stations of the Experimental Fusion Device, or EFD in short, hesitated for a fraction of a second before pushing a large red button on his console. A muffled but still powerful rumble then started at once, while his instruments became alive, with most indicators jumping to near their maximum indicated levels. The physicist, along with seventeen other scientists present in the control room, held his breath for a moment while hoping that the fusion reaction he had just triggered would be a sustained one. A wave of savage joy submerged him when he saw that it was.

''We have a sustained reaction! I also read a positive power balance. WE HAVE ACHIEVED A STABLE THERMONUCLEAR REACTION!''

Loud cheers erupted from the small crowd of scientists at that announcement. One physicist then grinned to the head of the project, a graying Frenchman.

''This is a banner day for Humanity, Doctor Charcot. We should put out a press communiqué at once!''

''No!'' was the immediate response. ''Let's not create false hopes before we could confirm the results of this test. I want us to monitor this initial reaction for a few hours, to see how truly stable it is. Then, we will shut down the reaction and attempt a restart. If that restart proves successful and is also stable, then we will spread the word. Our work today is thus far from finished, ladies and gentlemen.''

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[9] C.E.R.N. : Centre Européen de Recherche Nucléaire. European Nuclear Research Center in French.

08:27 (Washington Time)
Thursday, October 20, 2061
Oval Office, The White House
Washington, D.C., USA

President Thomas Warren gave a questioning look to his science advisor when he saw the triumphant expression on his face as he entered the Oval Office.

‘’I gather from your expression that you have a piece of good news for me…for a change, Joshua.’’

‘’Damn right, Mister President!’’ replied Joshua Steinberg. ‘’The Europeans just announced that they have achieved success with their experimental fusion reactor. They were able to restart the process a number of times and the reaction proved to be both stable and on the positive side in the power balance. Humanity now has a new, non-polluting power source with a quasi unlimited source of fuel, namely water.’’

Warren sat up in his chair, while a smile appeared on his face.

‘’But that’s great news! That should mean that we will finally be able to retire all the still existing fossil fuel power plants on the planet.’’

‘’Uh, not that fast, Mister President. The C.E.R.N.’s reactor is only an experimental model. The whole process still needs to be thoroughly tested and studied before plans for thermonuclear power plants could even be drawn. That alone will take at least a couple of years.’’

Those last words made the smile on Warren’s face partly fade away.

‘’And…when could we hope to start building such power stations, Joshua?’’

‘’Give it three to four years, Mister President. However, once we start putting in operation thermonuclear power plants, we will then have available to us and the rest of the World a nearly limitless source of power. With that amount of power, many things will become possible, like seawater desalinization plants to provide potable water to countries struck with persistent droughts and carbon reduction plants that will eliminate much of the excess CO2 in our atmosphere, thus reducing and eventually reversing the greenhouse effect that is causing so much of our environmental woes.’’

‘’Damn! I can’t wait to see that! Alright, let’s schedule a full cabinet meeting for next Thursday morning, at which we will discuss how to use that new development. In the meantime, I want you to prepare a presentation on the subject of thermonuclear

fusion energy and its implications, along with a list of recommendations on how to use it.''

''I will get on that right away, Mister President.'' promised the scientist.

11:03 (California Time)
Monday, December 19, 2061
Office of Mars Home Project Manager
Vandenberg Space Center

Robert Lithgow, now 74 years old, was still working from behind the same desk that he had been occupying for 25 years at the Vandenberg Space Center. And by the same desk, he meant that, literally. When the furniture at the Mars Home Project Headquarters had been replaced wholesale by new furniture sixteen years ago, Robert had clung to his old desk, refusing to let it be carted away. That desk represented to him the work of a lifetime and he had vowed to keep it until the project was declared completed…or until he died, even joking that he would prefer to die while sitting behind his desk. Those who worked around him knew that he was only half joking when he had said that, as Robert's dedication to the Mars Home Project was by now legendary. Robert's wife of 45 years had even quipped, with a trace of bitterness in her voice, that she had married a project rather than a husband. Robert was thus struck hard by the content of the email he had just received from Li Xiao Peng, the head of the Chinese Space Agency. In it, Peng announced that, due to the Chinese Central Committee's reallocation of funds towards the planned building of multiple future thermonuclear power stations around China, his country would drastically cut in the next fiscal year the funds previously allocated by China to the Mars Home Project. That meant for Robert the loss of over six billion dollars to the project's next year's budget.

With discouragement washing over him, Robert sat back in his chair, his mind in turmoil, as he tried to think of a way to go around that new problem. If China was ready to divert funds from the Mars Project, then other countries may just do the same, in which case his cherished project may just suffer a fatal blow. The worst part was that he could not blame the Chinese for the decision they had just taken. The benefits that cheap, plentiful and non-polluting energy from thermonuclear fusion would bring to China were huge, including opening the possibility to be able to power giant air

scrubbing filtration plants that would start to clean the heavily polluted air over major Chinese cities and industrial centers. If that could help to eventually stop and reverse the steady rise in global temperatures, then it would prove to be money very well spent. Finally resigning himself to have to manage as best he could the Mars Home Project on a shoestring budget, Robert opened on his computer the project's budget file and started looking for items and expenses that he could either cut or delay without causing a major impact on the project. That, however, soon proved to be easier said than done.

17:28 (California Time)
Friday, December 23, 2061
Main lobby of Mars Home Project Headquarters
Vandenberg Space Center

Robert harbored a gloomy expression as he was about to walk out of the large steel and glass building housing the Mars Home Project Headquarters. He should have been more cheerful on this Christmas weekend, but the future of his project still hung in the balance, with more announcements of state funds being cut from the project having arrived at his desk in the last couple of days. He stopped for a moment near the revolving glass doors of the main entrance and mentally kicked himself: Christmas was only two days away and his wife, children and grandchildren deserved better than to try celebrating Christmas with a bitter, depressed man. Taking a deep breath, Robert then did his best to chase away his worries and to regain at least some of the spirit of the holidays. He was about to walk through one set of revolving door when his cell phone rang inside his vest pocket. Taking the time first to pass the doors, he then grabbed his phone and looked who was calling him. He frowned when he saw that it came from the Space-X Corporation, one of the major suppliers of space components for his project. Praying that this was not about some complaint about future contracts cancellations, Robert opened the line and spoke in his phone while walking towards the nearby parking lot where his personal car was.

''Yes? Lithgow speaking!''

''Mister Lithgow, this is Richard Vance, owner and CEO of Space-X. Me and other corporate owners have heard about the cuts your project has suffered recently and discussed about them. To make a long story short, Space-X, along with Virgin Galactic,

Microsoft, Apple and Tesla Corporation, is ready to help fund the Mars Project, to the tune of eleven billion dollars…for starters.''

''Eleven billion dollars?!'' exclaimed Robert, not able to believe his ears. ''You are serious!''

''Very serious, Mister Lithgow. Many people may feel that your project is no longer necessary due to the recent developments in thermonuclear fusion and its promises of abundant energy, but we still believe that the future of Humanity is in space.''

''Mister Vance, I just don't know how to thank you and your partners. When could we meet to discuss this in detail?''

''In January, after the long holiday. I understand that you had quite a few rough days lately. Go home, have a nice Christmas and New Year: you need it. Money talk can wait for a couple of weeks. I will call you back in early January to set up a group meeting with you. In the meantime, have a good time with your family, Mister Lithgow.''
The line was then cut, leaving Robert to stare silently at his cell phone, not believing his luck. He then shouted out loud in joy, surprising the few people around him.

CHAPTER 16 – RETURN TO MARS

16:10 (GMT)
Tuesday, February 10, 2071
Passenger airlock to planetary shuttle hangar
H.S.S. FRIENDSHIP, in low Mars orbit

The young female crewmember manning the passenger airlock of the planetary shuttle hangar, situated atop the forward centerline fuselage section of the H.S.S. FRIENDSHIP, smiled on seeing how a young couple was holding hands while waiting in line: they were obviously very much in love with each other. The young couple's turn to pass through the control station soon came, with the crewmember asking a question to the woman of the couple while smiling to her.

''May I have your name and final destination on Mars, miss?''

The woman, a beautiful Asian in her twenties with light brown skin and black hair, answered her in a melodious voice.

''I am May Batrang-Sukarno and I am heading to Elysium City, under the Olympus Mons.''

The crewmember found her name in her embarkation list and recorded it as 'left ship' on her computer screen.

''You may now board the shuttle, Miss Batrang-Sukarno.'' said the crewmember before looking at the young man next in line. The latter spoke before she could ask him.

''My name is Michel Ponichnikov and I am also heading down to Elysium City.''

''Thank you, sir. You may proceed.''

Michel Ponichnikov, now a 25 year-old young man, grabbed again the handles of the baggage cart supporting his luggage and those of May and pushed it through the opened airlock doors, walking the twenty meters of open hangar space leading to the foot of the embarkation ramp of the planetary shuttle. Going by the seat number written on their embarkation card, he first secured his baggage cart in one of the racks meant for them at the back of the passenger cabin, then went to take his seat next to May. Those seats were actually designed for persons wearing spacesuits, so they proved

quite comfortable to the couple. May, turning her head to look at Michel, gave him a loving smile and pressed her gloved right hand into his gloved left hand.

‘’We are about to be back home, with fresh diplomas in our pockets and a job waiting for us on Mars. Are you excited?’’

‘’Of course I am, May! What’s most important, though, is that we will be able to build our future together, on the planet of our birth.’’

‘’And when would you like for us to try to have kids, Michel?’’

‘’Well, let’s see first what the living conditions are truly like in Elysium City before deciding. The place is still being enlarged and the first official occupants of the city have only been living there for three years, when we were still studying on Earth.’’

‘’Hum, you’re right! Still, conditions in Elysium City should be much better than in old Mars Base One.’’

‘’We will see, May. We will see.’’

Fourteen minutes after boarding the shuttle, the access ramp was closed and the pilot announced via PA system the imminent departure of the shuttle from the hangar of the spaceship. Three minutes later, the shuttle floated out of its hangar and took a safe distance from the H.S.S. FRIENDSHIP before firing up its main engine to start losing orbital speed, in order to enter the Martian atmosphere. Both Michel and May had already experienced twice reentries into the much thicker Earth’s atmosphere, thus found reentry into Mars’ atmosphere quite mild by comparison as an experience. The couple was able to follow the progress of their flight on the flat display screens fixed to the back of the seats in front of them, with external view cameras providing the images. After decelerating to low subsonic speeds, the shuttle then deployed its giant landing parachute, a directional model, and started a long controlled glide towards Olympus Mons. As they were approaching the gigantic extinct volcano, the voice of the pilot came back on the PA system.

‘’Ladies and gentlemen, we are now approaching our destination, Olympus Mons. We will be landing at the new spaceport built at the summit of Olympus Mons, inside its summit caldera. Once on the ground, our shuttle will roll inside a pressurized hangar and you will then be able to disembark, following which you will take an express elevator down to Elysium city. Those heading to one of the mining complexes under Olympus Mons or to either Mars Base One or Tharsis City will be able to catch a monorail ride at the Elysium City Station. We should be landing in about nine minutes.’’

Michel exchanged an excited grin with May then.

‘’Yes! They finally opened the spaceport on top of Olympus Mons! That should save us a lot of traveling time compared to when we were landing beside Mars Mining Base 01, next to the southern cliffs. The monorail ride from the cliffs to the cavern containing Lake Styx took a good four hours. I’m really anxious to see what Elysium City looks like now.’’

‘’Me too!’’ said May. ‘’The last time I visited the place, some seven years ago, I saw only large excavations and a ring dug along the shores of Lake Styx, with steel beams supporting the ceiling but not much else in place. The only parts then completed were the hydroponic garden complexes and food production complexes, which had been given top priority. It seems that your mother and her work crews achieved a lot during the last few years.’’

Michel nodded slowly once at the mention of his mother, Denise Wattling, who was still the head administrator and manager of the human installations on Mars. Along with his father, Viktor Ponichnikov, and the other first pioneers on Mars, including May’s parents, his mother had dedicated to date over 26 years of her life to exploring and colonizing Mars. She was now 66 years old but still going strong and working as hard as ever. Michel’s solemn wish was that his mother and her companions would end up being honored in history the way they deserved.

A last roar from their landing rocket engines and a smooth bump announced their landing on top of Olympus Mons. However, Michel and May stayed in their seats, knowing that their pilot still needed to make his shuttle roll on the ground to get to the hangar complex dug into the flanks of the central caldera. The shuttle actually rolled a good three kilometers before entering a cavern entrance dug on a wall of the caldera. It then rolled for a further 200 meters along a wide, curved tunnel, before entering one of two large underground hangars at the end of the tunnel. Airtight steel doors then closed behind the shuttle, sealing the hangar and allowing technicians to pressurize it. Once emptied of its payload, refueled and serviced, the shuttle was going to be able to roll back out through another giant airtight door forward of the shuttle, door which gave access to an exit tunnel leading to the open caldera of the summit. With the pilot announcing that they could now disembark, Michel and May got up from their seats and recuperated their luggage cart, on which pretty much all that they possessed was piled up. Going down the rear ramp of the shuttle with the other passengers, the young

couple walked across the vast hangar and entered a large door on top of which a lit sign said ‘Arrival Hall’. Inside, they found a reception counter where arriving passengers had to go in order to register their arrival and get indications on where to go next. Michel and May, like the other passengers fresh out of the shuttle, couldn’t help giggle in amusement when they saw that the two persons manning the reception counter wore green costumes making them look like classic Martian aliens out of old comic books.

‘’Well, it’s nice to see that humor still exists on Mars.’’ said a smiling May.

‘’Yeah! My father was always a funny guy. That is one of the reasons why Mom liked him so much.’’

When their turn came at the reception counter, one of the disguised employees extended a six-fingered green hand, while speaking in a voice deformed by a microphone system.

‘’Passports, please!’’

May was first to give her passport to the ‘Martian’, who then looked at it before nodding its head.

‘’Aaah, a fellow Martian! Welcome back on Mars, Miss Batrang-Sukarno. What is your final destination?’’

‘’Elysium City! I have a job and apartment waiting for me there.’’

‘’Excellent! You will be able to take one of the passenger elevators going down to Elysium City level, where the city reception office will direct you to your apartment and will brief you on your settling in procedure. The elevators are to your left. Have a good stay in Elysium City, miss.’’

‘’Thank you, mister.’’

It was then the turn of Michel to face the ‘Martian’, who basically told him the same things as to May. The couple then proceeded together with their luggage cart towards the elevators, finding four large ones and six smaller ones, plus two huge cargo elevators. They took place in one of the large passenger elevators, along with the rest of the people who had arrived with them by shuttle. That elevator was actually able to easily accommodate all 78 people from the shuttle, along with their luggage carts, and had seats with safety belts lining its walls. A young female employee, one not disguised as an alien, greeted them inside the cabin elevator and invited everyone to sit down.

‘’Welcome to Mars, ladies and gentlemen. Please buckle up the safety belts of your seats and lock the wheels of your luggage carts before we start our descent. This

elevator will go down a full 23 kilometers to the level of Elysium City and Lake Styx, with the ride taking 27 minutes. If you feel sick during the descent, you can use one of the bags stored under your seats. For those who have sensitive stomachs, I counsel that you take and prepare a bag in advance. We will be departing in half a minute.''

A sizeable number of the passengers hurried to get a plastic bag on hearing that, opening the bag and keeping it in their hands, in front of them. As for Michel and May, they had experienced a lot rougher riding conditions and held on to their luggage cart. When the elevator started to go down, it was in a progressive way, with full speed attained only after some fifteen seconds of descent. As they went down, viewing screens around the large elevator cabin started displaying images, while a female voice was heard overhead, accompanying the images.

''Welcome, ladies and gentlemen. You are now on your way down to Elysium City, the newest and largest human facility on Mars. It was built along the walls of a giant underground cavern that had been the main lava chamber of Olympus Mons millions of years ago. That cavern has a maximum diameter of 5.7 kilometers at the level of Lake Styx and a height of 13.1 kilometers between the lake's surface and the cavern's ceiling. Elysium City forms a ring around the circumference of the cavern, with one side opened on the lake side and the ring dug some twenty meters above the level of the waters of Lake Styx. In turn, that ring connects with twelve large caverns dug at right angle from the periphery of the lake, caverns that now house a number of farm complexes and industrial areas. While the side of the ring along the lake's shore has large, transparent airtight walls that originally kept the city inside a pressurized, breathable atmosphere, the whole of the cavern has by now been hermetically sealed, then filled with air. Residents of Elysium City can stroll without protective suits along the shore, using a promenade set just above water level. However, airlocks are still in place, in the improbable event that some sudden seismic event occurs and splits open the cavern. Lake Styx is made of typical Martian brine and covers a surface of 23.2 square kilometers, while its depth reaches to the bottom of a huge aquifer system, some 17,400 meters down from the surface. Exploration of that aquifer system by drone submarines has shown that it interconnects with other aquifer systems under the surface of Mars, with those aquifers sheltering a variety of Martian aquatic life forms, including fish measuring up to forty centimeters in length. Since the whole cavern is now pressurized and kept at an average temperature of 22 degrees Celsius, the surface of Lake Styx is liquid and residents can navigate around it in small boats, using the

numerous floating wharves built along the shoreline. The ring dug around the lake's shores has a circumference of 18, 850 meters at the center of the main ring boulevard and a width of 280 meters, while the maximum ceiling height of the excavated ring is eighty meters. By now, all the planned facilities inside the ring housing Elysium City have been completed and work on a second ring, situated some 500 meters above the level of Elysium City, has started some ten months ago. That ring will contain more gardens and agricultural facilities, along with forested parks meant to enhance the quality of living in Olympus Mons. While city facilities have been completed, populating Elysium City is still an ongoing process, with the present population standing at 5,793 residents.''

''Wow!'' exclaimed softly May at the end of the presentation. ''They truly did a herculean job here in the last thirteen years. I especially love how they planted trees everywhere to make the place more agreeable to live in.''

''And those trees also help purify the atmosphere of the city and cavern, by absorbing the CO2 in it and transforming it into oxygen. We should enjoy life here.''

What Michel didn't say then was that, while some areas of Earth, like Siberia, were still paradisiacal compared to what they had just seen about Elysium City, too many other regions were now over-polluted, parched lands or inundated plains and were nearly inhabitable. There was still hope that the situation could eventually be reversed, with more and more thermonuclear fusion power plants opening up around the World and providing clean power to giant atmosphere scrubbers, but that was bound to take decades before a difference could be seen.

Their elevator cabin finally came to a stop, with a recorded voice sounding as the doors of the cabin opened, revealing a fairly large reception hall.

''You are now in Elysium City. Please proceed to the city's reception center, where you will be allotted an apartment and will get more information on the services available.''

Getting up from their seats and pushing their luggage cart along, May and Michel walked out of the elevator cabin and went towards a long service counter where sixteen men and women were waiting behind computer work stations. The couple ended up being first to pass at one of the stations, where a young Asian woman gave them a wide smile.

''Welcome to Elysium City, lady and gentleman. May I have your passports, please?''

Taking the two Mars passports presented by the couple, the woman then punched their names in her computer and looked for a moment at her screen before looking back at May and Michel.

‘’Do you wish to share an apartment or to have separate residences?’’

‘’We will share an apartment, miss.’’ answered May, making the city employee punch more commands on her computer. The woman soon gave them two magnetized plastic cards, along with two color pamphlets.

‘’Here are your residence access cards, which also serve as meal cards. You will be living in Apartment 220 of the Rosewood Tower, in the Southern Sector. There is a communal cafeteria on the ground floor of your building, where you will be able to go eat. If you wish so, you can also pick up prepared dishes at that same cafeteria, which also functions as a catering service, to bring it to your apartment and eat there. Your apartment comes fully furnished and equipped, so you won’t need to buy any essential furniture or appliances. These pamphlets will show you where your residential tower is. Robotic taxis are available at the exit from this hall. A group briefing will be given at City Hall tomorrow at ten o’clock, where you will get more information about your jobs and how to adapt to city life here. In the meantime, you are encouraged to wear your fat suits once out of your spacesuits, in order to preserve your stamina and bone structure. Do you have any questions at this time?’’

‘’Uh, yes!’’ said Michel. ‘’When do we get to start working at our new assignments?’’

‘’That information will be passed to you tomorrow morning, at the City Hall briefing, sir. Anything else?’’

‘’No! We will be fine. Thank you, miss!’’

Taking the cards and the pamphlets, the couple then walked to the clearly marked exit door of the hall, passing it and finding themselves in a large, long tunnel brightly illuminated by overhead lamps. Seeing a long line of waiting robotic taxis to their left, Michel pushed their luggage cart that way, followed by May. A robotic voice came out of the taxi’s dash when Michel stopped his cart beside the small electrical vehicle.

‘’Where would you wish to go, please?’’

‘’The Rosewood Tower, Southern Sector.’’ answered Michel while transferring their suitcases and bags from the cart to the taxi. Once his cart was empty, Michel quickly brought it to a nearby cart storage line, then returned to the taxi, where May was already sitting.

‘’You may now depart for Rosewood Tower, Taxi.’’ tersely ordered Michel. The computer controlling the taxi obeyed at once, starting to roll quietly thanks to its electric motors integrated to its four small wheels. Following the tunnel connecting the reception hall with the lakeside ring containing the city, the vehicle accelerated to a top speed of fifty kilometers per hour. It soon slowed down a bit in order to negotiate a roundabout, turning on the main road of the city, aptly named ‘Lakeside Boulevard’. Even though they had watched the video presentation on Elysium City, May and Michel were left speechless at first by the sights offered by the city and Lake Styx as their taxi drove down eastward along the boulevard forming a giant ring around the lake. On their left, a band of ground some eighty meters wide supported a succession of steel and glass buildings with direct view on the lake, while a 180 meter-wide band of ground along the right side of the boulevard was covered by a collection of forests, grass fields and a few sports fields. Lake Styx, visible through huge panes of ceramic glass, was illuminated from above by what had to be an extremely powerful light source that made the opposite rock walls some 5.7 kilometers away across the lake plainly visible in the distance. Michel could see a small motor boat plowing through the waters of the lake at moderate speed, with a handful of people aboard it. As for the buildings lining the left side of the boulevard, they varied in height and architectural style, with the tallest being some fifteen storey-high. Those buildings were also well separated, with young trees, bushes and grass surfaces surrounding each of them. All this would have contrasted greatly with the images of crowded, dystopian-like cities often shown in old science-fiction movies. This was definitely not some concrete jungle with flashy neon signs everywhere and streets clogged by vehicles and people. Vehicle traffic along Lakeside Boulevard was actually light, being limited to taxis, a few buses and occasional trucks, all electric-powered, while some people could be seen walking or jogging along the wide sidewalk running along the left side of the boulevard. There were also a few cyclists visible, pedaling along a right side bicycle trail. The sight of those cyclists made May smile.

‘’Hey, that’s a great idea! Cycling around to work should be eminently practical here and would help me keep fit. I hope that getting bikes will prove easy.’’

‘’It should be! Such a non-polluting, energy-free mode of transportation should be encouraged here. I already like this place. Hopefully, our apartment will be of a decent standard.’’

May nodded her head at that. Both she and Michel understood that life on Mars was made for pioneering spirits who didn’t expect to live in luxury and were ready to work

hard to achieve a dream, mainly turning Mars into a second home for Humanity. All advertisings and documentaries about Mars living stressed those facts to prospective immigrants. Some people on Earth recoiled in horror at the descriptions of the communal-like life and social arrangements on Mars, screaming ‘Communism’ and deploring the lack of what they called ‘free enterprise’ and ‘capitalism’ on the Red Planet. In truth, the actual social organization on Mars could be compared to the old notions about a truly communist community, as all resources understandably had to be tightly managed to avoid both wastages and shortages. With many things still having to be imported from Earth at great costs and travel delays, this was no place for uncontrolled economic and infrastructure development, a fact that both May and Michel understood and accepted. If anything, they had been able to see during their university studies on Earth that Martians had in comparison to the average Earth citizen a much stronger sense of community sharing and of social responsibility, on top of being on the whole a lot more frugal in their perceived needs. May, for one, had been truly shocked on seeing the huge gulf evident in Earth cities between the luxurious residences of the small minority of rich people and the crowded and dirty ghettos too often lodging the poor forming the majority of the population. She had been accustomed on Mars in seeing everyone living on the same level of comfort, eating the same food and residing in similar facilities. For her, the true rewards she expected out of her work was a sense of accomplishment and professional pride, not collecting expensive luxury items and accumulating money. Yes, she expected to get a fair salary for her work, once the free benefits enjoyed by all Martians were counted in, but any sum of money she would save would mostly be used to pay for the occasional vacation trip to Earth she would take in the years to come.

Their taxi turned into a side street after some 800 meters, then into the entrance driveway of a twelve-storey building, with brass letters above the main entrance spelling ‘Rosewood Tower’.

‘’Aaah, here we are, May! Let’s unload our bags, then I will go see if I can find a luggage cart inside.’’

Both of them were still taking suitcases off their taxi when a middle-aged man came out of the building, pushing a baggage cart. The man stopped his cart next to them and smiled to the couple while presenting his right hand for a shake.

‘’Hello! I’m Nick Robertson and I am the superintendant and concierge of the building. I gather that you just arrived from Earth?’’

‘’That’s right, Mister Robertson.’’ replied Michel while shaking the man’s hand. ‘’Me and May spent the last six years studying on Earth. However, we were both born on Mars. My name is Michel Ponichnikov and this is my friend, May Batrang-Sukarno. We were given Apartment Number 220.’’

‘’Pleased to meet you both! I will help you bring your luggage to your apartment, then will brief you on the facilities available in this building.’’

‘’You are too kind, Mister Robertson.’’ said May while smiling to the superintendant, who made a dismissive gesture.

‘’Pah! Simple courtesy, miss.’’

Once the suitcases and bags were on the cart, Robertson started pushing it towards the glass doors of the main entrance, speaking to the couple as he went.

‘’The Rosewood Tower is one of the 42 residential buildings presently occupied in Elysium City, but it still has quite a few apartments available for newcomers. Apartment 220 is on the second floor and has two bedrooms, a lounge, a small kitchenette with dining table and a bathroom. While we have a cafeteria on the ground floor, facing the lake, you can take out prepared food in containers from the display counters of the cafeteria and bring them upstairs if you wish to eat with more intimacy. Communal facilities of this tower, all situated on the ground floor, include a Laundromat, a small gymnasium, an external pool, a communal lounge, a small kindergarten with daycare and a sauna and baths establishment.’’

‘’You have a kindergarten?’’ asked May, her interest showing in her voice. ‘’Are there many children living in this tower, Mister Robertson?’’

‘’Some! Out of a total of 237 residents, including you two, this building lodges 49 children, mostly infants and toddlers. Are you expecting, miss?’’

‘’Not yet, but we have plans, me and Michel.’’

‘’And I wish you good luck on that, miss.’’

‘’Uh, we saw a few people cycling around as we came. Is it difficult to find bicycles here?’’

‘’Not at all, miss! In fact, I still have a few bicycles available in my basement storage room. If you wish so, I can make you sign for one later on. Bicycles are in fact quite popular around Elysium City and many young professionals use them instead of

taking bus or taxi rides. By the way, do you mind if I ask you what is your professional specialty?''

''I don't mind at all, Mister Robertson. I just graduated with a diploma in agronomy and will be working at one of the hydroponic farms of the city. As for Michel, he graduated from the M.I.T. in Boston with a degree in thermonuclear fusion engineering and will work at the city's nuclear power plant.''

''Excellent! You will definitely be most useful additions to our community. I myself don't have the kind of technical and scientific expertise that you have, but I was always good with my hands and can repair about everything in a building.''

They kept exchanging small talk while going up to the second floor, until they stopped in front of a door bearing a number.

''Here you are, my friends: Apartment 220! I will let you unlock the door with your card, miss.''

May did so, sliding her magnetized card in the slot of the door's lock. The door unlocked with an audible 'click', allowing May to push it open. Taking a few steps in, she stopped in the middle of a fairly large living room furnished with a sofa, an easy chair, a video and music entertainment unit, a low coffee table and two shelving units. Looking back and to her right, she saw a small dining corner with kitchenette and a table with four chairs. Robertson, stopping his cart in the middle of the living room, then gave a tour of the apartment to the couple. In the main bedroom, he showed them the large bed, whose mattress was not covered with a contour cover or bed sheets.

''While there are no bed sheets in place, I have in my linen storage room a choice of various colors and decorating patterns bed sheets. You will be free to choose the pattern and color you prefer among the selection available. I can display that selection on the computer that comes with the apartment. Follow me!''

The superintendant led them back in the living room, where he showed them a powerful modern laptop computer stored inside a shelf of the entertainment unit.

''This computer will now be assigned to you and is remotely connected to the city's computer network. If you need a second laptop, let me know.''

''I will definitely need an extra one for me.'' said Michel, making Robertson nod.

''Then I will go get one after this, along with your choice of bed sheets.''

Robertson then powered up the laptop and punched in a few commands, making a selection of fabric colors and patterns appear on the screen.

‘’Here you are! Please select the ones that are to your taste.’’

It took a minute and a few hesitations on the part of May before she and Michel could agree on their choices, which Robertson noted down.

‘’Excellent! I will go get your bed sheets and your extra computer right away.’’

The young couple watched him leave, then went to the patio doors of the balcony facing the nearby Lake Styx. Going out on the balcony, Michel and May took hold of each other’s hands as they admired their view of the lake and the city.

‘’I think that we will be just fine here, my sweet May.’’ Said softly Michel before gently kissing her.

CHAPTER 17 – NEW TECHNOLOGY

08:03 (GMT)
Thursday, August 9, 2074
Olympus Mons Spaceport
Mars

‘’What a ship! It is splendid!’’

Viktor Ponichnikov, standing beside his wife, nodded his head in agreement while also admiring the big but sleek, arrow point-shaped space shuttle through the armored glass window of the arrival lounge.

‘’Indeed! This thermonuclear fusion rocket propulsion system sure beats our old nuclear rocket engines by a wide margin in terms of performance. To be able to approach and land vertically simply on engine power, without gliding parachute, is a huge step forward.’’

‘’God, what I would do to pilot such a ship! And for its parent ship to be able to make the trip to Mars in only seventeen days…’’ said Denise Wattling, who still loved piloting at the age of seventy. ‘’These new thermonuclear propulsion ships should greatly increase the flow of passengers and equipment we receive from Earth. Those 438 new immigrants who are about to disembark will certainly do us a lot of good in terms of population growth. After thirty years on Mars, we just barely passed the 6,000 people mark. If we want to become self-sufficient one day, we will need a lot more people on this planet, along with the corresponding installations and industries.’’

‘’True, but we are on the right path for that, thanks to the continued support that we got from Earth. With the costs and time of trips between Earth and Mars falling down significantly thanks to those new fusion ships, that should entice the authorities on Earth to continue delivering their support to us.’’

‘’I certainly hope so, Viktor. I certainly hope so.’’ replied softly Denise. She couldn’t help then mentally hope that she would live long enough to see the moment when her Mars colony would be declared self-sufficient. However, she doubted that very much: there were still many decades of hard work ahead before that cherished goal could be achieved.

14:36 (GMT)
Wednesday, October 01, 2081
Orbital space terminal 'ARES STATION'
Low Mars equatorial orbit

''Ares Station, from H.S.S. STEPHEN HAWKING: Docking maneuver now completed.''

That short radio message, coming out of an overhead speaker, was greeted by a concert of cheers from the technicians and space controllers manning the Ares Station space terminal: the H.S.S. STEPHEN HAWKING was the first ship to officially dock at the newly completed giant orbital structure. The commander of Ares Station, Jiang Min, activated his microphone to answer himself the visiting spaceship.

''H.S.S. STEPHEN HAWKING, from Ares Station, you are authorized to start disembarking your passengers and cargo.''

Min, a 68 year-old aerospace engineer who had been part of the original crew of the H.S.S. FRIENDSHIP during its historical first trip to Mars, then took off his radio headset and put it on top of the nearby chief space controller's station, where a hook kept it from floating up and away.

''I am going to go meet the ship's captain via the arrival hall, Steve.''

''Understood, Min!'' replied the chief controller, Steve Parsons. Min then walked out of the space terminal's control room, which was in zero gravity condition, using the magnetized soles of his boots to walk normally, albeit in a slow, cautious way.

Taking an elevator cabin to go down to the level of the passengers' arrival hall, some180 meters below the control center of the station, Min then followed for seventy meters a communications tube closed at both ends by safety airlocks, finally entering the large arrival hall, with its reception counters and information booths. There were no customs control booths or luggage inspection tables to be found there, as the space terminal, like all Human installations on and around Mars, was legally considered international territory under United Nations protection. That was however partially compensated security-wise by the fact that all cargo and passengers embarking on or around Earth on a Mars-bound ship were searched and told not to carry any weapons, drugs, animals, insects or plants on or with them. One constant worry of Martian officials

was the possible accidental importation on Mars of parasites, insects or vermin that could then swiftly multiply and spread through the hydroponic gardens on the planet, with possibly disastrous consequences. Any illegal importation of weapons, like firearms and combat blades, was also severely looked upon. With the few public security officers now working in the various Mars communities having only non-lethal weapons like tasers and riot batons, that point was of crucial importance in order to prevent the emergence of violent crime in Martian communities. Thankfully, Mars had mostly managed up to now to avoid crime in its midst, the only registered trouble up to now having been rare cases of drunken brawling and even rarer cases of domestic or sexual abuse. Since all essential needs were provided for free to its citizens by the Martian Administration and since there were few luxury items to be found around the planet, theft was as well mostly unheard of on Mars. There was also the fact that each new immigrant that came to Mars did so to fill a specific job advertised by the administration, thus saw all his or her needs provided from the time of departure from Earth. With all the available resources needing to be tightly managed to avoid waste, Mars was no place for free-loading immigrants with no employable skills or desire to work. As for tourists, they were still a rarity but, hopefully, that aspect of Mars' economy would eventually grow to the point of profitability in the years to come.

Min watched for a moment as a steady stream of passengers was coming out of the telescopic communications tube linking the STEPHEN HAWKING and the main access airlock of the arrival hall. Those 1,340 new immigrants would indeed be most welcomed additions to the Martian workforce, bringing with them a wide variety of skills, some of which had been absent until now on Mars. Min knew that there was at least one qualified, experienced jeweler and his family aboard the ship who, as such, would be the first jeweler to work on Mars, to satisfy a demand for locally-produced jewelry that used the gold, silver, platinum and gems mined on the planet. He couldn't help smile in amusement when an overenthusiastic young woman just off the ship whooped up with joy and jumped up in excitement, only to find herself floating up in the zero-gravity environment of the arrival hall, her arms flapping around in panic while she screamed for help. This was not the first time that such a thing happened and a couple of space terminal employees were standing ready with long poles equipped with hooks for just such an eventuality. The shaken young woman was soon presented with the end of a pole, which she frantically grabbed, to be then pulled down back to the floor of the hall,

where her magnetized soles secured her back to the ground. Once the bulk of the passengers had disembarked, Min walked to the access airlock and entered it, then walked down the communications tube of the STEPHEN HAWKING. A ship's officer greeted him inside the passengers transit hall of the ship, which had a much lower ceiling that the space station's arrival hall.

''Welcome on the H.S.S. STEPHEN HAWKING, sir! What may we do for you?''

''I am Jiang Min, Commander of Ares Station. I would like to speak with your captain, if he is not too busy.''

''Certainly, sir! Follow me, please.''

Leaving a crewmember in charge of the transit hall, the female officer led Min to one of the elevator cabins situated in one corner of the wide compartment. The two of them then rode up for some forty meters parallel to the centerline axis of the ship before their cabin stopped and its doors opened. The H.S.S. STEPHEN HAWKING was the first ship of a new class, with many more similar ships to follow, all using the tremendous power and efficiency of the new thermonuclear fusion rocket technology. Of generally ogival shape, with an overall length of 330 meters and a maximum width of 205 meters, the STEPHEN HAWKING was much more massive and voluminous than the 38 year-old H.S.S. FRIENDSHIP, which was still used to haul cargo and passengers between Earth and Mars. However, in contrast to the FRIENDSHIP, the STEPHEN HAWKING was much less dependent on the relative orbital positions of Earth and Mars, thanks to its powerful new engines, and could make the trip at the time of its choosing, thus greatly increasing the frequency of the trips between the two planets.

Once out of the elevator cabin, the ship's officer led Min to an airtight steel door and opened it, letting him enter what clearly appeared to be the bridge of the ship. No less than fifteen men and women were present and working on the bridge as Min was led to one graying woman sitting in a centrally-located command chair. The escorting officer then presented Min to the woman in the chair.

''Captain, this is Mister Jiang Min, Commander of the Ares Station. Mister Jiang, this is Captain Natalia Voronej, the master of the STEPHEN HAWKING.''

The tough-looking blonde in her fifties sitting in the chair smiled to Min and extended a hand for a shake.

''Happy to meet you, Mister Jiang. Your space terminal is certainly an impressive feat of space engineering.''

‘’And your ship is a truly splendid one, Captain Voronej.’’ replied Min. ‘’I came to review with you what we are going to exchange in cargo and passengers. I believe that you have brought with you two fusion-powered planetary shuttles that are going to be assigned to my space terminal, along with their flight crews and maintenance teams.’’

‘’That is correct, Mister Jiang. On top of that, we brought 1,340 new immigrants, along with 6,580 metric tons of various cargo and supplies. Thanks to your space terminal, we will be able to depart for Earth as soon as all that is transferred on your station, instead of having to wait for shuttles to haul that down to Mars piece by piece. And what do you have for us in exchange, so that I don’t travel with empty holds?’’

‘’Oh, I have plenty of valuable stuff for you, Captain, along with 93 passengers, Martian citizens who want to take some vacation time on Earth.’’

Min then took out of a pocket an electronic data pad and consulted it for a few seconds before speaking again.

‘’You will be loading up some 670 metric tons of Martian pink salt, 1,133 metric tons of molybdenum metal products, 5.6 metric tons of pure platinum, 3.8 metric tons of palladium metal, 2,080 kilos of iridium, 11.6 metric tons of dysprosium, 712 kilos of scandium and 961 kilos of thulium, plus 329 kilos of uncut peridot semi-precious gems. The quantities I quoted for the rare earth elements may seem negligible, but their value on the Earth’s metal commodities market total over 226 million dollars. Add to that the value of the platinum and molybdenum and you have a cargo of metals worth nearly half a billion dollars.’’

‘’Wow!’’ said Voronej, truly impressed. ‘’It thus seems that Mars is starting to pay its way in terms of economic balance, Mister Jiang.’’

‘’Right you are, Captain, and this is only the start. Up to now, Mars is proving to be a mother lode in terms of mineral deposits, with some of the deposits found to date being of metals that are rare on Earth or whose supply is nearly exhausted, like rare earth metals. And we have only explored and prospected a tiny fraction of Mars surface to date. The latest discovery dates back from only two weeks ago, when an incredibly rich vein of diamonds deposits was found inside one of the old lava tubes of Pavonis Mons, in the Tharsis Montes volcanic chain, near Olympus Mons. Exploitation of that vein is due to commence in about a month and it should become a major source of high quality diamonds, both for Mars and for Earth. I…’’

A communications technician on duty on the bridge suddenly interrupted Min, looking at his captain with a shocked expression.

‘’I’m sorry to interrupt like this, Captain, but the Mars Internet is now broadcasting a planet-wide urgent announcement.’’

‘’Very well, Mister Dominguez. Put it on the main viewing screen.’’

‘’Yes, Captain!’’

With Min also looking with some anxiety at the large viewing screen of the bridge, the technician quickly made the picture of a news presenter appear, with the overhead picture of some kind of crash site shown on split screen mode.

‘’…The flying rover was on its way to the Capri Chasma region, at the eastern end of the Valles Marineris, when it apparently suffered a catastrophic engine or flight control failure and crashed on the ground, killing all of its seven occupants. Rescue teams are now at the site of the crash and have confirmed that there are no survivors. We now know that the Chief Administrator of Mars, Denise Wattling, was at the commands of the rover when it crashed and is part of the casualties. For the benefit of the newer citizens of Mars, let us remind the viewers that Denise Wattling, now dead at the age of 77, was in command of the first ever Human team to set foot on Mars, some 37 years ago, and was also the commander of the first Human base on Mars.’’

Tears filled Min’s eyes as he looked at the file picture of Denise Wattling being shown on the screen, wearing her space suit with its visor up and smiling to the camera. He had to search quickly for a chair and sat in it, crushed by infinite sorrow and crying shamelessly.

CHAPTER 18 – STEPPING AWAY FROM ARMAGGEDON

15 :11 (Washington Time)
Monday, December 15, 2087
The Oval Office, The White House
Washington, D.C., USA

President Charles Lewis reread twice a particular paragraph of the executive summary of the report he was holding in his hands, then looked up at his science advisor, Doctor Janet Russell.

‘’How solid is this data, Janet?’’

‘’Pretty solid, Mister President. It was collected by over thirty scientific stations worldwide and verified by our top climatologist experts. What this study says is that global temperatures have gone down for the second year in a row, and this after temperatures have been steadily rising non-stop for over ninety years. I will concede that these two decreases in temperature may sound insignificant to most people, being respectively 0.3 and 0.5 degrees Celsius, but our experts are convinced that this confirms one thing: we are finally winning the battle against global warming, thanks to our atmosphere CO2 scrubbers and our new thermonuclear power plants, which have allowed us to finally phase out our last fossil fuel power plants.’’

Lewis sat back in his padded chair and let out a sigh of relief while closing his eyes for a second.

‘’Thank God! To be able to finally see an end to this calamity… How long do you expect that it will take before we could hope to see temperatures, as well as sea levels, return to the normal levels we were accustomed to at the start of this century?’’

‘’Uh, that is a pretty hard thing to guess, Mister President, especially concerning the sea levels, but it will certainly take many decades, maybe a century or more before we could return to 2000 levels. Now is definitely not the time to slack off our efforts, on the contrary. Our people should be made to clearly understand that before someone raises false hopes and tries to cut the budgets for our climate control efforts.’’

‘’You’re too true about that, Janet: we have no shortages of politicians and industrialists who can’t see further than their noses…or their wallets. I will thus instruct

my cabinet secretaries along those lines. Could you prepare a presentation based on this report, to be shown to the cabinet by Friday?''

''Friday is quite a short deadline, Mister President, but I will do my best.''

''Good! Another thing: I fully expect some of my secretaries to use this report to cut or even terminate all support for the Mars Home Project, under the excuse that it is now made redundant by our climate progress. What should I say to that?''

Janet Russell, a 53 year-old physicist, stiffened at once at that question and answered it in a resolute tone of voice.

''Tell them that it would be a most stupid decision, Mister President. After over forty years of herculean efforts, our colony on Mars is now on the path to self-sufficiency. However, it will still need many more decades of material and financial support before it becomes truly self-sufficient. In fact, I estimate that we will need to support our Mars colony for at least fifty more years. Yes, it is already able to welcome immigrants from Earth who were refugees from climate disasters and actually helped over 10,000 such refugees to resettle on Mars during the last few years, but there is still a lot left to be done.''

''I see! Well, I suppose that I will need all of my legendary leadership and oratory skills for that Friday cabinet meeting and for the discussions and debates that will follow in Congress afterwards on this subject.''

09:50 (GMT)

Friday, February 6, 2088

Apartment # 1015, Rosewood Tower, Southern District

Elysium City, Olympus Mons

Mars

''Here you are, Mister Djinigwina: your new family residence, Apartment 1015. It has three bedrooms, a lounge, a dining room with kitchenette, a complete bathroom and a separate washroom, plus a large storage closet and a balcony.''

''Uh, it is Djiningwinan, Mister Robertson, not Djinigwina.'' Corrected politely the thin 37 year-old man with dark skin and curly blond hair, making the building superintendant smile apologetically to Bo.

''Sorry about that, mister. Just out of curiosity, where are you from on Earth? I never heard a family name like yours before.''

Bo nodded his head at that, understanding how the superintendant could be ignorant about that.

‘’Djiningwinan is a very old Australia Aboriginal name, sir. My ancestors arrived on the Australian continent some 60,000 years ago, coming from South-West Asia via a land bridge.’’

‘’Oh, I see!’’ said Nick Robertson, who then looked down at the three young children accompanying the newly arrived couple. ‘’Your children seem quite lively and good-spirited, Mister Djiningwinan.’’

‘’They certainly are, Mister Robertson. Let me present you my family: first, this is my wife, Merindah. Then, you have my ten year-old son Daku, my eight year-old daughter Bindi and, finally, my four year-old son Monti.’’

‘’And what kind of job will you have here on Mars, Mister Djiningwinan?’’

‘’Please, just call me ‘Bo’.’’ Replied the Aborigine, seeing that the superintendant had some real trouble pronouncing his name correctly.

‘’Only if you call me ‘Nick’.’’

‘’Deal! To answer you, I was offered a contract to work as a sheep shearer and herder for the sheep farm here. Until a couple of years ago, I was working as a sheep shearer at a sheep ranch in Southern Australia, but global temperature risings have transformed what had been rich grasslands into a parched desert. The sheep herds progressively died out and I finally decided to find another place to live when the ranch I worked for was forced to close for good some two years ago. Unfortunately, most of Australia was in no better shape and New Zealand, which had fared better than Australia, was already packed to over-capacity with refugees. My family had to live in a resettlement camp for two years before this opportunity presented itself to us.’’

Robertson nodded his head slowly at that story, having heard many similar sad tales from other immigrants to Mars during the last couple of decades.

‘’Sadly, too many people have lived through the same kind of misfortunes that you had to go through, Bo. However, you now have a chance at a brand new life here on Mars. The lifestyle may be totally different from what you knew on Earth, but it has many good points to it. For one thing, you may find our society here to be a lot more egalitarian and fair than what is found on Earth. Also, due to the special living conditions on Mars, our community group spirit is much stronger than usual. Here, everybody helps everyone.’’

‘’That is definitely to my liking, Nick.’’ said Bo, meaning it. ‘’Uh, with the time we arrived by ship on Mars, I am afraid that we kind of missed breakfast. Is there a place where we could eat at this hour? And talking about the hour: what kind of clock and calendar system do you use on Mars? I must confess that I didn’t read too deeply in my immigration guide brochure.’’

‘’First off, about food: no problems! Our cafeteria is open from five in the morning to ten in the evening, while we have a small night counter where you can get ready-to-eat food all night. You also can either eat in the communal dining room of the building or take out portions of food selected by you, to bring up to your apartment and eat it there. Your kitchenette has the basic appliances to help in that, including a microwave oven, a refrigerator, a coffee machine, a toaster oven and a hot plate. I can guide you and your family to our cafeteria afterwards if you wish so.’’

‘’That would be truly appreciated, Nick. You are really kind.’’

‘’Just doing my job, Bo. Now, about our system of time and dates. In the first decades of this colony, we simply used the standard Earth calendar and Earth time, based on Greenwich Time. However, as our population grew and started adapting to life on Mars, it was felt that depending on a time out of synch with our new home planet didn’t feel right. So, in 2074, thirty Earth years after the first successful landing on Mars, a new system was adopted. However, the old Earth system was also kept and can be referred to at anytime, especially when dealing with ships’ arrivals and with Earth-Mars communications. Watches now produced on Mars actually show both time and dating systems on demand. Now, the main things for you to know is that the Mars day, called properly ‘sol’, is nearly the same length as one Earth day. In fact, one sol is 24 hours and 37 minutes long. Then, the Mars year is 687 Earth days long or, more properly, 669.79 sols long. The decision was taken to split the Mars year in 24 months, with 22 of those months counting 28 days each and two months counting 27 days, for a total of 669 sols. The small fraction left is added every two years. Thus, while 44 Earth years have passed since the start of Human presence on Mars, we are now in the Year 23 of the Martian calendar and today is the fifth day of Tharsis, the second month of the Martian calendar. But don’t worry about those kind of details, Bo: nobody will be offended if you continue using Earth time.’’

‘’Still, I certainly intend to learn this Martian time and date system, Nick: I want to live in harmony with this planet, the way I did in my old ancestral land.’’

Robertson, his expression sober, gently patted his shoulder.

‘’I like your way of thinking, Bo. You and your family will make outstanding Martian citizens. Now, I will let you get out of your spacesuits and unpack your things, then will show you the facilities of this building. I strongly advise that you put on your ‘fat suits’ before leaving your apartment with me: one excited jump and you or one of your kids may end up all the way across the street…or in the middle of it and among the traffic. There is a weighing and filling station on the ground floor where you will be able to refill the integrated pouches of your fat suits with the appropriate weighing-down pads. I will now leave you and will return in half a hour, to bring you to the cafeteria.’’

Robertson then left the apartment, with Bo and Merindah exchanging smiles.

‘’He seems to be a truly nice man, I must say.’’ said Merindah, a short and thin, 31 year-old Aboriginal woman. Bo nodded his head at that.

‘’Indeed! If all the people here on Mars prove as nice as him, then leaving Earth will have been worth it. Well, let’s get out of these spacesuits. You remember in which suitcase we packed our fat suits?’’

‘’Yes I do, Bo!’’

Some 32 minutes later, Nick Robertson showed up at the door of their apartment, as promised. Merindah was the one who answered his knocks and opened the door wide for him.

‘’We are ready to go down, Nick.’’

Robertson nodded with satisfaction when he saw that the whole family was wearing their fat suits, technically called ‘Felt Weight Compensation Suits’, or FWCS.

‘’Excellent! First stop will be my office on the ground floor, where I will distribute the weighing-down pads appropriate for each of your suits.’’

Turning around, Nick led the small family to the nearest elevator and called a cabin. The ten-level ride down was both smooth and fast and the six of them soon stepped in the central hallway of the tower’s ground floor. As they were passing various offices and shops, Nick described them quickly for the family’s sake.

‘’To your right, you will see the entrance to the tower’s kindergarten and daycare center, where children of up to six years of age can be educated and cared for while their parents are out working. Your little son Monti will be able to go there, starting next Monday. Next, on your left, is the tower’s infirmary, where a nurse on duty will examine and treat residents as needed. If an injury or sickness proves above her ability to treat it, she will then have the patient transferred to the city’s hospital, which is a fully equipped

and manned advanced medical facility. Then, you have the tower's gymnasium, which has an assortment of exercise machines and weight-lifting equipment. Outside the tower, on its patio facing Lake Styx, you will find a large external pool, two tennis courts and, most importantly for you, a well-equipped children's playground, complete with a sand square.''

The eyes of the three Aboriginal children lit up at those last words, while grins came to their faces. Nick finally stopped in front of a large door bearing a sign saying 'Superintendant'. The door was not locked and Nick simply opened it, letting the family inside a fairly large reception room where a mature woman sat behind a desk supporting a computer and a videophone. Nick turned half around and presented the woman to the Djiningwinans.

''This is Misses Juliette Chablis, my secretary and receptionist for the tower. Her job is to answer the questions and requests from the 693 present occupants of the tower and to help them as much as she can. Another secretary, Miss Minnie Makwando, fills the post during the evenings and nights. If you have any problems, don't hesitate to call them: they are here to help. Juliette, this is Bo Djiningwinan and his family. I will let you first record their arrival in the building and register them, then I will give them weighing pads for their fat suits.''

Juliette, a medium-built woman in her mid-forties and with long brown hair, smiled to the Djiningwinans and signaled them to approach her desk.

''If you will please pass me for a minute your citizen cards, I will register you in, so that you can use all of the tower's facilities without problems. What apartment are you occupying?''

''Apartment 1015, Misses Chablis.'' answered Bo while collecting the citizen identity cards of his wife and three children, which he then gave to the secretary. Juliette punched a few commands on her computer, then scanned the identity cards one after the other, punching in more commands with each card. Less than two minutes later, Juliette was giving back the cards to Bo while smiling to him.

''Here you are, sir. You and your family members are now fully registered as residents of this building, with full access to its services and facilities.''

''Thank you very much, Misses Chablis.''

Next, Nick led them to a weight scale and storage cabinet sitting in one corner of the receptionist's office and had little Monti stand on the scale, which was designed to

take account of Mars' low gravity. Looking at the display showing the calculated total weight of weighing pads needed for the toddler boy, Nick then took out of the cabinet the appropriate number and size of pads needed for his FWCS and inserted them in the pouches sewn to his fat suit, distributing them around equally while talking aloud for the benefit of the Djiningwinans.

''The pads used in your fat suits are both flexible and compact, in order to keep comfortable the wearing of your fat suits, and do not absorb liquids, so they won't become heavier if you are ever drenched by water. Their fabric also contains lead particles, which makes them denser and also provides you with some protection against radiations if you are ever accidentally exposed. I strongly urge you to wear your fat suits at all times during the day, including when practicing sports, so that your bodies could stay fit and strong enough to allow you to visit Earth in the future without encountering medical problems due to weakened bone structures and muscle mass. You should of course take off your fat suits before going to swim in our external pool. You will be each issued two spare sets of fat suits later tomorrow, so that you could wash the suit you wore on a given day, but remember to take out the pads before you put the suit in the washing machine. By the way, we have a communal Laundromat on this floor, with the cleaning products provided for free. As for the cleaning of your apartment, cleaning robots will take care of it, coming in on a daily schedule or on call. Your suits will be exchanged as needed in the future, as your children grow up. The only time when the wearing of a fat suit is advised against is in the case of women in late stages of pregnancy: they already have some extra weight to carry.''

Merindah smiled on hearing that.

''That makes eminent sense, Nick. The administrators of the colony seems to have some solid common sense.''

''Well, you certainly don't want some nitwits to be in charge of this place, believe me. Just adapting to Mars is already a demanding task requiring constant attention and precautions. Well, your little Monti is now all fitted. Next!''

Another fifteen minutes and the whole Djiningwinan family was ready to go, with their fat suits weighed down by pads. Bo jumped up and down a couple of times and flexed his arms and legs, testing the final result.

‘’This is neat! I feel nearly exactly as if on Earth, in normal gravity. Whoever thought about these suits was a genius. This is truly a simple, cheap and effective solution to a problem that could have caused a lot of long-term grief.’’

‘’Indeed! Well, time to lead you to our cafeteria, so that you could have brunch.’’ said Nick before leading the family out of the office and in the central hallway, where he walked them to the building’s cafeteria. The spacious room, well illuminated by large windows covering three of its walls, was nearly deserted at the time, something that didn’t surprise Nick. Only a handful of residents and one attendant at the food counter were present at the time. Bo and Merindah were struck by the fact that there was no need for them to register their use of the cafeteria, nor did the attendant ask for their identity cards before serving them. Such a concept of free food on demand was already a striking difference to life on Earth, where either money or a ration card was needed to get something to eat. While the lunch menu items were not yet ready to be served, the brunch items proved to be both abundant and varied, with Bo and his family settling on omelets with a variety of bacon, sausages, potatoes and toasts. Nick accompanied them to their selected table but only took a cup of coffee for himself, sipping it slowly while exchanging small talk with the Djiningwinans and describing to them in more detail the facilities and services available at the tower.

Once the Aboriginal family had finished eating, Nick led them to a large vertical display panel set near the main entrance of the building.

‘’This is an interactive digital map of Elysium City and of its various annexes, which form a large ring around the shores of Lake Styx. The cavern containing Lake Styx and the city has a diameter of 5,740 meters at water level, with the ceiling being 13,100 meters above us. We are here, in the Southern District, near the southern access elevator well. Connected to the city’s ring at right angles, like the pokes of a wheel, are a total of twelve large annexes, each 1,500 meters long and 250 meters wide. Those annexes, which can be individually sealed in cases of emergencies, like fires and accidental decompressions, are used as either agricultural centers, fish farms or industrial complexes and are where the majority of the city residents are employed. We have only one sheep farm, situated in the nearby South-southeast Farming Complex, so I suppose that it is there that you are going to work, Bo. Its entrance is about 300 meters to the east of here, an easy walking distance. Lakeside Boulevard, the main artery of Elysium City, forms a closed loop around the lake and gives access to the

whole city and its annexes via a well-served bus route that literally runs around the city. You can also call a robotic taxi from a console at the reception desk if you need one. The present annexes are regularly dug further and enlarged as we add new industries and agricultural complexes to the city. As you were able to see by yourself on arrival, the city has plenty of trees, bushes and grass areas everywhere. Those contribute both to the quality of life and to a clean atmosphere in the city. The atmosphere over the lake is also breathable. By the way, despite the abundance of patios with BBQ grills you will see around, including next to our external pool, BBQ grills are strictly of the electric type, to avoid polluting the air. The only places where you will see functioning smoking ovens will be in specialized food factories, where special air filtration and recycling units have been installed. To come back to this building, the nearest primary school is here, some 200 meters away. That's where your Daku and Bindi will go on Monday. Well, that's about it for the moment. Do you have any questions, Bo?''

''In truth, I would have tons of them but I can't even decide which ones yet. I will however make a point of chatting with other residents of the tower later today, at suppertime and in the evening. Thinking of it, I would have one question now: would I be allowed to go visit the sheep farm today, even though I am not due to work there before Monday?''

''You certainly can, Bo. In fact, I am sure that the farm manager would be most happy to see you and talk to you about your past experience in Australia. I could call him in advance to set up a meeting with him this afternoon, if you wish so.''

''Uh, to be truthful, I mainly wanted to see their sheep herd: The last sheep herds I saw alive was some nearly three years ago Seeing them again would remind me of the old country.''

''I can perfectly understand that, Bo.'' said soberly Nick. ''All areas and annexes of the city are open to all, except in certain parts of our industrial complexes which could present hazards to visitors. Feel free to visit them whenever you want. On this, I will leave you and your family free to go and walk around. If you need anything, just come and see me or Juliette.''

''We will! Thank you for everything, Nick!''

''My pleasure, Bo.'' replied Nick before walking back to his office, leaving the Djiningwinans alone in the entrance lobby. Bo and Merindah exchanged looks, with Merindah smiling to her husband.

‘’Maybe we could go see first that Lake Styx, Bo: the idea of a lake on Mars intrigues me.’’

‘’I agree! Let’s go, kids!’’

Finding their way to the lake was easy enough, as the Rosewood Tower sat facing it. They discovered then that huge, airtight observation bays separated the city from the cavern containing the lake, holdovers from the time when the cavern had not yet been pressurized with breathable air. However, those airtight bays were still in place, most probably as protection against some possible accidental decompression of the cavern following some improbable tectonic movement of the crust. What they also found was that large transparent airlocks had been built along the bays at intervals of one hundred meters, airlocks that gave access to the shoreline of the lake. Using one of those airlocks, the Djiningwinans then walked down a large, moderately inclined ramp that connected to both a floating wharf and a wide seaside promenade that followed the shore in both directions. Quite a few people were either walking, jogging or cycling along the promenade, while a few small boats were tied to the wharf. Bo sniffed with delight the strong marine smell of salt water coming from the green waters of the lake.

‘’This place smells even more of the ocean than on the coast near Sydney. I love this!’’

On her part, Merindah looked up along the seaside promenade, then across the lake, with the opposite side of the cavern visible in the distance, nearly six kilometers away.

‘’Building this city in such a place and conditions must have been a truly herculean effort, Bo.’’

She then looked up briefly at the intense source of light illuminating the whole cavern, but had to look away from the dot of bright light after only a fraction of a second.

‘’I don’t know what they use to light this cavern, but it is about as intense as the Sun at home. It certainly does a good job of replicating the Sun here underground. I can also feel some heat from it.’’

‘’I guess that we will have to ask someone about that later on, Merindah. Well, how about we go back inside the city and visit that sheep ranch?’’

The answer from his three children was a chorus of happy cheers, so Bo turned around and, taking little Monti in his arms, led his family back up the ramp and through the airlock.

As Nick Robertson had told them, the annex containing the sheep farm was only a few minutes' walk from Rosewood Tower and the small family soon stepped through one of the two airlocks connecting the city proper and the annex, one airlock being for pedestrians and cyclists, the other one, much larger, designed for heavy vehicles and large construction modules. Bo felt joy and nostalgia the moment that he was able to look down the vast, high ceiling cavern. The ground was entirely covered with thick, long grass, except for a ten meter-wide paved road forming a peripheral loop road along the outer walls of the cavern. Numerous, regularly spaced steel pillars supported a steel lattice that seemed to form the floor of a second storey covering the whole horizontal surface of the cavern, with the underside of the lattice structure supporting overhead lamps and what looked like multiple large sprinklers. What attracted the eyes of Bo, however, was the herd of sheep visible in the distance, with two horse riders slowly trotting around the herd.

''Look, Merindah! They use mounted ranch hands to keep the herd together. I will be able to ride a horse again.''

''That's great, Bo! You should be quite happy in this new job.''

''Indeed! Let's walk to the herd and those riders.''

The family thus started walking on what was essentially 37 hectares of grasslands, adopting a calm but steady pace. When the Djiningwinans came to within 120 meters of the herd of about 300 sheep, one of the horse riders turned his mount around and pushed it to an amble towards the family. The rider came to within seventy meters before he hesitated a bit and shouted to them.

''BO? IS THAT YOU?''

Bo's surprise at being recognized quickly turned to joy as the rider approached further.

''DONALD? DONALD RAMSAY?''

''BO! MY GOD, IT IS YOU!'' replied the horseman before stopping his mount in front of Bo and bending down to shake his hand. ''I was told that a new sheep shearer was due to arrive from Earth, but I had no idea that it would be you. What a nice surprise!''

''The same here, Donald.'' said Bo while shaking the hand of the one he had known as a young teenage boy who had worked with him at his old Australian ranch near Wagga Wagga, in the state of New South Wales. He then presented his family to the Caucasian man in his mid thirties.

‘’Donald, this is my wife Merindah, my sons Daku and Monti and my daughter Bindi. Merindah, this is Donald Ramsay, whom I worked with at the ranch before meeting and marrying you.’’

‘’It is a pleasure to meet you, Donald.’’ said Merindah while shaking his hand. ‘’How long have you been on Mars?’’

‘’Nearly six years now. I didn’t like how things were developing in Australia because of the rising heat and desertification and decided to try my luck on Mars when they advertised the need for experienced farmhands to work at a sheep ranch. My God, I will have to present you to my wife and kids tonight.’’

‘’And would I know by chance the woman you married, Donald?’’ asked Bo, making Ramsay smile with malice.

‘’I think so: I married Alice Hemsworth, the youngest daughter of the boss of our old ranch. She will be positively delighted to see you and your family. How about having supper together tonight, both of our families?’’

‘’That sounds like an excellent idea, Donald. Where do you live in Elysium City?’’

‘’In the Rosewood Tower, not far from this annex. Do you know where it is?’’

‘’I believe so : I just moved in there, in Apartment 1015.’’ replied Bo, a grin coming to his face. Ramsay laughed on hearing that.

‘’No kidding, mate! I live in Apartment 913, nearly directly under yours. How about we all meet at the tower’s cafeteria at, say, six o’clock? We could then go up to my apartment after supper to have a drink together and talk about the good old times.’’

‘’Sounds like a plan, my friend.’’ replied Bo, now feeling truly as happy as he had been in a long time.

CHAPTER 19 – A TIME TO CELEBRATE

11:52 (GMT)
Wednesday, May 14, 2127 (Mars Year 83)
Mars Base One ('The Nest'), Melas Chasma, Valles Marineris
Mars

''Everything is ready, sir. You may step behind the lectern now.''

''Thank you!''

The octogenarian man climbed the steps to the small podium and took place behind the lectern, where he adjusted its microphone and loaded his planned speech in its teleprompter via a flash drive. The old man was still solid and healthy for his age and, remarkably, kept wearing his 'fat suit' under his well-adjusted executive suit, something many elderly Martian residents eschewed in order to lower the loads and stress on their aging bodies. With still a couple of minutes available before his broadcasted address was due to start, he looked behind him to examine with a pang of emotion the brand new spaceship that would form the background to his address. The 'M.S.S. DENISE WATTLING' was a thermonuclear-powered spaceship meant to shuttle to Mars orbit and back both heavy cargo loads and up to 400 passengers at a time. If absolutely needed, it could also act as a fast courier ship and do a sprint to Earth, where it could enter its atmosphere and land. In pure technological terms, the DENISE WATTLING represented the most sophisticated level of spaceship building ever achieved by Humanity. However, the most important point about it in the mind of the octogenarian was the fact that it had been built here on Mars, with all its parts and systems also produced on Mars, thus its designation as a Mars Spaceship, or M.S.S., before its name. The ship, which only needed small final internal touches before it could be ready to fly, had been built at the underground shipyard complex of the Melas Chasma Space Yards, itself an annex of the old Mars Base One complex, now better known as 'The Nest'. The space yards complex had been completed some sixteen years ago and had until now concentrated on building flying rovers and other small flying craft, which were then used to provide transportation services between the various installations and settlements dispersed around Mars. Mars now counted five major population centers, 23 separate mining

complexes, three spaceports and a dozen small, varied outposts and research installations. The Nest was one of the five major population centers, along with Elysium City, Tharsis City, Alba Mons City and Ares City. However, what had been Mars Base One, the first permanent Human installation on Mars, would now be nearly unrecognizable to its first occupants. The cavern containing it had been gradually enlarged and its original installations either upgraded or replaced by larger, more modern and permanent buildings. Today, its population stood at over 9,400 residents who worked in the various industrial annexes of the underground complex, of which the Melas Chasma Space Yards was a part.

On the signal of the video manager, the octogenarian cleared his throat, then started speaking as soon as a red light lit up on the camera facing him.

‘’To all my fellow Martian citizens, good day! We are here, at the Melas Chasma Space Yards, to celebrate the completion of the first spaceship to be fully built on Mars, with components produced on this planet. As such, the M.S.S. DENISE WATTLING represents the ultimate achievement of decades of hard work meant to colonize Mars and make it a second home to Humanity. It also honors the legacy of an extraordinary woman who led the first Human exploration team to walk on Mars, then acted as the commander of our first permanent base, Mars Base One, which we now know as ‘The Nest’. That woman, along with her companions, started building what was then still a dream, with many unknowns and uncertainties facing that dream. Those pioneers, helped with more volunteers from Earth, multiplied along the decades while progressively building our colony and what we now call our home.’’

The old man then had to stop for a second, a big ball forming in his throat and with tears about to burst from his eyes. He however overcame his emotions and continued his speech, his voice becoming stronger in volume and tone.

‘’Denise Wattling was also my mother, a role in which she proved to be as devoted and kind as she had been in her role as our first leader. Now, I, Michel Ponichnikov, as your newly-elected governor, am proud to celebrate her memory and that of her fellow pioneers. I am also proud to be able to proclaim today to all of you and to the people of Earth the achievement of a dream we worked so hard for over eight decades to attain. Today, the United Nations, with the approval and acknowledgement of all the governments on Earth, proclaimed Mars as a self-sufficient colony, where

Humanity will be able to expand and live in both peace and harmony. Today, we can proudly call ourselves Martians!''

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