The HUMBOLDT SEVEN: A Science Fiction Adventure

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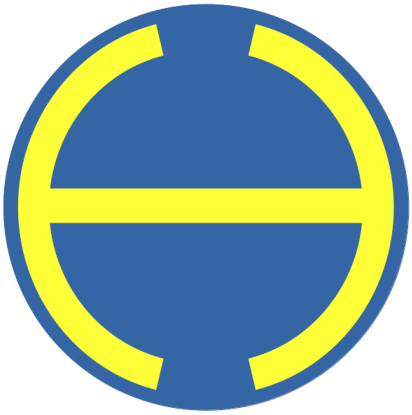

Contents

1 Duel over Goose Bay

A pair of sonic booms – "Crack! Crack!"– swept over the Canadian taiga, rolling back from the mountainsides and making a large black bear raise its head in irritation, while a herd of startled caribou galloped for a minute aimlessly before coming to rest again. The sources of the booms were two fighter aircraft, a stubby *Phantom* pursued by a slender pencil-shaped *Starfighter*, both of which by that time had already reached the narrow valleys which split the hills around Goose Bay.

"All right, Aldi, you had it coming!" the pilot of the sleek Starfighter exclaimed, as he zig-zagged behind the Phantom through the maze of canyons they had entered by now. He flipped a switch on his control stick which armed the cannons, but then he gave a little curse because he had lost his focus on navigating the plane for a fraction of a second, and had nearly crashed into an outcrop of rock.

"That'll be the day," the other pilot radioed back with a peculiar German accent and the slightes indication of a laugh. He gave the control stick of his Phantom a jerk, and the plane with the German *Luftwaffe's* "Iron Cross" on it rolled sharply to the right where an even narrower canyon branched off their valley.

The Starfighter pilot almost overshot the canyon and had to engage his braeks to be able to follow the Phantom's turn which cost him valuable speed in his chase. To compensate, he turned on his afterburners, and with a wild roar his aircraft which bore the blue, white and red roundel of the *Royal Air Force* seemed to lunge forward in pursuit of its prey, taking up speed again.

"Joker fuel," a third voice entered their radio conversation. The Starfighter pilot knew that this was the "observer" who occupied the Phantom's second seat. The message cautioned them that they were about to run out of fuel and had to think about returning to Goose Bay airfield. Checking his instruments, the Starfighter pilot pressed his lips firmly together: He had just enough fuel to safely conduct one more run.

But as he looked up again, he found that he was alone. The Phantom was nowhere to be seen anymore. He had only left it out of sight for a moment, but the Luftwaffe fighter seemed to have vanished. The pilot looked around, dividing his attention between the airspace around him, his instruments, and the landscape through which he zipped at neckbreaking speed again. The Phantom was gone.

"Aldi?" he queried into the ether, but the other pilot didn't respond to his nickname. For a moment the Starfighter pilot was worried that his German counterpart might have misjudged a manoeuver and crashed into the mountains. He decided to pull up his machine from the cover of the valley to get a better overview over the landscape they were crossing.

Almost the same instance that the Starfighter emerged above the stark hills their sparse vegetation of grass and heather, his radar warning went off. The pilot under-

stood immediately what this meant and pulled the Starfighter up in an even steeper angle and entered a sharp curve at the same time, but though his plane was more agile than the German adversary, it was too late: The chubby Phantom had left the labyrinth of *cols* long ago and pursued the British plane level above the hilltops of the terrain. The minute the Starfighter had broken from its cover, it had been in the Phantom's sights, and now all the Phantom pilot had to do was pull his trigger.

Both planes' electronics gave a series of sharp beeps which were immediately followed by another curse of the British pilot, and the observer's judgement: "Valid hit on you, Tango Foxtrott!" The German pilot summarized the situation even more tersely, as he laughed: "Gotcha, Jamie!"

Fifteen minutes later, both aircraft had landed at the military airport of Goose Bay again from which they had started an hour earlier. The installation served as an international base for NATO fighter pilots who found here ideal conditions for combat training: The landscape was open, and they could roam it almost at will, whereas the crowded situation in central Europe with its dense network of settlements, cities and roads only left the narrow strips to manoeuver their jets in.

Jamie McMillan, the Scottish pilot of the Starfighter, climbed out of his machine and spoke a few words with the technicians who took it over from him and would make it ready for another sortie the next day. The performance of the high-tech machine had been virtually flawless – that he lost the dogfight over Canada's prairie was the fault of a moment of distraction on its pilot's part. McMillan walked through the hangar to the German Phantom, where its pilot and the oberserver were just doing the same.

"Allright," the observer said after he had taken off his helmet and oxygen mask, under which an unnaturally greyish face was to be seen, "I expect your reports until six tonight. And –" the observer continued after a short pause, "The next time I'd very much appreciate it if you actually considered our safety guidelines not as mere suggestions. Going at Mach 1.2 through Straker's Gorge is definitely *not* in the rules."

"Absolutely, Sir!" both pilots pledged with a display of contrition. They watched the observer walk away to the exit of the hangar with what appeared to both of them as a slightly unsteady, wobbly gait, and traded malicious smiles. Then they shook hands.

"Nice manoeuver of yours," McMillan conceded, but his German counterpart made light of it: "The minute I saw that you'd overshoot at Kanookiaq bend I knew I had you. But that was really close: Twenty knots[1] less or a moment later, and you'd have made minced meat out of me!"

"Still, drinks are on me tonight," the Scotsman insisted in accordance to the deal they'd made at the start of their training term together. Since then they had flown quite a number of simulated missions, sometimes together as each other's wingman, sometimes against each other. When they engaged in dogfights, both of them had had their share of victories and losses. The German pilot thus offered no resistance. "But

[1] A *knot* is equivalent to one nautical mile per hour, a little more than a mile per hour or 1.5 km/h

maybe next time we *should* stick to the safety guidelines", he suggested, "at least a little."

When they made for the hangar's exit to get out of their sweaty flight suits, two men in uniforms of the military police came towards them. McMillan had noted them earlier standing in a hangar corner, waiting for them.

"Captain James McMillan, and *Hauptmann* Albert Mack?" one of the MPs wanted to know when they met, and both of them nodded. "Would you please follow us?" the officer asked, but it was a command in all but the wording.

"What did we do?" McMillan mildly protested, "Speeding ticket?"

"I told you we should stick to their guidelines," Mack replied with a weak smile which couldn't hide the fact that he was concerned. Usually MP didn't intercept you on your way to the showers and the bar just like that.

The policemen stayed tight-lipped and only gave a hint of shaking their heads in response. Mack wondered if he should be a little obstinate and insist on seeing the IDs of the policemen, but then decided against it. What use was a display of token resistance?

"This way, please," the leader of the MP team ordered and lead the way out of the hangar. His partner waited until McMillan and Mack followed him before he brought up the rear of their little parade. The eyes of the aircraft technicians follwed them uneasily.

2 A Very Special Kind of Briefing

Their guards led them to a small, isolated building at the edge of the airfield which was usually used for mission briefings. The barrack was made from corrugated metal mostly, and when they approached it Mack could see that, despite the bright afternoon sun, the shutters of the small windows were closed.

He and McMillan were led inside to the briefing room which looked quite similar to a classroom: A number of rows of chairs faced the front of the room where huge maps, a blackboard and a few display panels hung above a little podium. The podium was occupied by five people. The MPs gave a crisp military salute towards the podium and then took position *outside* the briefing room. The pilots exchanged a glance: That the policemen left meant that it wasn't the pilots who were considered a risk, but that they themselves were to be protected from outside threats. Mack wasn't quite sure whether to be relieved or worried about this.

Among the five people on the podium, the German recognized only one: He was a highly decorated officer, one Air Commodore Henderson, but this served merely to increase Mack's confusion. They had met only very superficially, and Henderson had little to do with the affairs of fighter pilots. As far as Mack was aware, the Commodore was professed with the space programme.

"Gentlemen," Henderson opened the conversation with all the air of a British parade ground officer, lacking only the martinet under his arm, "you will excuse the manner in which we have brought you here; it is owed to the circumstances.This is my aide, Lieutenant Foster?"

Henderson pointed to the second uniformed person on the podium who held a briefcase and a folder in his arms. The other three were civilians, two scientific-looking men in lab coats and a young girl, maybe sixteen of seventeen years of age. *Ein bunter Haufen*, Mack thought to himself. Then Foster began to speak:

"Captain McMillan, Hauptmann Mack, before we proceed, we must observe a small formality. This meeting is to introduce you to a particular mission for which you were chosen. This mission carries a high risk, so we can not order you to accept it, but ask you to volunteer. On the other hand, the mission carries a top secret profile as well, so we can't tell you anything about it *before* you volunteered." He smiled thinly, as if he was embarrassed about this.

With a voice hard as a rock Henderson took over again, leaving no doubts that he felt no need to apologize: "Of course you can refuse, but since we are in a kind of a fix, I have to tell you that your career will be going nowhere if you decide to reject."

Mack and his friend exchanged a glance. *Don't you love the way the military handles democracy?* He nodded. "Happy to serve the fatherland," he said with a touch of irony, and McMillan followed suit. Later, when thinking back on this afternoon, Mack found

he would have accepted the job even without Henderson's threats. Being introduced to a mission in this manner had all the suggestion of adventure, so how could he have refused?

"Thank you very much," Henderson accepted their decision and pointed to the hard chairs which always were too small, especially if you sat down on them in a clunky flight suit. "Please make yourselves comfortable!" he returned Mack's irony. "I have to announce to you that your new assignment will take some time longer than your hitherto scheduled term at Goose Bay. When we're done with the briefing, you will immediately begin writing home to your families and dependants that your term has been extended, and that you will stay at Goose Bay for at least four more months. And of course you will *not* mention your true assignment."

Mack inhaled deeply. How was one to explain an overstay of several months? He made a mental note to find out about laundry services on site.

"Are you acquainted with Project *Cairngorm*?" the Commodore proceeded without as much as a wink. Both pilots shook their heads. "I only know it's a kind of quartz gem, and the name of a mountain range," McMillan muttered. "Good, because otherwise we'd have a considerable security leak." Henderson seemed relieved. He went on: "But you have heard about HUMBOLDT?"

This time both nodded in synchronicity. There was nothing secret about HUMBOLDT, to their knowledge: It was a joint American-European spaceflight project. The Europeans were building what was essentially a small space station. Since their own *Europa* carrier rocket was not advanced enough to boost the station into space or to manage supply flights, the Americans provided their new *Hercules*, a successor to the powerful *Saturn V* which had carried men to the moon and back. In turn, *Europa* would carry a smaller capsule called ARGOS with rotating crews to HUMBOLDT and back. Mack still was at a loss what he and McMillan had to do with that, and what the secrecy was about. But Henderson's next sentence shed at least a little light on it:

"There are reasons that we have to ... 're-dedicate' HUMBOLDT for a different purpose. And there is also a good reason for our American friends not to know about it. Your turn, Professor!" he spoke and handed the stage over to the elder of the two scientific-looking people. The Lieutenant introduced them as one Professor Hilbert from the German Max-Planck-Insitute for Advanced Studies and Doctor Nordström, his assistant. The presence of the girl remained unexplained, but she seemed to be comfortable with the surroundings and, as Mack noticed, familiar with the subject.

"Gentlemen, I may assume that you are familiar with the subject of General Relativity?" Hilbert, an elderly person with somewhat of a belly, rimless glasses and a receding hairline, opened his explanation with an unmistakeable German accent. The pilots nodded cautiously. Of course physics had been part of their education and they new the basic idea behind Einstein's theory – that there was a limit to the speed with which matter or, for that part, any information could pass through the universe, that this limit was the speed of light, and that this was a far more fundamental and far less penetrable barrier than the sound barrier. Mack's knowledge didn't extend far beyond that: Had he been asked to calculate anything in context with relativity, he would have had to give up quickly. But Hilbert didn't seem worried about that. "I don't want to bother

you with lengthy mathematical excurses, but it seems that we have a found a loophole in Einstein's equations, and this loophole would allow us to ..." He was looking for words: "... not exactly *break* the barrier of the speed of light, but to tunnel through it."

Mack suddenly listened with even more interest than before. McMillan next to him gave a surprised whistle: Up until now they had thought that mankind would be forever confined to the solar system, because limited by the speed of light, any voyage to another star would take years or even decades to accomplish. Hilbert's relevations shed a new light on this.

The professor's assistant took over. The doctor was a large man with a kind of sinister expression on his face, but he shared his superior's tendency to baldness. *Is that required for a scientific career?*, Mack thought to himself. Nordström opened with the peculiar Scandinavian pronounciation Mack had hear from Norwegian and Swedish pilots. "Starting with the discovery of pancake vortices around a photon stream, professor Hilbert developed a device which we have called a 'Hilbert slingshot' which allows us to open a tunnel into the *Nebenraum*. The slingshot then can hurl any projectile into the *Nebenraum* which it will traverse in *Nullzeit*, before it re-emerges in conventional space at a pre-determined point."

Mack found it hard to follow Nordström even though he had the advantage over his colleague to understand the German terms which crept into the doctor's explanation. He ventured a guess: "So, I understand correctly, that this slingshot essentially bypasses the light barrier or goes underneath or however you want to express it, and comes up at the other side?"

Nordström nodded: "A bit like an artillery shell which impacts behind a mountain range."

"But it reappears unharmed?" Mack inquired. He had a vague feeling where this conversation was heading.

"Absolutely," Hilbert insisted, "We actually have fired two probes with our slingshots to distances of one light-week and three light-months. We received their radio signals properly after a week and three months, respectively. Since their radio waves travel at the speed of light, this means that they travelled instantaneously."

"Not quite", the girl interrupted, "You told me there was an extra delay of one point three minutes, *Papa*, due to the Mikat-Krämer-*Trennschicht*."

Papa – that explained the girl's presence. She was Hilbert's daughter. And apparently quite advanced in her own studies.

"Yes, dear," Hilbert conceded, "But I didn't want to bother the gentlemen with unnecessary details."

"Indeed," McMillan shouted, "at three months out there, I think we can well accept a delay of a minute and a half."

"Now we plan to continue with the next stage of our research," Nordström took over with what seemed to Mack a slightly malicious smile. "This time we plan to use a manned projectile."

So this was it, Mack thought and felt the adrenaline rising in his blood. What an idea – Were they really chosen to be mankind's first interstellar astronauts? He felt

a bit uneasy about being called a "projectile", but that was nothing compared to the possibilities offered to them.

The Commodore resumed the briefing again. After the more-or-less scientific excurse, he seemed more at home to explain actual plans and proceedings. He unveiled one of the wall panels which until now had been covered with a huge sheet of paper. Underneath there was a design drawing for a large spacecraft or space station. The heading read HUMBOLDT.

"To this end, we will use our space station. Of course, this entails the structural re-design of many components, to make them more suitable for using the Hilbert slingshots," he explained, "This redesign will proceed with the utmost secrecy, at a level of 'Cosmic Top Secret' – which is why we had to use the proceedings you noted." Now Mack understood: The briefing barracks were used because their metal walls shielded them from electronic bugs. And now it was obvious why the shutters were closed, too.

Henderson continued: "Outfitting the HUMBOLDT will take some three months, that is our best estimate. the HUMBOLDT will then make a first excursion to a nearby star, as a 'shakedown' cruise. This will just be a short sortie to assess the suitability of the Hilbert slingshots in general and the HUMBOLDT in particular. Until the ship is ready, we will use the time to train it's crew. You have already volunteered to be a part of it."

Once more, Mack and his Scottish counterpart looked at each other. That went quickly.

"On its maiden flight, the HUMBOLDT will carry a crew of seven," Henderson went on to explain, "It is to be an international team of specialists." For the first time, the Commodore allowed himself a little smile: "Welcome to have you aboard the team!"

McMillan raised his hand: "Sir, thank you very much for the honour. I do have a question, though." Henderson made a gesture for the pilot to proceed. "You mentioned that the Americans are to be left out of the deal, correct?"

Henderson nodded, and Foster said, "The Hilbert slingshots will have an immense technological and of course also strategic impact. We wouldn't want to burden our American allies with considerations about these, before we're actually 100 percent sure of the implications ourselves." Mack smiled weakly. What Foster had said, was: We want to have the lead in this new space race, before the Americans even now there is a race on.

McMillan had obviously already understood this, as he continued with his questions: "But if the Americans are supposed to bring the HUMBOLDT up with their *Hercules* – aren't they going to find out?"

Naturally, Henderson was prepared for this argument as well: "Only if someone talks. Seriously, we plan to delay shipping the HUMBOLDT until the last moment before the launch by inventing technical problems, and stuff like that. That will make sure that the Americans have no time to snoop around to closely."

"At the same time as the *Hercules* launch," his aide Foster proceeded, "*we* are going to launch a *Europa* rocket with a warhead, and bring it to close proximity with the HUMBOLDT, where it will explode. At the same time, we transfer control of the HUMBOLDT to our own mission control. To all the world and the Americans in particular it must look as if the HUMBOLDT blew up during launch. In reality, we'll have all the time to

check out its systems and launch the ARGOS with the crew."

Though Henderson seemed to be a man who didn't show much of his emotions, in this moment it was pretty obvious how proud he was of his plan.

3 Back to School

That evening was Mack's and McMillan's last day in comparative freedom. They were allowed to visit the bar on the airfield and drink alcohol for one last time. The next morning they headed for a plane which brought them halfway across the globe to Woomera, the Australian rocket site. Henderson had chosen this place for several reasons. Foremost of all was that Woomera served to launch the ARGOS into space anyway, so setting up a dummy copy of the HUMBOLDT and training a number of astronauts there wouldn't cause any suspicion. At the same time they were remote enough that there was little likelihood of discovery by the Americans. In return for their support, the Australians could contribute one member to the crew of the HUMBOLDT: He was called Joe Wanamaka, a wiry Aborigine with the typical flat nose and bushy hair of his people and a broad smile and a wry sense of humour, as they were about to find out quickly.

Wanamaka was a Sergeant of the Australian Air Force, and his job on the HUMBOLDT would be to service the ship's nuclear reactor which provided energy and fed the conventional drive whenever they weren't using the Hilbert slingshots. These were in short supply anyway, Hilbert, who had accompanied them along with his daughter to Woomera: They required large amounts of so-called "rare earth" elements, and without attracting undue attention on the world markets, they had only been able to collect enough of the rare earths for four of the slingshots, each of which was able to propel them once through what Hilbert had termed *Nebenraum*, or the "space-next-to-it". But since their first missions was supposed to be only a quick foray into deep space, Henderson had deemed that supply sufficient: One slingshot to fire them to their target star, one to manouever around in it (should they require to cover distances which were too large to be bridged with their conventional drive in reasonable time), one to come back, and a final slingshot as reserve.

The ship's second technician was a Spanish sergeant, Cedric Delgado. Like Wanamaka, he was a short and slim guy, but while Wanamaka was clean-shaven, Delgado sported a moustache and goatee, which made him look like a nobleman from the era of the Spanish empire. This also earned him the nickname "El Cid" after the Spanish national hero of the middle ages. Delagdo was tasked with the maintenance of heating, ventilation and air conditioning on board (or "HVAC" for short), and with keeping the HUMBOLDT's electronics operational.

The crew was complemented by three civilians. Serge Francochamps was a tall, burly Belgian with a shock of blonde hair. Adept at languages like many of his fellow countrymen, he could converse in English, Flemish, French, German and Italian with the ground control crew during exercises, often driving them to exasperation this way. As their expert on cutting-edge technology, Francochamps would be the world's first "as-

trogator". He had to program the Hilbert slingshots to bring them to their destination and back. With the ship's radar and optical systems he would also navigate them within their target system by calculating the firing sequences of their conventional drive.

The Italian Grazia Lombardi helped him with this task. The stout young woman with the dark brown eyes was the master of Schopenhauer, the ship's computer. Time after time Mack had stood in awe when he saw the speed with which she took long tables of numbers from Francochamps' observations during exercise, typed them into Schopenhauer's keyboard and fed the electronic brain punched cards and paper strips of instructions virtually at the same time. The results were so quick and accurate that Mack sometimes suspected foul play, but in the end he had to admit that "Lella", as she was called, was simply an incredibly good programmer who seemed to know every memory cell of Schopenhauer by its first name.

Jeannette d'Assault was the seventh and last crew member. With long limbs and long blonde hair she looked fairly fragile, but like all the rest she had gone through a thorough physical training regimen: She took personal pride in the fact that she had finished a two-mile obstacle course ahead of all the rest of the team. She was a biologist, and her job was twofold: First of all, she would serve as the exo-biologist and examine any life forms they may encounter in deep space – which included trying to make contact with possible intelligent creatures. Secondly she also served as the ship's medic and had to have an eye on the possible physiological effects of the slingshots on humans, a matter on which they currently had no information at all, and which was the subject of many discussions among them in the evenings, when they relaxed from the training.

Mack and McMillan had been chosen for their piloting skills: One of them would be the overall commander of the mission and the pilot of the HUMBOLDT, the other would be in charge of the ship's communication (though Mack could see little sense in that – What were the chances that they'd find anybody out there they could trade their radio call signs with ...?) and their shuttle: Attached to the HUMBOLDT, there was what the aerodynamics experts called a "lifting body", less ceremoniously also described as "a flying bathtub": The vessel was called PETRARCA. It was shaped like a flattened drop of water and had no conventional wings, but used its own body to create lift while it was inside an atmosphere. Equipped with a nuclear drive, it could manoeuver in orbit and touch down on a planet and return to the HUMBOLDT, carrying the pilot, two passengers and some equipment – or, in case of an emergency, the whole crew. But that was an option neither of them wanted to seriously consider, because it would mean they were stranded on a foreign planet. Anyway, Henderson had not yet decided which of "the two Macks", as the German and the Scotsmen were jokingly called, would occupy the commander's seat, and who would serve as PETRARCA pilot.

Their time in Woomera was surreal. Officially, they were the backup crew for the HUMBOLDT, should one of the members of the prime crew fall ill. But in reality Henderson's plan was to tell the ignorant prime crew only at the last moment that their services weren't required, and their jobs would be taken over by the backup team. Naturally, Mack and his men would have a completely different mission profile than was advertised, most importantly in handling the all-important Hilbert slingshots. So they

prepared most of the time seperated from the prime crew, but on the few occasions when they worked together, Mack was embarrassed. The prime crew thought they were about to make history in space flight, while actually they were already sidelined through Henderson's machinations. When it was time to board the flight, there would be a lot of confusion, anger and desperation.

The HUMBOLDT was a huge craft by any definition, dwarving both the American *Apollo* and the Soviet *Soyuz* capsules. It had a cylindrical shape and was as large as one of the *Saturn V* upper stages – standing about 30 meters tall, with a 7 meter diameter. With provisions for a seven-man mission of up to fourty days, the PETRARCA attached and a heavy nuclear reactor with its shielding and fuel, it weighed almost one hundred tons.

At the cylinder's top end, there was a docking adapter for the ARGOSshuttle which would bring the crew from Earth and back again at the end of their missions. Following that there were several decks one below the other: First the "flight deck", the bridge of the HUMBOLDT where all the controls were located. Beneath that there was the "lab deck" where d'Assault and the others had a level stacked full with instruments and laboratories for examining their new surroundings. This was followed by the "habitation deck", or "hab deck" for short, the crew's living quarters. Of course, not much privacy was to be had on a space flight where every kilogram carried to orbit counted, but at least each crew member had a little niche to himself which he could close off from the others by means of a curtain. Hooked to the alcove walls were light sleeping bags into which they could creep to sleep in zero gravity, to avoid floating around and bumping into controls at night. There even was a small locker for personal items. For the crew's convenience, there was a tiny galley to heat up meals, and a table large enough to accomodate all seven of them, so that they even had something like a mess to socialize. A cell which passed for a shower and a toilet complemented the interior of this deck.

There were no solid floors or ceilings, only metal mesh which separated the individual decks. Along the axis of the ship the mesh had a gap, and a steel cable helped people navigating from one deck to the other.

Below all this, there was the "lower deck", which held their provisions of food and water as well as the air conditioning and oxygen recycling plant. These were critical systems which Delgado had to be able to reach quickly in an emergency. Integrated in the lower deck was also an airlock to crawl through to the docked PETRARCAshuttle, and a narrow passage led down to the HUMBOLDT's interiors – the reactor and the fuel cells which provided them with electricity. But because of the heightened radiation levels down there, they would only venture there if anything had broken. At the bottomm end of their craft, a huge nozzle extended into space where the fuel, superheated by the reactor, would expand and drive the ship forward while itself being expelled in the other direction.

Training for the weightlessness of space provided its own difficulties with a ship of that size. The Americans had had great success with huge tanks filled with water, in which their astronauts floated around in almost zero gravity. But the large size of the HUMBOLDT made that impractical: A water tank, thirty meters deep, would have required enormous excavations, and rapidly diving into dephts of thirty meters and back

again caused much trouble with the blood's oxygen supply. Finally Woomera's engineers came up with a system of pulleys and cranes with bungee ropes into which the astronauts were strapped on each deck, so that they moved around almost weightlessly.

Their training regimen was brutal. They had an awful, awful lot to learn, Mack found out. And that comprised not only the completely new spacecraft and the technology associated with it.

For example, during his training as a combat pilot he had had to deal with differential equations to get a basic understanding of the dynamics of airflow and his plane, stuff he could mostly forget afterwards when he flew his plane "by the seat of his pants". Now it was completely different: For example both he and McMillan, the designated pilots of HUMBOLDT and PETRARCA were confronted with a set of data, like the size and mass of a planet they're supposedly orbiting, plus their orbital parameters like their current speed and altitude. Then they were asked to find out fuel consumption and time required to alter the orbit to a different set of parameters, once by calculating it exactly, a second time by giving a rough estimate on paper, and finally by making an educated guess in his head! There were evenings when he had the feeling that the slide rule was glued to his hand, and he couldn't let go.

But of course, that wasn't all. In an emergency, each crew member had to be able to fill in for any other, so everybody needed to have a basic understanding of all other jobs. To achieve that, the astronauts were encouraged to teach each other the basics of their special fields. After d'Assault's lessons, for example, they all had a working knowledge of antibiotics, how to apply a tourniquet and how to give each other injections. For days all of them had bruised ellbows. McMillan saw his colleagues through simulated landings with the shuttle, and Wanamaka made a lasting impression when he explained with a broad smile that, technically speaking, all the time they would be flying atop a fairly powerful atomic bomb, and that even slight mistakes in controling their drive could turn them into a tiny nova quite quickly. That was sure to catch everybody's attention.

The consumption of coffee and tea rose considerably. Constantly Woomera's psychologists were hovering above them. Henderson had made it clear that it was enough if *one* of them didn't seem to be up to his task, that he or she would break under the strain of a mission, that the psychologists were empowered to cancel the whole operation. There were no backups for the individual positions, so either the whole team would launch, or none of them would go, and the whole flight would be scrubbed. Mack noticed this seemed to make everybody work a little harder, and one on occassion, when they were all having diner together, he made a remark to the effect that maybe that was the whole point – maybe regardless of individual weeknesses, the launch *would* go ahead under all circumstances, but it was a trick to make them put their noses deeper into the books. Then he saw how the psychologist observing them made a few notes in his notebook, and decided it might be wiser to keep his trap shut.

4 Decisions

Almost constantly together with the team was also Lia, Professor Hilbert's daughter. Mack didn't quite understand why she was allowed on site, but she attended as many of the classes and trainings as was possible, observing and sometimes even discussing matters with the astronauts and technicians. She was quite sharp and always seemed to ask the right questions. Despite her young age, she was also socially adept, talking as well as listeing. If things went as they all hoped, she would one day make a damn fine captain of a spaceship, he decided.

As for himself, Mack found that he seemed to be slacking at some of the exercises, especially the simulations where he sat in the commander's chair of the HUMBOLDT. He seemed to be irritable and poorly focused, which of course reflected on the crew he had to lead in the simulation. This puzzled the pilot, because up to now he never had had problems in leading people, or decision making. At a point some four weeks before the launch of the HUMBOLDT, he decided it was serious enough to talk with one of the psychologists about it – he would have felt extremely bad if it would be his poor performance which in the end would force them to scrub the mission.

As Mack entered after a long day of work, the psychologist was sitting behind his desk, surrounded by piles of paper and a number of textbooks on psychology and medicine – but also some engineering volumes. Apparently the "shrink", as Henderson referred to the doctors, also tried to be up to par with the technical aspect of the astronauts' job to be able to better assess their behaviour, something Mack really appreciated. The sun was low on the horizon and cast long shadows throughout the tiny office.

Mack explained what bothered him.

"I see, *Herr* Mack," the psychologist answered. With the same uncanny precision with which Lella Lombardi punched Schopenhauer's keys when she entered a new programme, his hand jabbed forward halfway into a stack of printouts and dragged out a folder which he began to peruse.

"I see," the medic repeated after he had scanned the pages, "Indeed, your performance rates worse in the command scenarios than on other occassions," he confirmed Mack's gut feeling, before cautioning: "Not *dramatically*, but *significantly*."

"Am I doing much worse than McMillan?" Mack wanteed to know out of curiosity. They had been told that they were the only two candidates for the commander's chair of the HUMBOLDT, but maybe Henderson and his men were already considering a third option – Francochamps, possibly? The physicist-engineer had shown that he was capable of taking things into his hands. Or maybe even the French biologist d'Assault?

The psychologist smiled wryly. "I'm afraid I can't answer that, Captain." He then dropped the papers and leaned back in his chair.

"But to be honest, we've discussed the situation with you already. Interestingly enough, it seems that whenever you're on your own, you're perfectly capable of handling the scenarios. Only when you're supposed to be leading the crew you begin to act erratically." He made a little pause. "I have developed my own little theory as to this."

He leant forward, inviting Mack to do the same, and lowered his voice to a conspirative whisper. "Captain, is it possible that you experience a blockade about this job – that you don't really *want* to be the HUMBOLDT's commander?"

It struck Mack like a relevation. He hadn't really pondered that, but now that the psychologist invited him to consider the possibility, he found that it was absolutely the case: In a pinch, Mack was able to deal with most of the scenarios hurled at him, but preferrably he let somebody else do the decision making.

"Besides, looking at your results," the psychologist continued as Mack nodded, "you constantly excel when it comes to piloting the PETRARCA. If you want my opinion – which you apparently do, otherwise you wouldn't have come to me – you really want to fly the shuttle. And you're subconsciously afraid you won't get to do that if you're in the responsibility seat."

"Actually ..." Mack stuttered, then stopped mid-sentence. Yes, that was it: He obviously hadn't had a chance to fly the PETRARCA for real, but he had always been excited during the simulation rides. If the simulator was anything like the real shuttle, it was an absolutely amazing feat of technology, maybe even more so than the HUMBOLDT itself, and flying it into the atmosphere of a strange planet or moon would the the ultimate thrill of a pilot's career. He was a *pilot*, Mack learned, not a *commander*.

He spoke somewhat about it with the psychologist, who confirmed his notion. He was shown some evaluation charts which, from the start, showed Mack's attitude towards the different positions in the crew's hierarchy.

But he wondered: "If I don't show enough ambition to get the job of commander, isn't that going to reflect badly on me? Or on the crew as a whole?" He was still worried that his poor performance might lead to a cancellation of the mission, a possibility which hung above them like the proverbial sword of Damocles, but the doctor reassured him:

"On the contrary. As a matter of fact, you can easily imagine what a chaotic plave the HUMBOLDT's flight deck would be if all of you scrambled for the commander's chair. If you don't have any ambitions of being the crew's *alpha* male, don't think of yourself as a lesser man. All our experiments have taught us that a well-composed mix in the crew is best. Just think, if you were the 'crown prince' intent of taking over from the current commander, you might even encourage him to make a wrong decision, or hold information back from him to see him fail. In the end, that wouldn't help anybody."

Mack felt quite relieved with that information. But before he took leave to return to his quarters, the doctor had another word of caution for him: "Of course, there is one drawback to this. After all, this is the military, and currently you and McMillan both hold the rank of captain, or *Hauptmann* in your case. Naturally the HUMBOLDT's commander must hold superiority to the rest of the crew, which means that McMillan will be promoted to the rank of major before the start – including the highter pay grade."

The newly designated PETRARCA pilot smiled: "I can live with that."

"I thought so," the psychologist returned the smile, and they shook hands. "Come again anytime, if you have any open issues."

It was now 48 hours before the *Europa* rocket should launch with them on top to rendezvous with the HUMBOLDT. Henderson had called the crew for a meeting in one of the conference rooms at Woomera after another hard day of honing their spaceflight skills. At least Henderson had given them time enough to shower, eat a little, and slip into comfortable clothes. But still the seven were worn out and tired as they arrvied one by one – and nervous. As they took their seats, with Henderson and his aide Foster at the front of the room, subdued voices wondered what the reason for this meeting was. Mack looked around: Neither the overhead projector nor the blackboard at the meeting room's front were prepared, so Henderson apparently didn't have much information to provide. The commodore himself held only a slim folder with a few sheets of paper, Foster was completely empty-handed. Notable was also the absence of the psychologist team which for the last three months had constantly been hovering above them. Hilbert and his engineers had already left for the States to supervise the mating of the HUMBOLDT with its *Hercules* rocket.

After everybody had found their chairs, Henderson opened to address the little assembly without much ceremony:

"Miss Lombardi, Miss d'Assault, gentlemen, I have called you for this little meeting at the end of your training regimen. I hold here the final assessment of the psychologists regarding your test results and suitability for the mission. As you remember, since we have no backups for any of you, we're pursuing an all-or-nothing policy, which means either all of you will be going up on the mission, or, if you don't meet the shrink's requirements, none. They have set a limit of 700 points, below which I was advised not to proceed." He made a dramatic pause, which was completely out of character for the hard-as-rock no-nonsense officer they had come to know and, grudgingly, appreciate.

"I have bad news for you, and good news," he then continued. It was quiet enough in the room to hear a pin drop, and then he dropped the bomb: "Your accumulated score is 689 points, and the shrinks told me it's a no-go."

A moan ran through the group of seven people. Someone threw a pencil in disappointment across the room, another slapped his hand angrily on the table, and a third one cursed under his breath. Mack folded his arms over his chest. So, this was it. No spaceflight. No bold explorers in foreign star systems. No ride in the PETRARCA. All this a waste of time.

Henderson harrumphed to get people's attention back, and then proceeded: "Luckily for you, I have more faith in you than in the psychologists, and I have always found the 700 points limit quite arbitrary, considering we don't know what to expect on the mission. So, as the one with the final say, I overturned the shrinks' decision: HUMBOLDT has a Go, we will proceed with the mission as planned."

Cheers broke out, and the seven astronauts lay in each other's arms. Foster's voice could hardly be heard as he tried to restore remnants of order: "Your countdown is

now at 47 hours and 53 minutes. You have leave until dawn."

5 Go for Orbit

Far, far below him, the mighty engines of the *Europa* rocket woke to life with a roar like a giant wounded beast. Mack couldn't help thinking what every astronaut thought at his first ride – *Every part was bought from the cheapest bidder ...*

A shudder ran through the rocket, a vibration first, then a trembling and an increasingly more violent shaking, and finally it felt as if a huge fist pushed the rocket upwards, and Woomera flight control was heard in Mack's earphones: "We have liftoff!"

Like a lift that didn't stop accelerating skywards, the *Europa* with the ARGOS module and its seven passengers zoomed faster and faster skywards. Mack had had his share of wild flight manoeuvers in a variety of jets, but this was something completely different again, something for which no simulation could prepare him. He closed his eyes, because without windows, there wasn't enything to see from their capsule, and the rocket was controlled from the ground at Woomera anyway.

"Pogo oscillations" built up. He had been warned about this: The *Europa* wasn't constantly accelerating anymore, but seemed in turns to be violently pushed forward, and then to fall back again. It was a problem with many large rockets, because when accelerating upward, fuel was pressed to the bottom of its tanks and subsequently fed into the combustion chambers with increasing force – leading to higher thrust, and another raise in the fuel feed. This went on until the engines flared out for a second, acceleration dropped, and the cycle started over again. Rockets could be torn apart by these "pogo shakes", but the *Europa* engineers had assured them the problem would last only a few moments.

Mack thought back over the last two days they had spent on Earth – how imperious that sounded, "back on Earth"! They were told to write letters home to their loved ones one last time, telling them that they'd be on an "extended training mission" and would be out of touch for some time. To make it appear genuine, the letters were re-routed from Australia to Canada, before being sent back to their recipient in Europe. Then they bundled up their personal belongings and passed them to storage until the time they'd return.

Then Henderson had given them their final flight orders, revealing their destination. The HUMBOLDT was supposed to go to a star with the quite unceremonial official name "61 Virginis". Some astronomer with a background in Robert Heinlein's science fiction had suggested the informal name "Humpa" for it, and it stuck. Humpa was located some 30 light years from Earth in the constellation Virgo, and it resembled the sun in many ways, which gave the astronomers hope that it would also be surrounded by planets – maybe even an Earth-like planet.

They "Galileo Seven", as the crew referred to themselves now, received a scientific programme to perform while at Humpa which was supposed to occupy them for about

a week, but since there were so many unknowns involved, McMillan had permission to extend their stay to up to fourteen days. After that, he was supposed to return, but Hederson avoided the question what Earth was supposed to do if the HUMBOLDT didn't show up on time: As to the crew's knowledge, there were no more Hilbert slingshots available and no second ship prepared, so there was no hope for a rescue mission. The HUMBOLDT was equipped with food, fuel and consumables for fourty days. That was the time they had to make their way back home.

Mack received what felt like a severe jolt forward throwing him into his harness, but he knew that that really was just engine shutdown of the first stage, and the acceleration had stopped. For a few seconds, everything was eerily quiet after the roar of the engines, as their rocket hurled on a free-fall parabola through the upper reaches of Earth's atmosphere. Noise from the rear indicated stage separation. The protective covers of their ARGOS capsule were blown away, and for the first time they could look outside through tiny porthole: The sky was a dark purple with pinpoint stars in between. Earth was behind them and invisible.

Mack waited. They were still far too slow to keep up in orbit and would fall back to Earth rather unceremoniously unless ... the second stage kicked in. Another roar, another burst of tremendous power behind them, and they made progress again. Some chatter on their earphones informed them that they were doing fine, steadily gaining alitude and speed.

Only an hour before their own launch, at Cape Kennedy the *Hercules* with the HUMBOLDT on top had been launched. Henderson's compliacted sequence of events – the launch of the spaceship, the simultaneous launch of the decoy at Woomera, and the explosion of the decoy next to the real HUMBOLDT – apparently had worked out and baffled the Americans, how their prized new *Hercules* carrier rocket could fail so desastrously. they had had no indication of malfunction, except that the performance of the *Hercules*' engines mysteriously lacked somewhat – as if the rocket's payload was about fifty kilograms heavier than calculated.

The second stage shut down, and the third and last stage took over. By now, only a fraction of the initial mass of the rocket was left, and the ride was much smoother and softer than at the beginning. After all, they had left Earth's atmosphere with its sometimes violent crosswinds behind themselves. Mack looked around, and his eyes met McMillan's. He laid in the centre of the top tier of three couches, with Mack and Francochamps to the left and right of him. Below them, a second level of couches was occupied with the rest of the crew, along with the last-minute addition of one "Yuri" in a specially padded cage.

Yuri was a "Currawong", a raven-like bird of Australia which was very common around the Woomera are, and the technicians had thought a tame specimen would make a good mascot for the flight of the Galileo Seven. They didn't have the heart to reject the bird which was named after Yuri Gagarin, the first human in space, and since they were told that he was actually housebroken, they accepted.

"Everybody okay?" McMillan inquired, and a series of affirmations was the response – Even Yuri gave a kind of moaning call from within his cage. The commander passed the result of his little poll to the ground station, just as the third stage stopped burning

as well and detached from the ARGOS.

"We copy you're doing fine," Woomera responded. "Orbital insertion for you is complete. You are 43 kilometers behind HUMBOLDT and 2.5 kilometers below target." The operator gave them a number of other orbital parameters which McMillan jotted down on a notepad. As planned, they were trailing the HUMBOLDT on a slightly lower orbit. This meant that their orbit around Earth was shorter as well, and so they effectively took up with the HUMBOLDT without having to do anything.

Francochamps engaged the radar, and almost immediately they got a signal from the HUMBOLDT, and looking out through the porthole, Mack could see a single star dead ahead – this had to be their target! Over the course of a few minutes, the star grew brighter and finally took on the appearance of a little disk, until Mack could make out the cylindrical shape of their new craft.

Currently, there was little to do for Mack. McMillan was doing the manouevering of the ARGOS, while Francochamps was checking their orbital parameters and the radar signals, so Mack took out a camera from the overhead compartement and shot a few photos of their ship as they approached. After all, their trip had to be documented as well as possible. He also took the opportunity to take a few shorts of his crew comrades, as far as the cramped space in their capsule allowed it.

Distance to the HUMBOLDT had shrunk to less than one-hundred meters, and Mack for the first time realized how huge it was. Compared to this, the American *Apollos* and the Russian *Soyuz* looked like phone booths. They had a veritable mobile space station for themselves . . . !

By now, Woomera had turned on the HUMBOLDT's rendezvous radar by remote control. This made the final approach much easier for McMillan, who had pulled down a kind of periscope to help him with the last crucial minutes of navigation. He lined up the ARGOS' nose cone with the front section of the HUMBOLDT, and rolled the ARGOS gently around its longitudinal axis, until their "up" orientation was the same as the HUMBOLDT's. Now they were only some twenty meters apart.

"I'm giving it a final push," McMillan spoke softly, as if to himself only. He was completely absorbed in his delicate task. His fingertips nudge the ARGOS's control stick, the thrusters responded with a small hiss, and the two vessels moved towards each other. McMillan's fingers hovered over the control stick, in case he had to abort the manoeuver in the last second. "Steady now," he said.

Then there was a metallic "clank" sound, and the ARGOS shook for a second. "Capture!", Francochamps exclaimed with an excited voice that was unusual for him. He flipped a few switches, and an electric motor at the very tip of the nose cone began to whirr for a few seconds. Then the Belgian gave the signal they had been waiting for: "We have hard docking!"

They cheered and clapped hands in the capsule and heard in their earphones that the team down at Woomera did the same. But there was no time for extended celebrations. Rather, time was of the essence, because the Americans wouldn't sit forever

and twiddle their thumbs. Most probably they'd be trailing their telescopes to the sky quite quickly to find out what happened, and the HUMBOLDT was large enough to be detected easily.

So McMillan unbuckled quickly and moved to the very tip of their conical capsule where the docking adapter was located. He openend the hatch, and light streamed in from the well-lit HUMBOLDT while pressure between the two vessels equalized with a hiss. As the others followed suit in unbuckling, Mack began to perform his last job on the ARGOS: He shut down all the capsule's systems to put it in a state of hibernation. If everything went okay, they wouldn't need to ARGOS anymore until they returned from Humpa and would start their descend down to Earth.

One after another they transferred into the HUMBOLDT by floating more or less gently through the docking tunnel. They didn't have much time to savour the new feeling of weightlessness they had experienced hitherto only for short intervals in parabolic plane rides. Likewise, they couldn't admire the huge interior of their new home for long, although they now saw it for the first time for real, not just in a mock-up replica: It was time to get the HUMBOLDT ready for flight, and to arrive at the "Go/No-Go" decision, whether to proceed with their mission or to abort it.

Wanamaka and Delgado dove right through the central openings in the floors mesh to the lower decks where the engineers would check out the nuclear reactor which was their primary power supply and propulsion system, as well as the other electrical systems. D'Assault followed them but stopped at the level of the lab deck to assess the state of their scientific equipment and instruments. Up on the flight deck, Francochamps took readings from his instruments and passed long strings of numbers to Lombardi who had taken her seat in front of Schopenhauer's console. Together they would program the first Hilbert slingshot for the paramount shot through the *Nebenraum* towards their destination.

Mack communicated with Woomera and passed on further data for the astrogator's task from the tracking stations, while McMillan throned above them in the flight deck's central couch, coordinating the incoming messages and taking readings from his own instruments. Mack was immensely proud of their crew as they set a new record for the Go/No-Go decision check on the HUMBOLDT and were even faster than they had been at the ground simulations. Only little over thirty minutes after they had opened the hatch to the HUMBOLDT, all crew members had given their assessment and had buckled up in their seats on the flight deck again.

"HUMBOLDT, what's your status about Go/No-Go?" Woomera finally inquired.

"We have a Go for all stations," was McMillan's answer.

A brief silence followed. Then the ground controller at Woomera replied tersely: "Copy. Godspeed, HUMBOLDT!"

McMillan flipped the switch which engaged the first Hilbert slingshot.

6 Stowaway!

Mack came to his senses with a feeling like one of the worst hangovers he had experienced in his life. He was dizzy, his head hurt, he felt like vomiting, and there was a metallic taste in his mouth.

The reason for that he could readily understand. He drew his hand across his mouth and watched it with eyes which had a hard time focussing, but then he saw: There was blood on his fingers. Obviously he had bitten on his lips the minute McMillan had engaged the Hilbert slingshot. Mack coughed and found he had a sore throat as well. How long had he been out? He checked his watched quickly: Apparently less than a minute.

But as people stirred around him, his spirits were lifted: They were alive.

That hadn't been taken for granted, because the effects a quantum shock would have on a living body were naturally far from understood. *It seems*, Mack thought to himself, *it takes its toll on people. But we have survived.*

"Roll call," he heard an order from McMillan's chair. It sounded as if their commander was experiencing a hard time as well. Mack smiled grimly.

After a few seconds, all seven of them were accounted for. Like Mack, each one of them felt "under the weather" one way or another, but none of them was unfit for work, and already within these first moments, they were beginning to recuperate. So, this was what interstellar spaceflight was like – not exactly a joyride, but manageable.

They set about checking out their stations. Like the living beings, it was quite conceivable that their delicate electronic equipment would have been damaged by what Hilbert had termed "quantum shock," the side effect of doing a jump with a Hilbert slingshot. As far as Mack understood it, it was somewhat like the sonic boom generated by a plane flying faster than Mach 1, but related to light speed, and on a quantum level. This meant that for the minute they were alive and kicking, but whether their ship was still flightworthy was something they still had to find out.

For the first time since their launch, the German became aware of weightlessness, of the odd feeling of falling through a bottomless space without taking up any speed, even though he was still buckled up in his seat. After the *Europa* enginges had cut off, everything had to be done in a hurry, and he had been so focused that he had almost been in a state of trance. Only now, with Earth far behind them, did he allow himself to take in the oddity of their surroundings. He glanced quickly at one of the small windows which allowed them to peer into space.

It was pitch black, but what had he expected? That they'd emerge from hyperspace right in orbit around a planet? They weren't even sure whether Klendathu would have any planets, far less what their orbital parameters around their sun were.

Mack began the checklist for his station, while Wanamaka and Delgado unbuckled.

The engineers hovered above them, and Mack's gaze followed them as they grabbed hold of the pole running along the central axis of the HUMBOLDT and disappeared through the gridiron floor towards the lower decks. Mack's checklist was shorter than the one of his colleagues, and he could proceed through it almost automatically. There wasn't terribly much to do as far as communication was concerned. Later Mack would also dive to the lower deck and make sure the PETRARCA was in good condition, but since their shuttle wasn't essential for their safety, that could wait.

They had been so busy with learning, training and the launch preparations, that they had hardly had time to think what they were actually doing: The were the first human beings to venture farther out than the Moon's orbit, to jump across the void between star systems and to arrive in the vicinity of a different sun, trusting the fragile and unproven systems of their somewhat ramshackle craft. They had no idea what to expect in the Klendathu system: Would there be a developed civilization with which they could establish contact? Any kind of life? Would there be any planets at all, or was Klendathu a lonely maverick, crossing their corner of the galaxy by accident?

D'Assault had made sure that none of the crew required her medicinal assistance, then she followed the engineers, diving down to the lab deck to see whether all their scientific instruments were still intact. But Francochamps, sitting next to Mack, was startled. Mack sensed that something wasn't right, and automatically got tense.

Francochamps was looking through what seemed at first glance to be a kind of periscope, but what was really a telescope. The optical tube of the telescope ran through the side of the ship, and with a remote-operated optical head, the astrogator could look in different directions and changed the magnification of his image. He appeared puzzled.

Like any good commander, McMillan quickly noticed the tension Francochamps and then Mack and even Lombardi exhibited. The computer engineer had interrupted her checkout of Schopenhauer to look at Francochamps when McMillan dropped his own checklist and turned his attention to the astrogator.

"What's the matter, Serge?" he inquired, not sure what to make of the situation.

The Belgian took his face from the telescope's eyepiece and returned McMillan's looked. His expression showed something like embarrassment.

"I hate to say it, skipper, but I can't *find* Klendathu," he cried.

"Allright, no reason to panic," Mc Millan advised, and Mack wasn't sure whom he really addressed. He exchanged glances with Lombardi, before the commander continued: "Probably we've simply miscalculated with our first slingshot and ended up someplace we didn't expect. We can correct that with the others we've got. And in a worst case scenario, if one shot with the Hilberts brought us here, a second shot can bring us home."

Francochamps, who hadn't been so much worried but rather puzzled, turned his attention back to the telescope scanning the sky. The intercom crackled, and Wanamaka and Delgado reported from the lower deck. It seemed as if either the launch or the Hilbert jump had mechanically stressed components, and some pipes had developed leacks. Nothing serious, but worth keeping an eye on.

In the meantime the astrogator had switched his optics and introduced a prism into

the light path. He murmured something in his native Flemish language and grabbed a folder from a rack which he browsed intensely. Mack understood what he was doing: The prism split up each star's visible light into a spectrum, and each spectrum exhibited dark lines which were characteristic for the chemical composition of the star's atmosphere and hence helped identify the star. It was really a kind of astronomical fingerprint.

After a few minutes, Francochamps emerged from his intense checking and counterchecking of the star catalogue and the pictures he got from his telescope.

"I think I've got a fix, skipper," he announced.

"So, where are we?" McMillan wanted to know.

"We're considerably of course, though nothing we couldn't rectify," the astrogator explained, "If I'm correct we are in the vicinity of Klendathu. But while we expected to arrive within a few light minutes from the sun, we actually seem to have fallen short by thirty light *hours*."

Mack whistled between his teeth. That was considerable. But no cause for alarm yet.

The astrogator meanwhile fed the image from the telescope to a camera and projected it on a monitor. In the center of the crosshairs there was one star visible which was somewhat brighter than the others – that was their destination? Their plan had been to resurface in a distance to Klendathu comparable to that from the Earth to the Sun. Since Klendathu was similar to the Sun, they should have seen a huge, blistering orb ahead of them. But thirty light years meant that they were about ten times as far away from Klendathu as Pluto, the outermost planet of the solar system, was from the Sun. Klendathu from here was really just a star among others, and not even a particularly bright one.

"Alright," McMillan replied. It was obvious that he didn't like this development, and Mack understood immediately why: Not only did their equipment not work nearly as reliably of precisely as they had expected. In additon, since they were so far away from their destination, using the HUMBOLDT's conventional drive was out of the question to bridge the gap to Klendathu . That would require too much fuel and time – but this meant that they would have to use up another of the preciously few Hilbert slingshots they had for the last leg of their flight. "Check your results again, Serge," their commander ordered, "And when you're done, I want a calculation for another Hilbert jump to our target point."

"Understood," Francochamps replied. He had jotted a few numbers on a notepad and now showed the result of a small calculation to their commander. "One thing I noted: Our jump ended 0.5 per thousand short of our calculated destination."

"So, what's the significance of that?" McMillan wanted to know.

"That translates to an extra mass of the ship of around 50 kilograms," the astrogator replied. "Do you remember the performance of the *Europa*'s engines?"

Of course McMillan remembered, but there was little he could do about it now.

A kind soul had in the meantime thought of Yuri, and the raven-like bird was released from its captivity. It took the Currawong some time to get acquainted with weightlessness. Already on Earth Currawongs were considered notoriously poor fliers which left the impression of being drunk and neartsighted. It wasn't much better during Yuri's first minutes in the HUMBOLDT. The bird almost comically tried to get its bearings, but after a while began to understand the changed situation and then really seemed to enjoy himself, exploring its new home.

Somewhat uplifted by Yuri's display, Mack almost forgot about the setback of their manoeuvering problem. He was done with his checklist and unbuckled himself from his seat to check out the PETRARCA.

Like Yuri, Mack needed a few minutes to come to terms with weightlessness. Of course, even before his astronaut training he had experienced moments of weightlessness in his *Phantom*, but this had always only lasted seconds, and he had been strapped in his seat. Parabolic flights during his preparations for this mission had seen him floating in a large plane in free fall, but even this had been limited to a minute or so. Right now, the free fall felt unendig, which was both confusing and disconcerting.

But if Yuri could handle it, so could he, Mack decided. He focussed on the job at hand, pushing himself gently over towards the center pole, grabbing hold of it, and then pulling himself "downwards" towards the lower deck, though of course the terms "up" and "down" were as meaningless as "East" was at the North Pole.

After a few seconds he had reached the lower deck and exchanged a few words with the engineers. Delgado and Wanamaka wanted to know what the problem with their Hilbert jump was, and Mack gave them a brief account.

"Do you think it iis serious?" the Spaniard wanted to know in his peculiar accent.

"Cid, I'm not sure. Even if we have the same error on the way back, it wouldn't be a desaster – provided we still have fuel and oxygen left, we could limp back to Earth from that distance," Mack replied. "But of course it doesn't exactly give you faith in the slingshots."

"Do you think we should have a look at the other three slingshots?" Wanamaka suggested, but Mack could only shrug. As far as he knew, none of them had special training with the slingshots – they were just considered a given. Fiddling with them might worsen their situation. And anyway it was McMillan's call.

Mack left the others. By now the whole body of the ship was vibrating, pulsating with a peculiar hum. They had nicknamed it the "heartbeat" of the HUMBOLDT, a characteristic "pom-pom" sound which ran along the hull of their vessel at about half the rate of a human pulse. At first, Mack had been worried that something was amiss with the HUMBOLDT, but Delgado had assured him that this was only the consequence of their nuclear reactor which served as their main propulsion unit, but also provided the energy for climate control, ventilation and all their instruments. The pumps drove coolant through an intricate design of pipes and turbines with around thirty strokes a minute, or more, if more power was required, and this was what they heard and felt. Actually, *not* hearing the sound anymore would be a cause of concern, because that would have meant that the reactor was down. They had fuel cells to bridge failures of the nuclear pile, but they lasted only a few hours – "Using them is like the HUMBOLDT

holding its breath," Delgado had explained.

The pilot entered the small airlock near the hull of the HUMBOLDT, outside of which their shuttle was docked. He had been worried that the shuttle would have been torn off by the forces of the Hilbert jump, but of course that was absurd. The idea of the Hilbert jumps was exactly that ship, crew and equipment would *not* be subjected to the usual effects of mass, momentum and force. The indicators on the airlock's inside showed that everything was fine.

After closing the inner hatch of the airlock, the outer one could be opened easily by the pilot, which meant that the airtight seal between the lock and the shuttle's hull had held. Now the silver hull of the PETRARCA lay only a few centimeters before him. In a third step, Mack slid the hatch on the shuttle's back sideways to get a good view of the interior of the little craft. The narrow tunnel opened sideways to the pilot's cockpit, and downwards to the two passenger seats and the small cargo space.

Mack's hair stood on end, and he immediately stopped the gliding motion with which he had been about to enter the PETRARCA. Something was *wrong*, terribly wrong, although he couldn't immediately point to it. He sniffed. The air in the shuttle was clammy, somewhat cold and stale, but he couldn't smell any dangerous fumes. Then it dawned on him: He smelled *sweat* – the unmistakeable smell of a human being. This was followed by a muffled sob.

Without a second thought Mack dove into the tunnel. The interior of the shuttle was pitch black, because all its electrics had been turned off for the flight, and the cockpit windows only showed the starry night sky around Klendathu. He turned on the backup batteries, and the emergency lights bathed the ship in red light: In the cargo room, there was the slim shivering silhouette of a girl, curled up against a corner, grabbing hold of one of the pipes, and apparently oblivious to the arrival of the pilot. "*Was zum . . .* " he muttered under his breath, then he quicky made his way back to the airlock and punched the button which activated the ship's intercom.

"Jeannette, I need you down here, at once. We have a stowaway!"

7 Seven-plus-one

Naturally, Mack's call had been met with incredulty. As their medic, Jeannette d'Assault later recalled, at first she thought that he had inhaled noxious fumes and had hallucinated. But after a minute when she had made her way to the small cargo space of the PETRARCA, she could confirm his story.

The girl turned out to be Lia, Professor Hilbert's daughter. Somehow she had managed to make her way past guards and posts, engineers and technicians and had hidden away in the cargo bay just before launch. Caught in the dark, unventilated and unheated space, she had made it through orbital insertion and the subsequent Hilbert jump but only God knew what she had gone through in those hours.

D'Assault and Mack had brought the girl into the warmth and light of the HUMBOLDT, where she slowly gathered her senses. After a brief examination by the medic, the crew made her a hot meal and brought her hot cocoa for which Francochamps even sacrificed some of the treasured chocolate he had brought with him. She ate and drank in silence and then, completely exhausted by the ordeal, fell asleep in mid-sentence. It was a weird sight, because in the weightlessness her head naturally didn't drop to her chest, and she didn't let go of her fork. Rather, her movements slowed down, her eyes closed, and then she hung motionless in zero-gravity, like a mechanical toy that had wound down.

Lombardi had cleared her private bay for Lia, and they had tucked her passed-out body into the sleeping bag not without difficulties before they clipped her to the walls and closed the curtain. Now, as the crew sat around the mess table, soft, rhythmical snoring could be heard from behind that curtain.

McMillan looked sternly at his crew members. The implications of a stowaway on board – a minor to boot! – were far-reaching. Naturally, this case hadn't been covered in the commander's instructions.

"So, how is our passenger doing, Jeannette?" he inquired in a subdued voice, as if not to wake the teenager.

"So far so good. She had no couches to cushion the effects of the G-forces during launch, she couldn't buckle up during manoeuvering and especially during the Hilbert jump, so she got bruised and battered quite a lot," the medic answered, before showing a thin smile. "But she told me she does judo on a regular basis, that probably helped her somewhat. She is a purple belt."

"No amusing anecdotes, please," McMillan cut her short in a no-nonsense tone, "Is she alright so far?"

D'Assault took the hint. "A few cuts and bruises, but no concussions, as far as I can tell. She got hypothermic and dehydrated in the PETRARCA, but I daresay after a good night's sleep she's going to be a happy camper again tomorrow." The cold and the

thirst wouldn't have a lasting effect on the girl.

"Fine," McMillan said, "Did she say anything what on Earth made her hide away in the shuttle?"

"Do you really need a reason for that?" Delgado interrupted. He beamed broadly. "If you were a teenager, if you had access to the launch site by virtue of your father, if you could pass the controls with the background knowledge you caught over the months – wouldn *you* have passed the change to go on an adventure like this?"

"Cid, you seem to think that this is just a boating trip down the lake. It's not. It's deadly serious. We all can lose our lives like that!" the commander growled. Delgado became more serious.

"If you're – How old is she? Fourteen? Fifteen? – it *is* a boating trip, and of course she feels she's immortal," he replied.

Francochamps, who had quietly done some calculations on his ubiquitous notepad, interrupted: "On the upside, we now know what happened to our Hilbert jump, and during our launch. Assuming Lia weighs about 50 kilos, she has increased the mass of the HUMBOLDT by roughly 0.5 per thousand. This is exactly the amount the *Hercules*' engines missed, and the distance our jump fell short."

"In other words," McMillan completed his line of thought, "both the *Hercules*' drive and our Hilbert slingshots worked correctly?"

"To the precision of our measurements," Francochamps confirmed.

"Either way," Lombardi interrupted him. The computer engineer continued, "I suspect we will immediately return to Earth? I mean, we can't endanger Lia any more, can we? She's a child?"

"That's exactly the question I want to discuss with you." McMillan looked from one to the other again. "I'm not really prepared for this situation, so I want to deal with this by consensus with you. After all, if we turn around now, it's going to affect all of us."

Mack was surprised by this development, since he had expected McMillan to decide the matter by himself. But of course, it made sense to seek the advice – and confirmation – from the other crew members. In the end they weren't so much a military commando, but had become a band of friends during their training.

"If we stay here, all the risks we take upon us will concern Lia as well, and all of you know that that means a lot of risks. Neither the HUMBOLDT nor the PETRARCA have been flight-tested, not to mention what we might find in the Klendathu system.

If, on the other hand, we fly back to Earth now, I have no idea how long it would take before they would have assembled enough Rare Earth material for another mission, if a second mission would be considerd worthwhile at all, or if we would be chosen as its crew again."

"Not to mention," Mack chimed in, "that there'd be plenty of people telling us we bailed out too quickly, and we'd given up too readily. And maybe they'd be right. After all, this flight did cost quite a lot."

He could vividly imagine the storm of criticism they'd have to face if they were considered "quitters" upon returning home, having squandered the taxpayers' money on a pointless joyride.

Delgado, the engineer spoke up first and gave his view on the situation in the shape of a risk assessment: "From my point of view, the most dangerous situations are the Hilbert jumps. The first one, we've already done. The second one we must do as well, regardless of how we proceed here. So, aborting the mission gives us nothing."

"Yet at the same time we have the responsibility for Lia!" Lombardi gave to consider.

"Do we?"

Joe Wanamaka, who had up to now remained quiet, had spoken up with his soft, low voice. McMillan made a gesture for him to continue.

"Look at the girl. For a minute, forget about the fact that she's younger than we are. We've been with her since we started our training, you guys know her: She's smart, bright as a pin. If she doesn't know something, she'll always ask the right questions. On some theoretical aspects of this whole quantum stuff she may have a better background than any of us – heck, it bears her father's name!

She has shown some spunk. I don't know how she got through the guards and controls at Cape Kennedy, but she did it. That takes not only courage, that takes cleverness as well. She can look after herself, she can take responsibility.

You've seen her when Aldi and Jeannette picked her up from the PETRARCA. She had had quite a ride, a terrifying ride, if you ask me. She had no idea when we would find her, if she would freeze to death, suffocate or die of thirst first. But I don't think she shed a single tear until we collected her. All she asked for then was a hot cocoa!

Frankly, I have absolutely no problem with her as a crew member by my side."

A moment of silence ensued. Wanamaka looked at Mack.

"What?", he asked the pilot who had turned to him in amazement, "What did I do?"

"That was quite a speech!" Mack grinned.

Apparently Wanamaka's appeal had won McMillan over. He later confided with Mack that he had considered putting the problem to a vote of the crew – whether to go on with the mission, or to abort it on account of Lia. But he had decided against it, most of all because it wouldn't have been fair towards the crew: He had been chosen as the commander, and their safe flight was his responsibility. Neither Wanamaka nor one of the others could take this burden off his shoulders.

But after he made his decision public, he asked everyone's opinion on it. With varying degrees of confidence the six others said that they could live with the decision to keep Lia on board, and opted to proceed with their mission, and even Yuri croaked what was interpreted as agreement.

Delgado pointed one consequence of Lia's presence out to their commander: Their supply of "consumables" – mostly food and water – would last for 280 "man-days", or for 40 days with a 7-man crew. Now that they were eight people, they would run out of supplies already after 35 days. McMillan took note of that, but replied that this shouldn't have many consequences; after all they weren't supposed to use up their supplies to the last, but return with plenty of reserves.

After this was done as well, they could all go back to their original tasks: Serge and Jeannette took sightings of the Klendathu system and tried to find out if it had planets, and what their orbits would be. Lella Lombardi held intimate conversation with Schopenhauer, their bord computer, preparing reels of punched tape with calculations for their next Hilbert jump, and Wanamaka and "El Cid" had disappeared in the lower decks of the HUMBOLDT again. Mack finally had returned to his job of checking out the PETRARCA.

The shuttle had a nuclear pile like the HUMBOLDT, only smaller. Like the HUMBOLDT, the shuttle also carried tanks of liquid hydrogen which was heated up by the reactor to several thousand degrees before it expanded in the engine nozzle, blasting away into space and giving the shuttle in the process momentum in the opposite direction, driving it forward in accordance with "Newton's third law", which applied universally.

This mode of the drive would be used to propel the shuttle in the vacuum, to decelerate from orbit or to land on a moon without an atmosphere. But the hydrogen supply was limited, and so were the manoeuvres the PETRARCA was able to perform with it. But there was a second mode of the drive: Once inside a planet's atmosphere, Mack could slide away parts of the heat shield which otherwise covered jet intakes. From then on the atmosphere would be used as the "reaction mass" the reactor would heat up and exhaust through the nozzles. As opposed to the hydrogen, the air supply was unlimited, so the PETRARCA could remain aloft for hours, as long as it stayed within the atmosphere.

When taking his seat in the cockpit, the tiny empty space behind the pilot's seat gave Mack an idea, and he made a mental note that he would have to talk to their engineers about this. Then he proceeded to boot up the reactor which had as yet been inert until it reached a standby mode. From now on it was possible to get the PETRARCA flight-ready within a few minutes, which meant that in an emergency they could use it as a lifeboat, if the ARGOS was not available.

Mack looked around and wondered what it would be like to actually fly the PETRARCA. Of course, he had had countless numbers in simulators, but he knew from experience that this was nothing like flying a real machine in a real atmosphere. There would be immense challenges waiting for him. Encountering a new planet they would have no idea how its atmosphere was composed, how pressure, temperature and winds changed in different altitudes and locations. Would there be clouds or fog hampering his sight, turbulences, hailstorms?

Even more importantly, until now they didn't know if Klendathu even had any planets. If the star was an "orphan", basically all they could do was make a few astrophysical measurements of it, and shoot a few pretty pictures of the constellations which from here looked slightly different than from Earth, to prove that they really had made the trip. That would be a letdown, and Mack kept his fingers crossed Klendathu would turn out to be a bit more interesting than that.

He caught himself yawning and looked at his watch: It was already long past midnight. The commotion caused by the find of Lia had disrupted their schedule by several hours. Pondering their options was useless right now, it was more important that he

got a good night's sleep before the next day, when their mission would start in earnest.

He shut down everything which wasn't required for the standby and left the PETRARCA again. On the way to the hab deck, he noticed that everybody else was already gone to bed: The lights were dim, and the curtains before their niches were drawn closed. Even the HUMBOLDT's heartbeat seemed to have slowed down, and suddenly Mack himself felt infinitely tired. He went to the unusual task of slipping inside his sleeping bag in weightlessness, and finally managed that. A part of his brain noted that Jeannette and Serge had left no notes about the results of their survey: To find out whether Klendathu featured any planets would have to wait until the morning.