

# ANALOG ASTRONAUTS

## *In Digital Missions*

Novels and short stories written by analog astronauts who participated in the lunar and martian analog missions at The Analog Astronaut Training Center.

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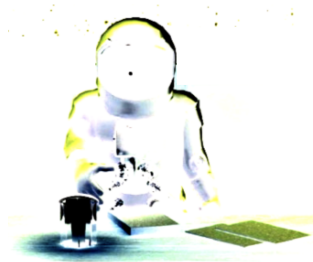
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# PREFACE

It is our pleasure to share this book with you, because this is not like typical artwork. Usually people write books because they gained some experience and want to share it with others. Here we first induced specific conditions and experiences in the frame of simulation of a space mission aboard the spaceship simulator called the habitat. A mission scenario was standardised for all our authors - analog astronauts. They spent 10 days in Poland following the same procedures and experiences. We randomised their stay in isolation and confinement by sharing the same scenarios with people from different countries and cultures, different genders, new and experienced, students and experts. After the mission egress, we proposed analog astronauts to participate in this project. In particular, we asked them to describe their reflections, feelings, emotions, everything that was born in their minds during the mission from their subjective point of view. Focus was put not on all results but from the perspective of sharing. It means that we asked for stories dedicated to be useful and worth reading. This task was voluntary, so we are aware that the content of this book is not presenting the full screen on the output of this experiment, however a unique compilation of real experiences of people can be recognised.

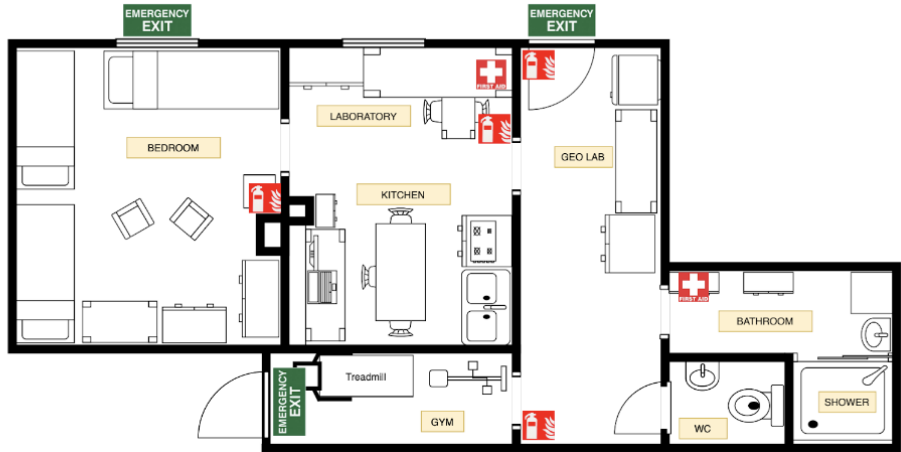
It is amazing how different people, from different environments, react to the same stimuli! The main objective of writing this book is to gain a deeper understanding of subjectivity. We are not giving answers, but inspire to think and admire the beauty of diversity of human nature.

Analog astronauts are dreamers, explorers, focused on self-development and reaching the stars. The level they want to reach is hard but they keep trying despite obstacles. The only way to space is to discover it in your mind. Subjectivity seems to be the clue of individual power able to move mountains. Did they manage to see more than their senses allow? What did they discover after entering harsh extreme isolation and confinement? Was it worth trying? All these questions you may find answered and deliberated in the upcoming chapters. We wish you great joy in meeting our friends, authors of this work, and analog astronauts. Some of you (guess who), will fly to space in the future...



# INTRODUCTION

Space analog missions are scenarios performed in environments analogous to space. The Analog Astronaut Training Center created an environment analogous to a small spaceship, which landed on the Moon. This facility is called the habitat and consists of six modules: a bedroom, operations room (laboratory and kitchen), geolab, gym, bathroom (shelter) and toilet (Figure 1). The total living area is 57m<sup>2</sup>, the environment is confined. All doors and windows are closed and isolated from natural sunlight. Walls are covered with silver foil reflecting light of specific wavelengths. People living there are exposed to increased levels of carbon dioxide and noise frequencies similar to those on the International Space Station. We couldn't simulate lowered gravity, because our Moon base simulator is located on the Earth, however we developed microgravity clinostats and several prototypes to induce altered gravity conditions for plant and cellular growth.



**LEGEND**



**Figure 1.** Plan of the AATC habitat. The 100 year old wooden house was adapted to run isolated studies on humans and other living organisms in standardised laboratory conditions.

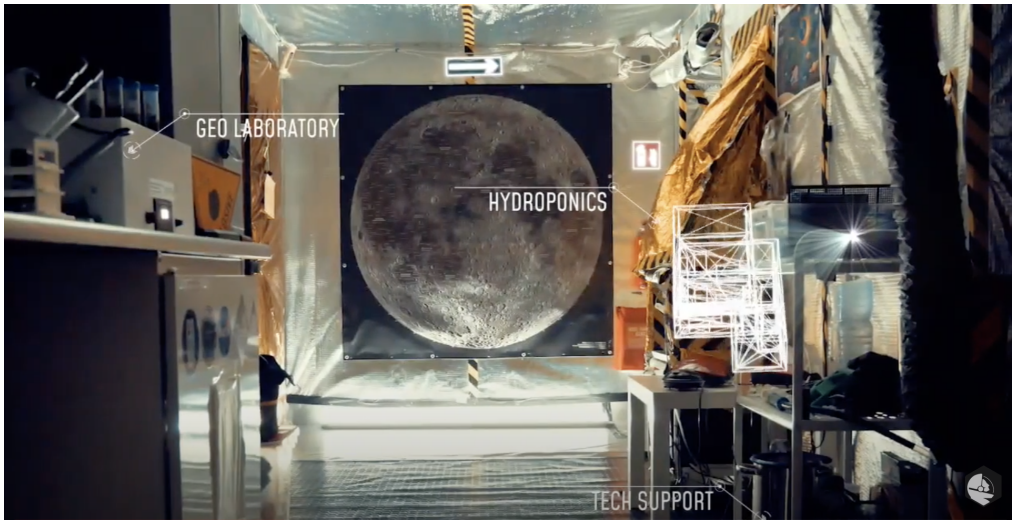
The environment inside the base is continuously monitored by more than 50 multi sensing electronic devices. Temperature, humidity, pressure, CO<sub>2</sub> levels, noise, power consumption, and light intensity are measured in each module at various heights allowing 3D mapping of environmental conditions (**Figure 2**).



**Figure 2.** Visualisation of selected environmental parameters inside the AATC habitat during a lunar analog mission. Both crews: analog astronauts inside the habitat as well as Mission Control Centre Crew have access to this data in real time conditions.



Cameras monitor all modules (except for the hygienic part) and send live data to the Mission Control Center (MCC) dispersed in Europe. Several people work voluntarily as MCC in various countries, therefore all data must be digitalized and carefully analysed. Each analog mission is prepared considering the mission scenario and the main mission's objectives. Beside individual experiments, participants called analog astronauts are following standardised procedures to fulfil planned long-term studies. We test subjective time perception, group dynamics, and multiple types of diet. During each analog mission we collect physiological and psychological data using the same tools and methods. This book is written after successfully organised 55 analog missions with more than 250 analog astronauts trained.



Rzepiennik, a village in the South-East of Poland, is unique when it comes to space. The first analogue space mission in Poland took place here, on August 15-21, 2016, in the domes of Queen Jadwiga's

astronomical observatory in Rzepiennik Biskupi. Since 2018, space enthusiasts from all over the world have been coming to Rzepiennik to empathise with the role of an astronaut and undergo unique training in a wooden hut transformed into a space base. The house is inconspicuous and hard to access, but these are advantages of such a place. Newcomers from the Americas, Europe and Asia admire the night sky in Rzepiennik, the beauty of nature and the kindness of its inhabitants. Here they find their dream Moon. The road to the habitat leads from Kraków's Balice airport. The journey takes place at night, so participants of the mission do not know where they are being taken in a black tinted corporate van. A number of documents to sign, such as consents for monitoring, participation in research or mental and physical health declarations – all increase the mystery. Each person is closely observed and the decision for boarding is made just before the mission launch. For a week or two (depending on the type of mission), the crew cannot see sunlight and has no access to Earth time. The locks are closed and only emergency situations allow people to leave the base after prior approval by the Mission Control Center. The isolation of the crew in the habitat is quite different from that known from the quarantine, because the base gathers strangers from different parts of the world who have to work together urgently in severe time constraints and harsh living conditions. There is no privacy, but constant noise generated from hundreds of electronic devices. Analog astronauts should constantly monitor the concentration of carbon dioxide. On a small area of the base, 6 people is enough to dangerously raise the concentration of carbon dioxide in moments of inattention and lead to an irritating headache. Same as in space. Leaving a comfort zone and exposure to an extreme time regime for adaptation to the new stimuli is

the clue of this place and its actors. Welcome on board and enjoy the journey!



Photo created by artist Aoife van Linden Tol. Crew was requested by the Mission Control Centre to simulate microgravity during the EMMPOL 5 lunar analog mission 8-14 May 2021.

# PRE-MISSION

Pre-mission time is a moment when candidates learn about the mission scenario and are tested to take the most appropriate roles during the time of isolation inside the habitat. Preparations for the mission last at least a month before the arrival to Rzepiennik. People willing to participate in the training send their CVs and cover letters. After setting the date of the mission, the participants get acquainted with the scenario of the activities and regulations in the habitat. The day before the mission, an integration training is organised for the crew in Kraków. One of the tasks is the night entry to the Piłsudski Mound without phones, flashlights, without a word. The crew can only communicate using body language. Physical endurance in a quick uphill climb, leadership skills and group responsibility are tested. Volunteers receive mission patches and blue flight suits, the same as real astronauts wear. Since putting on the uniform, mission participants become analog astronauts, i.e. people who will perform tasks analogous to real astronauts. Depending on the number of analog astronauts, several roles are proposed: Commander, Vice-commander, Communication Officer, Crew Medical Officer, Data Officer, Astrobiologist, Space Engineer, Public Outreach Officer. Each role corresponds to specific responsibilities during the mission. Like actors, analog astronauts are asked to play their roles. Mission Control Center supports the team to optimise the selection process.

At this time, people meet each other. Usually they are strangers. Everything is new and unexpected. Organisers invite them all to their home and share their most private space to increase the speed of integration and levels of trust. How to trust each other in such a short time? There is no logic here, only believe...maybe this is a test already? Are we believers or not? Yes, we are. Otherwise we wouldn't be here.

Agata or Agatha - this name will be repeated many times in presented reports. She is the main organiser of analog missions, taking care of each person individually starting from the beginning, which is reading CVs and motivation letters to the end by saying goodbye and staying in touch. She is the one responsible for meeting the crew, performing on-site pretraining, wandering in the forests at night, making coffee and tea, driving a car to the habitat and back, she is the one responsible for scientific outcome and further work with data analysis. She tries to inspire, teach and share good energy.

# REPORTS

# *1. A Girl lost in Space*

*Selene Cannelli, Italy*

*Exp.39 Kepleria*

*27 Sept - 6 Oct 2021*

Did something ever call to you? Have you ever felt that something was missing, or you just weren't right for this place? Did you ever find an answer to those questions by just tilting your head 45 degrees north? Do you know what's 45 degrees north?

The unknown.

Since I was a kid, I would just think about sport, dinosaurs and space. I was happy that night time would come because then I would be able to see the Moon and the stars, mostly because I was convinced that they were always following me. Sometimes, I still like to think that. But all this passion I had for space vanished in an instant, or to be more specific, it vanished through a single phrase that was on repeat for the first 18 years of my life: "you can't do it". But isn't space this new frontier that is opening possibilities, an almost blank slate where we can start fresh by not repeating the mistakes made on Earth? I'd like to think so.

Who am I? Good question and the answer is: I don't know, yet. But I can certainly tell you what my academic background and experiences make me: an archaeologist, a microbiologist who studies the importance of viruses in the environment, an addictive world traveller who loves adventures, discovering new places and cultures, and a missed Olympian, now injured rugby athlete. Yet I'm still not sure of who I really am and possibly because my greatest adventure is yet to be: an astronaut. I know that the day I'll be immersed in the dark,

surrounded by yellow dots and doing a spacewalk while looking at Earth, then and only then I'll know who I really am. Isn't it called the overview effect for this reason?

It took me 30 years to finally embrace my astronaut dream, yet, when I spoke to other wannabe astronauts, I felt my dream was not as important as theirs. Anyway, with all my doubts, I applied for the 2021 ESA astronaut selection, even after not meeting the minimum requirement of 3 years of work experience after graduation (don't hold your breath, of course I didn't get the call), and I decided to do an analog mission hoping it would start my space career, even after everyone told me that doing it doesn't mean you are an astronaut. Well, thank you so much for the reality check, I imagined that the meaning of analog is real.

So here we go. A lost archaeologist/microbiologist (let's call it archaeobiologist) travel adventurer, locked up for 10 days in a tiny space module, with engineers, a physicist and a 17 year-old boy? After all, we were on the Kepleria mission, and like any good archaeologist, let's start the journey with a good old story.

\*

### **Kepleria**

When our mission debriefing started, one of the first things we were told was that our mission was special and that each of us was selected very, very carefully. As much as you believe in those words, you don't want to keep your hopes up. Because yes, around me there were amazing people doing amazing things, with jobs that I'd love to have, and then there's me. A 31-year-old who had finished her masters just 2 years before and been jobless since.



Okay, okay, I didn't stay put, I started to get involved in space-related projects as a volunteer. No matter how many times I told myself "I deserve to be here," yet somehow it didn't feel right. I think this is what is called Impostor Syndrome, which I witnessed in other people (even in my crew), but to me, it didn't seem like a syndrome, just something real. Or was it just that being an analog astronaut felt just right, as though that small cubic house was the place that I was always meant to be? I don't remember if I ever felt like that before, but for sure I didn't feel in the right place for a very long time. Maybe it felt so right that I couldn't believe it? I couldn't believe that something in me was starting to change, to grow closer to my goal? Maybe yes, maybe no. For sure, I'm not a psychologist, but I know that this mission was special for me.

It was my first one, it was the first time I put into practice my archaeology degree in space, and I did meet incredible people. And let's say it, we had a weird, fun and amazing crew. So yes, thinking of the old astronomer, Johannes Kepler, Kepleria was the right name for our mission.

\*

## **Our New Home**

Our new home, a tiny space with no windows, elevated CO<sub>2</sub> levels, a hydroponic system and cockroaches, plus living with other people who use wipes as a means to shower. Little did I know that I would get used to the smell of the habitat quite quickly. I'm not sure how to describe it.

It was a mix between:

- Help there is no fresh air here
- I feel like I'm breathing in other people's breaths
- A fish smell
- Soil coming from the soil pebbles of the hydroponic and from the hissing cockroaches' house.

The first day there, I had a constant headache and could distinguish all the smells. When I woke up, it just smelled like home, from which I would never make a scented candle anyway. Now that we are starting to get into the mission, maybe it is time that I also state my role:

Selene, the medical officer and archaeobiologist. I like to think that I am the first archaeologist ever to do an analog mission, but probably not. I hope to show how archaeology and art are also important when we're talking about space exploration and missions. I also feel that our team's different life experience was one of the things which made us special. A very male captain, truly all he wanted to do was help us (trust me, he's a great guy), a kid wanting to be a space engineer, an amazing Colombian scientist (the internal communication officer and electric engineer), our Tunisian vice-commander soon to be trained as an astronaut and our satellite engineer expert, and our physicist turned into an educator, our outreach communication officer. We truly were unique, each with different career goals in mind, but all wanted to work in the space sector and contribute to see it grow. Three of us with the wish that someday we could work on a real mission in space as astronauts. We entered the habitat with the hope to understand at least a bit better some of the physical and psychological challenges astronauts might face, to challenge ourselves, our own work, and to collaborate with people that we just met one day before. This mission had all the ingredients to be a possible failure, yet for us was a great success. In the end, we would still be crewmates and would leave the habitat as we did. United.

\*

## CanSat

My crewmate came up with this project as she wanted to build a step-by-step guide for a CanSat which could be made by anyone at a low cost, and man it. It took us some time to find cheap material that would still work. What was the purpose of this CanSat? And this is valid

for the real world as well. Scientists, and me, would like to do most experiments for the fun of it, and what about money? Who's going to fund that experiment? Because if you want to find funding, you need to justify the why, the supposed outcome and what will be the benefits.

Thankfully, the youngest crewmate of all came out with the idea of measuring CO<sub>2</sub> levels and how they change in the different altitudes. The loving virus nerd in me came out, and I added the microbiology part. Inserting a membrane to capture samples of the microbes in the air in the stratosphere. I was mainly interested to find out what kind of viruses live up there and in what quantity. Viruses are the most abundant organisms on Earth. When you look up at the sky and see all those stars, well imagine that it is the sea and multiply those stars. Those are the viruses. Even their role in the environment is fundamental. One of their key roles is to guarantee a constant nutrient recycling, and something helping with evolution by transferring certain genes to the host, making it more adaptable to a new environment, for example. Yet, not many studies are being conducted on viruses, even less when it comes to the stratosphere. I would be interested to understand what kind of viruses could live there, after how long do they die, whether they could infect other organisms in the stratosphere, and how they move. It was great because everyone else was also interested, and so began the frenetic internet search to find the perfect membrane for our device. Usually, if you want to study viruses in the air, you need an aeroplane and specific tubes, which are heavy and expensive. If we could manage to find a solution to integrate this virus analysis on our CanSat, the team could have solved a huge challenge by finding a cheaper and easier solution and looking at the virus data in correlation with CO<sub>2</sub> as well. Science is exciting!

Hopefully, this CanSat will be built around mid-2022 and launched by using a hot air balloon.

\*

## The Interactive Space Museum and Archaeology in Space

As many critics said already, only engineering is necessary for people to conduct space exploration missions. It doesn't matter if cables are all around the base. Look at the International Space Station (ISS), there are cables everywhere, also because it's the easiest way to reach them. Even astronauts will tell you the same. Looks don't matter, as long as it keeps you alive and does its job.

However, people are not made to just survive, we're made for living. Take the pandemic. When it hit the world, we survived mostly by restricting where we went, especially through lockdowns. This caused many people to suffer psychologically.

You might wonder, what does this museum even have to do with space? Well, history makes us study and remember our mistakes, as we're supposed to learn from them and not repeat them anymore. Do you know why *Homo sapiens* are the only species on Earth able to have this technology and to develop civilizations? Because each day we remember and learn from yesterday. We didn't build the first rocket overnight, it took many years, studies and mistakes. Take a sports club. When a new member comes in, they are asked to honour and respect the jersey, and the number on it. More specifically, to honour who wore it before them, so to keep alive also the values the club stands for. Like it or not, we're using history every day, and I like to think that archaeologists, together with historians, are its guardians. So yes, the museum was also important.

Through the museum, I wanted to show the history of the habitat, taking you on a journey of the experiments which were conducted there, and why they were influential for the base. I wanted to make it

interactive because you learn better when you use all of your senses, and because every time at a museum I dream of breaking glasses and just start touching everything... with cotton gloves.

The fun part about creating it was to look for resources so that the museum also looked intriguing. The rover was the best thing that could have happened to us. Its story is sort of a sad one. The rover has been there for a long time, and crewmembers used it, broke it, tried to repair it and instead made it unrepairable. It was also important because some of its parts were made by trying out the 3D printing machine, an instrument fundamental in future analog and real missions. There was also a model of the Moon. That model was won by Dr. Agata and her team in a NASA competition. I put it there because by downloading an app you could see a 3D Moon map, but also because of what it stands for. To win the competition, the team put their creativity and scientific knowledge into it. They worked hard and as a team. It's to remind the crews that you are there as a team, and together you can achieve the impossible.

On the lowest shelf on the left, instead, you can find the book of the first Earthly owner of the habitat. I thought that his story was also important, because without him, how different would have been the habitat today, and probably how much harder would it have been to find the perfect place? On the shelf on its right instead, we find a scientific experiment done at the base. It's a membrane obtained from kombucha. It's amazing the things you can do with it, other than creating the kombucha drink. I should say, it probably smelled a bit, but it was super cool and one of the best in situ resources. In fact, we used this membrane to cover our food, and it worked. The good part is that you can bring this membrane outside the habitat and use it in everyday life, instead of the usual transparent film. The final shelf, second from the left, is supposed to change exposition after every crew. I made this in a

way that the leaving crew can leave something of themselves and let the next crew know them a bit. In this place, the leaving crew should put the most used object during the mission. For us were the life-saving duct tape and the nail gun (which wasn't there because we were still using it). I'm not sure if future teams have done this, but I hope so, even because it allows us to understand a bit of the crew habits. It would be interesting to take a picture at the end of every mission and see the different objects that the crew uses, or if the crew perhaps use the same objects.

Studying pictures of life in the International Space Station (ISS) is in fact already a research project which has been started by archaeologists. By looking at the pictures, they want to study how astronauts interact with objects, whether they use objects in space differently than on Earth, and if they made new rituals or habits.

They go through many pictures, as each day almost 1000 or more pictures are taken onboard the ISS. That's why they asked for help from machine learning, to help them to categorise the pictures. Through this study, called the ISS Archaeological Project, they want to understand how a multicultural society works in space, helping us understand what society we could build in the future on a Moon base. This study might not be as important as conducting engineer testing, but could help us understand us, humans, better, and prepare us to put aside our differences to cooperate for a goal we have had for a long time: build and sustain life on other planets.

While on the base, I initially wanted to conduct a more in-depth archaeological study. I wanted to look at how the crew interacted with objects, the habits of cooking meals. I was curious to see if we would build our own customs and how they were reflected by interacting with the base. I wanted to come out and write a paper and finally publish

something, I also wanted to also write about the importance of analog missions. I just wanted my name out there and to be known. Basically, the wrong reasons.

I started to do research, looking at previous papers about analog missions, also to understand how to apply the archaeological method to my mission to do the research. For ages, I couldn't really find anything, and then one caught my eye. It was a paper that just talked about the outline of an analog base. While reading it, I just thought, what is the contribution that this paper brings to the scientific community? It's almost like a grocery list. I didn't want something like that, and I was really happy with my museum. Now, I hope that the wider space community can see the contribution that archaeology could give on the more human front, and on another aspect. Archaeologists are great at finding ways to take as little of a sample as possible and not mess a site before it has been recorded. Here's the shocking fact: archaeology is a destructive science. What we take to examine, most of the time, gets destroyed. Why not use these skills to help set outer space environmental policies that will also help to preserve the environment around our base? I believe that archaeologists could bring a new perspective both on space and on Earth in helping preserve habitats. It's time to leverage this.

\*

## **The Routine**

Our routine was also part of scientific studies, well of psychological and health studies. When we were told our routine, I thought I wouldn't make it because I just don't like to stick to a plan. I was wrong.

Each day was supposed to be 15 hours, beginning from the moment you wake up. In this, you had to fit three meals, urination time, 1-hour gym, almost hourly health checks plus your work. At the 15th hour strike, you

were supposed to go to bed. Supposed to, because we managed to do it just the first two days.

The scheduling was a complete revelation. After the first day, it was like I was always on this schedule. Even if I barely knew the weather outside, if it was raining, sunny or windy, just by waking up after 8 hours from the 15th of the previous day, I felt that a new incredible day had started, and I had to be ready to take advantage of it and to live it, plus not forgetting to measure my first urine volume of the day (when all I wanted to do was to just rush to the bathroom and free myself). One experiment of the mission was to measure the litres of urine you produced daily. This is the only record I broke and probably retained, with my 3L of urine in a day. Of course, I drank a lot as well, which now I think I hold the record for the most litres drunk in a day. Can you guess how many? 3L.

The joy of urine does not stop here. As the medical officer, I was the one that had to check all of the urine samples. I'd done it four times in our ten day-long mission, and all those times right after eating breakfast. And you know what? It wasn't weird, I mean, some of my crewmates were just looking the opposite way and disgusted just thinking that some urine could spill on my gloves. I was ok, it was just some analysis that didn't affect my humour or appetite. Sometimes, I was just frustrated at some members that didn't urinate until after breakfast! I mean, how do you manage that?

One part of the routine I enjoyed the most was the gym hour. This hour was at the perfect time for me, and I miss it a lot. As you are constantly living with the crew, this was your very own special hour. You have to exercise because it has a big impact on your health, and can help you release stress or negative emotions. In space, it is even more important



as it helps you to not lose all your muscles. During this time, other members were also not supposed to talk with you.

I also enjoyed what came next: “shower” time. After the gym, I was sweaty in a way that I’ve never been before. To clean up, I was going into the cubicle of a storeroom and cleaning myself with baby wipes. I still had my music on, and after I felt fresh and clean. Every 2-3 days I also used dried shampoo. As a heads-up, don’t apply a lot of it as it leaves your hair a bit white. There have been a couple of occasions where I had to speed up the showering process because I was cooking lunch, or had started gym later. And let me tell you, it got me irritated. I enjoyed that process so much that I was jealous of it, and it was something I was really looking forward to each day.

Another part of the routine was cooking meals and eating together, in groups of two. You might think that we saw each other every second of every day we spent in the habitat and that we must have always spoken with each other. Well, the truth is that we were working most of the time and when working we spoke about work, not our personal life or stuff like that. It was during the meals and the snack breaks that we truly got to know each other better. Those were happy times we truly enjoyed. For example, we came to know that the microwave became our best ally, as it was making a crewmate happy with his super warm food. It was also amazing to see him throughout the mission, as he was in a completely new environment and social group. And the true fun came at the meals, seeing him looking at the food. All he could dream of was Nutella and a hot pizza. To sum it up, the routine is a thing I still miss now. I tried to replicate it at home but failed miserably.

Now, I want to show you a side of the base, inhabited by life that wasn’t human, and I don’t refer to the dead mice that were left on the fridge by the previous group.

\*

## **Can we live without animals and plants?**

To the title question, I can answer yes. In a base outside of Earth, it would be possible thanks to technology, but it is worth doing research on how to bring animals and plants up there. First of all, plants could help us produce oxygen and are also a source of food. In fact, finding a way to establish an agricultural space is fundamental to providing astronauts with a balanced and nutritious diet. Plants are also good for the spirit. And as you can talk with plants, you can have the chance to talk with animals as well. I'm not saying we're bringing horses or dogs into space, but fish. Fish can be integrated with the agriculture system, where we can use their water, rich in nutrients, to water the plants. Fish are also a possible source of food. Other animals which we could find with us in space are insects. Insects are one of the most efficient forms of life. They eat almost everything, and don't need a lot of space or specific food to survive. Plus, they are the food of the future. You heard me right. If you have travelled just to try some insect delicacies, you have passed a part of the training to live in space: eat whatever is there and can give you protein.

If you take part in one of the AATC analog missions, you will have to kill, grind and cook the cockroaches that are there, lucky for us there are scientists who are working on 3D printing food. Insects can be cultivated and used as the paste for this 3D printer, it would be like eating a burger, but made from insects. The future is bright.

In our habitat, we had the pleasure to have fishes and the amazing hissing Madagascar cockroaches. Every night before going to bed, I was always visiting both of these guys to see how they were doing and wishing them goodnight. I might seem weird, but seeing other living things, including the salad, just made me feel better, relaxed, like

everyone had its purpose at the base, and we were in this together. I just really liked having other animals and plants with us, as I'm also a nature person who is addicted to hiking and exploring.

We took care of the fish by feeding them every two days and changing the water once, by first boiling the water, letting it rest and cool for a day or two, and once cold, putting it on the fish tank. Easy-peasy.

With the cockroaches, we had more fun. First, one of them was pregnant, and we were waiting impatiently for her to give birth because as soon as this would have happened, I could have put to use my pipetting skills! After giving birth, the mother would have produced milk, which we could have collected with the pipette and sent it to scientists to study its property. Cool, don't you think? Could have been, only if the mother didn't have a miscarriage. We're not sure why that happens, but the crew and I thought we may have killed them because we changed their habitat, and this caused the mother to experience a shock reaction.

We were tasked with changing their home because we were fine with touching them. I must admit that for some reason I couldn't touch them without gloves. When I was a kid, I was touching every insect, then once I touched the belly of a green shield bug and it was so smooth, it just felt wrong. And that's why I used gloves. Anyway, we changed their habitat also because there were tiny white insects there that were bad for their health. By changing the soil and wiping the box, we thought we could get rid of most of them. I mean, we did. We didn't see them for a few days, then I noticed some of them again, but way less than before.

Once we moved the cockroaches to their clean home, we saw that they looked a bit disoriented, as they tended to mainly stay on top of their

egg box, especially for the first two days. They would leave it to just go to eat. I think it was after three days from the spring cleaning that the mother lost her kids. We were pretty sad, I should have seen it coming, we were responsible for the shock after changing all the soil. Even just writing about it makes me sad, and to question why I didn't think about it at the time. I really liked them and I miss them. It was fascinating looking at them, seeing them eating, looking at their tiny bites left on the apple, how they played with the eggshells. I really didn't want them to become our food. I preferred them alive.

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## **Art in Space**

While the museum could be considered as art, it has more the build of a place aiming to intrigue other people, by also making it pleasant to the eye. In this final chapter of my story, I want to show you how art can be a powerful tool for team building, personal wellbeing and to help in developing new projects. Our mind is always at work and with art, we can give it a break, as it can help us relax as well. By doing so, we can come back fresh and with new ideas to improve a project or design. So, if at work you find yourself stuck, look for something to colour in, or another team-building activity like the one we did. We formed a line and Eryk, at the back, thought of a drawing. He then drew it on the back of Justyna and so on. Well, we managed to create an abstract painting from a really simple one.

Another activity related to art was the Space Dragon, which you could even do right now. You might find it beneficial to do this when you're starting a new project or journey (like starting university, a new job, or looking for a career change). All you need to do is to start by tracing the shape of your hand. Draw inside what you feel inside you, and outside the feelings about the world surrounding you. Like, if you're starting a university, you could put inside the expectations or what you're afraid

of, and outside you can draw the possibilities that await you, for example, an obstacle that you want to overcome.

The great astronomer, Johannes Kepler developed astrological calendars - horoscopes. In a way, he mixed arts, geometry and astronomy to understand how planetary configurations affected humans and the weather on Earth. He actually disliked astrologers, as he thought they couldn't understand the bigger picture because they didn't know how the planets moved or have any knowledge of the rules of mathematics and astronomy.

Kepler drew horoscopes for himself and his family. It was also a way to influence political decisions, which he did as an Imperial and district Mathematician. For example, while in Graz (1595), he forecasted a peasant uprising and a Turkish invasion. These things did happen and contributed to Kepler's renown reputation.

Anyway, if you'd like to look at your birth chart or horoscope through Kepler's method, you can just google: birth chart. The thing is, the horoscope which he did, might not be the best looking ever, but they worked. Now, with online tools, you can do your horoscope and draw it as you like it. Some websites can also explain the meaning of the position of the planets and what it means for you.

I hope you enjoyed my journey and can now see that space is so much more than engineering. Space is a personal experience and is a place where people one day will live, and not just survive.

## *2. Rocketman*

*Simonas Pukinskis, Lithuania*

*Exp. 40 Yuriya*

*13-19 Oct 2021*

First of all, it was a pleasure to participate in such a project. The day I received the invitation to participate in the mission I was glamorously walking through the quads of University College London (UCL), and seeing the Wilkins Octagon (the central hall of the University Main Library) in front of me. Agata made my day, beginning my journey at UCL and on the very same day being invited to the AATC unleashed such emotion from within me that even a marvellous glossary would not even be able to compile the words to describe the sheer inspiration I felt that day.

Introductions were made via zoom online and I was delighted to speak with like-minded people! I met all at MCC and that night exceeded my expectations. I remember that our Commander managed to leave a good impression and was well-suited for his role. Perhaps, being sharp-minded and cold-blooded was simply our Scottish leader's features. Speaking of the whole crew, I had no issues. I always saw myself as rather a chameleon who could adapt to anything when it needed to meet the requirements of a new ambiance. Dr Agata is one of the few people that I aspire to be like and follow, she is powerful, competent, empathetic and simply brilliant.

Starting the mission itself, already at the habitat I imagined it would be much bigger than it actually was. I did not imagine it would be so

hidden and painted-in the simplicity of the countryside. Having 58 square metres to live and operate in such a small environment was a challenge which immediately revealed the true colours of one's character. Surprisingly, our crew was mature, calm and filled with great listeners. The only thing that could describe the atmosphere of our habitat was harmonic. We had plenty of fun, in-depth conversations and got to know and learn from each other whilst we encountered challenges. I felt like there was my very own little family and at home.

I was slightly concerned regarding everyone's sleep, the crew started to look very tired as the mission went on. I felt exhausted, especially after our designated sport time even though I kept my mind positively charged with my ambitions.

It is important to mention my diet, for some reason I seemed to keep on thinking about more and more food. Specifically, I missed sugary foods such as snickers, pancakes or Coca-Cola. I am used to working with a sugar rush outside of the habitat.

Overall, each day on the mission felt quite similar. Every day we did something slightly different but it still felt that time was standing still and only the experiments such as the Vinci power nap (space psychology) were progressing. To be honest, I learnt something from each person who I shared the mission with. I genuinely liked everyone, I will definitely miss having so much laughter. Our team was made up of people from a mixture of backgrounds with varying opinions but at the same time we were well balanced and I loved it. In my humble opinion, with additional training and preparation, we would be an

extremely efficient crew with excellent dynamics. I believe that this crew could easily spend more than a week in the habitat.

Despite everything, I don't regret anything that happened, the time with the crew and overall experience is something that I will remember for my whole life and I am grateful to all of you who have been a part of it. Dr. Agata is one of the few people who I would like to be or be guided by. She is powerful yet empathetic, she is an integral part of all analog astronaut's missions at the AATC.

To conclude, this mission made me realise that I am still young and full of potential and there are plenty of things I need to and can learn. I want to inspire other people and stay determined to keep working hard to achieve my goals. I became the first Lithuanian Analog Astronaut that started this mission in the AATC. I am very proud of myself and my country. I want to bring this enthusiasm to develop erudite discussions within Lithuania.

Our mission was put in the spotlight in my home country, we were published on Lithuania's national website and mentioned on television. I was most humbled when I ended up on my local newspaper's front page. I strongly believe that I could be someone who will guide Lithuania into this new century of space and its industry. I know it's ambitious in the world's most competitive job market, but a person with a dream will find a way. Ad Astra.



### *3. Analog Diary*

*Aidyl Gonzalez-Serricchio, USA*

*Exp.31 Solaris*

*10-17 Jul 2021*

*Exp.32 Eden*

*19-27 Jul 2021*

After my experience in the habitat, I know that I am a BADASS. For all of my life, I have been underestimated in my intelligence, my strength, and my endurance. I am second generation from the US, my parents emigrated from Puerto Rico with little more than an elementary education. At that time, the expectation of young girls in my neighbourhood from society, and myself, was to try to avoid the violence and drugs which could end my life and avoid getting pregnant until marriage. Growing up, most of my childhood friends had their first baby at 14 or married at 16 while they were pregnant. I knew that I wanted more opportunities and experiences for myself. I wanted to head to the stars. As an analog astronaut, I could thrive, survive, adapt, de-escalate conflict, learn, gain strength and make incredible friendships and collaborations.

The saying, "you can take the girl out of the 'hood' but you can't the 'hood' from the girl" is really true. The first night in the habitat, I made sure I had the top bunk. Why? I was scared for my physical safety. I was in a room with three men who I had only met during a couple of zoom meetings. The habitat was in a foreign country, in the middle of nowhere, and I couldn't speak the language.

If there was a problem I knew that the incident would be recorded, but help wouldn't be able to come in time. For the first two nights I slept with one eye open and a weapon just in case. Then I realised I was being ridiculous. The three men were professionals at the top of their field who were compassionate and working through their own emotions.

My hardest struggle was overcoming the shame and sadness I had because I had actually believed that I would be attacked at night by my crewmates. After processing that first challenge, being in isolation was very relaxing for me since I thrive in a structured setting with goals set for each day and working with a team. Most importantly, I knew my husband was supporting me, taking over my responsibilities from home so that I would have time to focus on my duties, experiments, and overall growth as I entered a new phase of my life. I realised the trauma I experienced growing up in an environment with violence, limited resources, and a neighbourhood with such little safety did hijack a lot of enjoyment out of my life. I began to LIVE, value every moment and acknowledge my awesomeness and accomplishments.

I was isolated for two weeks, first in the Solaris mission and then in Eden. We were a crew from different countries, encompassing a physicist, mathematician, military officers, botanist, an engineer, and me (a molecular geneticist and educator). We learned about each other's goals, talents, cultures, healthcare systems, and our shared love of exploration and music. We had great discussions and enjoyed sharing our language together. We were awed by each other and bonded in our

shared experience of lack of warm food, pissing in bottles, and our low-quality sleep due to our crewmates' loud snoring. Our greatest moments were when we spoke with students from the US (Bronx, Los Angeles, and Las Vegas) to discuss our research and our duties in the habitat. We represented the power of an inclusive team **from** many backgrounds coming together to work towards common goals, survival, and celebrating each other's accomplishments and endeavours.

(\*Nuyorican is a New York Puerto Rican)

## 4. The Candra

*Sebastian Hettrich, Germany*

*Exp.44 Candra*

*1-7 Jun 2022*

*(Disclaimer: All characters and events appearing in this work are somewhat fictitious. Any resemblance to real persons, living or dead, is purely coincidental and/or intended. Based on a true story. No animals, whether terrestrial or extraterrestrial, were harmed. Do not try at home, or at least wear safety glasses, your choice, you have been warned.)*

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### **Prologue:**

It was about time to leave Earth behind. The whole planet was a mess, one catastrophe following the other: extreme weather events, global virus pandemic, natural disasters, another climatic event, another

ecosystem lost, and a mad man starting an ever growing war forcing energy and food prices to explode on a global scale leaving the poorer in the world hungry, and then of course there was an ever growing army of brainless zombies, who still didn't want to believe it or just simply didn't care about it.

It was at that time, when the richest of the rich made a run for the stars letting Earth and everyone else on it, to rot in the mess which they had created. A friend had told me she knew the position of an old decommissioned research vessel from the early days of space exploration hidden somewhere in the Polish mountains. It might need a few spare parts, has some power issues, and the zero-G shower is irreparably broken, but it might still take off from Earth. The CANDRA-44.

Back in the old days the word CANDRA most certainly was an acronym for something, but it was so long ago that it has already been forgotten from history. Not that the loss of a name mattered much when the loss of civilization and our planet were dawning upon us.

My friend mentioned she would gladly show me the position, but she and her family despite all wouldn't leave Earth.

“You cannot fly the old lady on your own”, she warned, “it needs at least five, better six people to operate CANDRA. And I might just have the right people to complete a full crew, but I warn you, the CANDRA is not one of these modern, fully automated, especially fully equipped spaceships every fool can fly and neither does it have the same lavish

amount of space inside. You will be cramped in with little to no privacy at all.”

It took me a moment to think about it. Dangerous, yes. Uncomfortable, very much so. But the alternative - staying on this dying, war-ridden, virus-contaminated Earth - was even worse.

“I’ll take it!”

What do you need when you leave Earth for good? Well, if something could be learned from the disasters on Earth it was that it always comes down to basic human needs: shelter, clean water, food, and maybe some good brew from home. As a research vessel the CANDRA also once contained a biolab with hydroponics to study the effects of space on plant growth. In a world where every day is basically old-fashioned survival training, you learn a few basic skills over the years, if you didn’t have it before. Mine was to grow vegetables basically everywhere I could find space, a substrate, and an intense enough light. Six people confined in a small space for an infinite amount of time would at some point need some fresh food once the supplies ran low or no one could stand the canned and dried food any longer. When that point would arise, I didn’t know, but I wanted to be ahead of it, i.e. bring already pre-grown seedlings into the CANDRA. Out of my vast crop collection I had gathered over the years it was difficult to choose, but in the end I had a selection of vegetables and herbs that could grow food, medication, and seasoning without the need for insect pollination.

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## T-o Launch day

With squeaking wheels and elevated speed, our black van drove through the Polish countryside. Before we had looted a local supermarket for supplies and potable water. We had been making a plan before in regards to what and how much we needed considering the maximal launch weight of the CANDRA as suggested in an old type-writer written, almost bleached to invisibility, document containing the technical data. Also there were still no signs of what “CANDRA” meant or stands for.

Our crew had boiled down to only five. We had already lost one crew member before we even had the chance to meet him. That too only one day before launch. He had fallen victim to one of the many diseases haunting Earth at present day. Since the CANDRA could also be operated with only five crew members, it would just mean we actually had more payload available for supplies and the “old lady’s” life support systems would only have to bear with 5% of the load it was originally designed for. My fellow crew members were all younger than me, students still, but with bright minds and amiable characters once you got to know them better. There was J. from France, M. from Cyprus, Powder from Poland, B. from Germany, and me, Sebastian, also German.

The van drove up a hill and left the road onto a small path into the woods. The vehicle was shaking and I was more than worried about our

Kombucha colony on-board, which would be used as a basic material for repairs, maintenance, planting substrate, or many other purposes. We finally arrived. The CANDRA seemed very unimpressive at first. Camouflaged so that she could have been mistaken for an old country house, she stood on the hillside surrounded by trees, bushes, high grass and shrubbery. Only as soon as we opened the metallic entrance door, that said in almost faded yellow letters “CANDRA-44 Main Airlock”, we could see that inside it was indeed an old spacecraft and that it was indeed very small.

Our Polish friend reminded us we didn't have much time if we wanted to launch. Apparently we were not the only ones looking for the CANDRA, so we frantically unloaded the light cargo onto the metal ship. Which we had to do by hand as the CANDRA was one of the old ships that still did not have shiny cargo mechanics to move the supplies and spare parts. We received a quick briefing about the systems and how they work. Our friend knew so much about the ship that it made me wonder if she had any connection to it that I didn't know about.

The launch sequence would be fully automated. Thereafter our crew engineer, J., would have to calculate and insert our flight trajectory into the old lady's board computer, an old raspberry pi. Our Polish friend offered to be of any support after launch for as long as we are in range of the communication systems, in case we need any support with the ship's systems. B. was assigned to crew the communication console as long as we are still in reach. His main job though was to tend the Kombucha colony and explore whatever use we could make of it. Powder was assigned to be our crew astrobiologist who would be

working on makeshift power supplies based upon organic material e.g. human hair. M. had been assigned to be our second engineer. Her work would come into effect once we would have landed the CANDRA somewhere on a planetary surface and need to make use of the local regolith for construction material. Myself, I was assigned to be the crew medical officer. I guess my doctor title had again been mistaken for a medical doctor's one, but ok, I will handle it. And in any case, there will still be an airlock to deal with unwanted diseases that I cannot cure... My main job though was the food production and to keep the crew safe and foresee whatever emergencies could happen, after all, the CANDRA was an old ship held together by pieces much older than any of us.

The outer airlock closed behind our friend and we were now on our own. We stored the supplies safely and strapped in for the launch of the CANDRA.

## **T+1 Getting set-up**

Waking up to the constant humming and rattling of the old air recycler after a night that did not contain much that could have been called sleep, was not very pleasant to say the least. Somehow we hadn't yet set up the life support system properly as also the temperature at night had gotten too warm to catch proper sleep, so I got up with a headache and even more tired than when I went into my bunk the evening before. The night had been interrupted by multiple times waking up to the old lady's still unfamiliar sounds of the life support and engine room, and



some other sounds I didn't manage to locate, some of them sounding like faint voices, but it might just have been my imagination.

Also my thoughts had been wandering, giving me a lot of ideas, tasks, and other things to discuss and decide about later on with my fellow crew mates.

Starting my duty as crew medical officer I was making sure that everyone performed their medical tests before we went on to have breakfast. It took us a while to get the medical equipment running. Some devices just needed a fresh set of batteries, some needed to be installed on each of our private hand terminals, and some we could only understand thanks to Powder who would understand the Polish-only manual that came with the device.

The ship's interior had the blank metallic walls and bulkheads, made for functionality not for comfort, as it was standard in the time the CANDRA had been built. On top there were many pipes and cables in different sizes and colours, some with obvious purposes, others did not reveal where they connect to or if they are still in use at all. It will be a bit of work for the crew engineers to figure that one out.

After a breakfast with Justine's pancakes and a briefing to discuss today's tasks, I started inspecting the CANDRA's hydroponic systems. Whoever had used it last time left it abandoned in a mess. It was still filled with old substrate - some porous clay often used in the past for keeping indoor plants in hydroculture - and old plant material (seems the scientists working on the CANDRA before had been studying *Lepidium sativum* in it).

Back on Earth I might have just disposed of it and taken new substrate, but here in space we have no supplies other than those we brought with us, and unfortunately that did not include fresh, unused hydroponics substrate, so I had to clean out the mess in the hydroponics and try to reuse the old substrate for my purposes. The hydroponics module however had never been designed to grow large amounts of crops, as I realised with disappointment. It was old and built mainly for research purposes on small plants. In many places parts had been replaced with 3d printed ones, others had been cut out of pipes or lab materials. Clearly the CANDRA's research team had been running on a low budget, trying to patch glitches in the system themselves with whatever they use for a spare part.

After some time cleaning and figuring out where which power line connects to (I labelled them in the process), I could fill the hydroponics supply basin with enough technical water to get the pump covered and start the system up. Despite everything, it seemed to still work, but it would not be enough to generate food for five crew members, so I searched for additional ways to grow food and found another, even smaller, apparently 3d-printed, aquaponics system. It seemed to be defective, but after setting it up, I discovered that it had a leakage in the system which needed patching up.

I found an old glue gun (back in the day they still used glue guns instead of the more precise plasma melters) which - given it still being functional - might just do the job. It took me a while before the leakages were sufficiently fixed so that I could finally power up the system.

Clearly, this one was not designed to grow enough food to sustain a crew. It looked more like the proof-of-concept work of a colourblind

undergraduate engineering student. Well, whatever. We are on our own with what little we have and have to make due with it.

I couldn't find any documentation on what studies had been performed on both systems, neither did I find satisfying information on the systems themselves. Who knows what kind of weird scientific experiments might have been performed on it? What residue still left might be caught up in the pipes or the substrate itself?

I decided to let the water cycle a bit in idle before taking some measurements to be sure it is safe enough for a) not killing off my seedlings and b) not killing my crew and me. The tests showed that indeed the substrate had been treated, but the amount and type of salts and minerals led me to the conclusion it must have been some fertiliser experiments that had been conducted there. I decided to document my findings and also to write a manual for the entire system. You never know when it comes in handy.

The rest of the crew was equally busy, occasionally cursing on account of the antique or broken equipment. We also took turns in the small gym room. You don't move much on a small spaceship and deteriorating muscles is the last thing you would want. And yes, apparently the CANDRA seemed to have been one of the first vessels that had been equipped with one of the first artificial gravity generators that had been developed, maybe even the prototype itself, and it even seemed to work without an issue. That was a pleasant surprise, but still you need to keep yourself fit to survive and maintain muscle mass.

The food was good, we have some excellent chefs among the crew, but everyone was tired and exhausted so after a delicious dinner in the

ship's galley, a quick debriefing about the first day's work, and some routine medical checks there was not much quality crew time left before we fell into our bunks.

## **T+2 Alarm!**

Alarm! Or at least it sounded like it at first. After a very short night with almost no sleep (the air recycler at times made strange rattling noises) a loud, intense kind of music was playing via the ship's comm system and all lights powered up. I fell out of my bunk cursing and swearing. Hadn't had much sleep and getting robbed of even that little bit in this way felt very wrong. I cursed the designer of CANDRA (some Dr. A. K. as we had found on some of the ship's systems). Apparently the on-board system had been programmed to change the time every day and accordingly the wake-up times in order to perform sleep and whatever behaviour studies on its crew. Well, it must have been amusing to watch our behaviour now, hah?

Since I couldn't sleep, I got up and proceeded with the morning routine. Breakfast lightened up my anger a little. It was my turn today, so I fried some omelette with cheese and apparently it wasn't half bad. I had quite some work on my list including to finally get all my seedlings into the hydroponics and aquaponics systems, and since I found an empty tray and some bags of potting soil in the storage compound to set up a simple compost that would serve a double purpose: recycling our organic wastes as we didn't want to airlock them out, and giving space for growing some more extra food. For example we found some old, but still not rotten potatoes that had been growing shoots. Don't ask me how they managed to survive that long in the CANDRA, or if maybe

some locals had used the ship to hide their harvest from plunderers. At least we could make good use of them.

The food was good and lifted the crew's spirits. We scoured the shelves to find any supplies and uncover the technical capabilities of the mysterious ship we were launching. We had to better understand how we would build our new life together in our new home. On a more dreary note, we also needed to be more comfortable and find any potential spots for failures that we would need to prevent. Unfortunately, most of the equipment was broken, old, or contained some unlabelled mystery material inside that just screamed “don't open!” We might need to tidy those up, maybe even airlock them, but not quite yet.

I finished my routine water sample measurements from the hydroponics system, finding interesting changes after inserting the plants into the system. I did my medicals and fell into my bunk. No crew time today either, I just hope our work-around solution to disable the CANDRA's weird wake up calls would work and let us sleep, particularly since one crew member started feeling sick. Probably we brought one of the many Earth diseases onto the CANDRA. I was wondering if the CANDRA had body bags somewhere in storage, then sleep came...

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### **T+3 Survival**

If I had been asked before entering the CANDRA on how I would imagine this whole enterprise to go down, my best guesses would have been something along the lines of: starving to death because we ran out

of supplies, fighting each other to death over the last self-grown potato, a fatal malfunction of the ship's old engine spreading our powderised remains across the entire solar system, or getting hole-punched by some uncharted high-speed space debris, and definitely not until a much later point of our journey.

I wouldn't have set my bets on going down by a mysterious virus that infected 40% of the crew already on day three. Well, here it was, two crew members reported sick and were down with fever, showing similar symptoms to one of the current global diseases on Earth. Day three only and already pushing 40% percent of my crew through an airlock? That seemed not quite right. Also, why is this the first thought popping up in my mind whenever thinking about it? That does not sound like me. I mean maybe as the crew medical officer I should at least try to save them. I guess that would be something people in the former times would have called "ethically correct". I checked what kind of medication the CANDRA still had in its medical storage compound and if it was still usable. Indeed there were some basic medical provisions available. That and convincing the infected crew members to take in some extra vitamins was all that I could do for them at the current moment. They anyways didn't seem too keen on leaving their bunks for longer than necessary and if so, they did while wearing exhaust prevention filters in front of their mouth and nose to prevent spreading the potential disease. Unfortunately the CANDRA did not have more than just one of the standardised test sets for this kind of disease left, so we would never find out which disease it was.

The rest of the crew seemed fine for now and went on with their daily business. Mine was a lot less now that the plants had been transferred to the hydroponics and aquaponics systems and got a head start to grow with the pre-existing fertilised substrate and a simple CO<sub>2</sub> fertilisation system. From now on I only needed to observe how their development was going forward. So I had time to assist my crewmate in her attempts to poison everyone on the CANDRA and/or blow up this whole place.

She had found some regolith material in a box full of powders and chemicals, many of them unlabelled, and she had some ideas. She turned the table into a construction block, only that the very fundamental chemicals which she needed were not in storage anymore or perhaps they never had been. The lab equipment was mainly made of non-heat resistant polymers, which imposed a challenge on heating her sample. Since the old, apparently chinese-built autoclave oven was also not suitable for this kind of transformation, I helped her to an improvised lab space heated by a (more or less) controlled chemical reaction fed by the ethanol we found somewhere in between all of these chemicals.

During lunch preparation, the first minor accident took place. Today I was cooking for the crew (or at least those who still had enough of an appetite to eat) and while I was trying to clean out the swamp from the galley's sink, something sharp stabbed me in the finger. Upon inspection, a thin wafer of glass with one spiky end became apparent. Sharp enough to easily cut through skin. It seemed to be taken from the microscope supplies, but how did it get into the galley? Sharp enough to be a weapon... I did not want to follow up on this thought and what

had been going on in the CANDRA with its previous crew.

I patched up my cut, hoping that the glass wafer didn't contain any toxic contaminant, and continued with the food preparation. Meanwhile the air recycler that collects the used air from the cabin with the six bunk beds and the galley suddenly decided that his work week already ends after only three days and with a loud rattling sound. J. - barely awake and still sick - was in that moment closest to it, and tried to restart the system. Only that it came online and after a minute was rattling even louder. "Shut it off, before it blows up!", I shouted from the galley. She tried to push the power button with little resonance from the old machine. "How? The system does not respond!" "Cut off the power supply!" I desperately yelled. With a final shiver through the ship, the main air recycler came to a halt.

Great, two crew mates and the main air recycler down in just little under three days on the way, that must be a new record. That is, if there is still anyone accounting for these records. The noise also woke up B. who at first couldn't believe that the air recycler was already broken. Still weak, he started searching for a way to fix it despite Powder and me telling him to wait for a moment and maybe first ask our Polish friend if she knew more about the system and could help us fix it. Finally he complied and I served lunch to whoever wanted to eat. Meanwhile we got an answer via the comms: "I do not know. Dismantle it and see if you can find the problem." Not very helpful, apparently she didn't know the issue either. B. found an old manual for the system, yet nothing that could help us any further. We could already feel and see on the internal sensor data the air temperature and carbon dioxide levels



rising. We had to repair the air recycler or in a few hours we might run into too high concentrations. With one engineer too weak to deal with the problem and our other engineer, civil engineer as we got to know, being equally busy on something else, it was up to me to dismantle the machine while B. assisted in the process.

First off a lot of dust had settled in all of the inlets which we promptly removed. The sound had indicated that it was something mechanical which was not working properly, like something grinding inside, and indeed after taking off the backplate of the air recycler, the vent became open and wheeling it manually the grinding noise was quickly found: the mount of the engine seemed to have worn off over the years, in conclusion the vent's wheel was grinding once per round onto the inner side of the casing generating this disturbing sound. Luckily it was nothing that could not be fixed with some extra washers between engine and machine casing, if only we had washers...

As our inspection didn't find any that could have been useful, we used some staples as washers, and slightly increased the distance between engine and casing. A quick test in its dismantled state seemed to work, so I put every part back in place, closed the casing and plugged in the outlet pipe again. The air recycler was working, even better than before as the cleaning seemingly improved the air flow and thus the air inside the CANDRA. This time we still had luck, but who knows what next might fail.

Powder was experimenting with different materials to create a back-up power supply and already had an experimental prototype ready for

testing. We learned about M's synesthesia, i.e. that she sees colours around people and items and how she interprets them. Different colours had different meanings. Black for example meant that something bad is about to happen, and as she reported she had seen a lot of black these days that we have been on the CANDRA indicating a far larger event yet to come in the near future. Exhausted, we went into the bunks. Given the dark unsharp prophecy of something bad to come, I was anxious about what day four might bring.

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### **T+4 Zombies**

The night was uneventful. Getting more and more used to the CANDRA's systems, the sounds of the air recyclers, the chemical smell of the lab and its equipment, the heat, the moisture, also the alternating flow rates of the technical water in the toilet didn't bother me anymore. I got used to the fact that washing hands took longer than I was used to. The old Russian pump feeding the system was not the best anymore and I wondered when the time would come that it would finally fail on us. It was only day four and I felt already familiar with the old lady's interior, it felt almost like home. As though it had been four months, not just four days. Time seems to work differently on the CANDRA, definitely a phenomenon to look into once I will find some idle time.

Unfortunately the two infected crew members were in worse condition today, still in pain and still with fever. But the CANDRA didn't have an infirmary where we could have treated them. The ship was just too small for that. How long until we had the first casualty? How long until we decided to airlock them to prevent the rest of us from getting

infected as well? Given that we hadn't gotten it yet, which was not to be excluded anymore since the remaining crew members did not feel as energetic as usual and showed slight signs of early symptoms later that day. Our meals fell more and more apart, as everyone more or less ate when they felt like it, a common daily schedule was equally non-existent anymore, only the regular medical check-ups stayed the same.

I collected the organic waste and enhanced the biocomposter, planted some more potatoes and seeded more cress plants, found from some old seeds in the storage compartment of the biolab. Maybe we might even get to harvest some of the greens before the disease would give us the peace we couldn't find in life.

When turning towards the hydroponics I realised two things. First, I checked the CO<sub>2</sub>-fertilisation system I had put in place to enhance plant growth, but I found that the old pipe I used for directing the CO<sub>2</sub> from the bulb where it originated to the plants had several breaks, seemingly from material corrosion. I was cursing this ship and its old, broken equipment. Luckily I had seen a new pipe somewhere that I could use to exchange with the old one. Secondly, when inspecting the plants closer I found a zombie, a cress plant which was in the system and dead. Left behind by the CANDRA's former scientist crew, which appeared to have been woken up, happily raking its tiny leaves into the cold artificial light of the hydroponics system. A zombie plant. First dead and dry, now green and healthy as if nothing ever had happened. Something strange was going on on the CANDRA. The crew almost immediately got sick once we set foot on the old lady, yet the plant life seems to

thrive. Who knows what studies the eggheads before us had performed in here. Maybe they were trying to find the cure for death? Revival after you died? That something was off with the substrate of the hydroponics I was aware of, but my limited abilities just confirmed high amounts of phosphates and nitrogen salts in there. Who knows what other material or even energy they used to apply on plants. CANDRA or at least the logo, as we found in an old database symbolises the balance between matter and energy. Is that what was happening here? The dead plants feeding off on the energy of my crew mates? No way, that couldn't be possible, there must be some other explanation.

However, the fact was that we - aside from some mystery bottled filled with some unlabelled goo, which of course we did not open - had not found any clues about what research had been going on on the CANDRA and neither was anything known of the whereabouts of the scientists that used to work here. Something mysterious was happening, and I had the feeling the longer we stayed the closer we would come to find out.

It was Powder who woke me up from my thoughts: "Sebastian I measured something weird, can you have a look?" Something weird, well what was not weird on the CANDRA? Powder had been working on a prototype for an emergency power supply based on glue stick, aluminium foil, human hair, and some other components, that in combination seemed to generate some voltage, however when they switched the multimeter to current it showed nothing. A voltage without current, that indeed seemed weird. But it wouldn't have surprised me anymore as on the CANDRA many weird things seemed

to happen. However this mystery did not seem to be one of those. I suggested testing the instrument on one of the unused power cells we found in a drawer in the galley, as they - even after these long years - should have maintained their charge. Once Powder had performed the test, it turned out that the instrument was the issue and did not work. Well, so much for that. Apparently plant lifes do fine on the CANDRA, yet instruments and humans seem to suffer. To be fair, the instrument had been on the old lady since the previous crew had been there and probably even longer.

Well, if you cannot measure voltage and current, you cannot tell whether Powder's battery was actually working, so we had to come up with a solution. Building a simple voltmeter isn't too complicated given that you are provided with the right materials to do so, and that was the issue here. There were two options on how to build a voltmeter. One, using a diode and various resistors. The later ones we found in masses, the diode was more difficult to come by. Powder disassembled an old broken power plug that was equipped with a control diode, however it turned out that it was built for higher voltages than the battery would provide leaving only option two; build an analogue voltmeter. For that we found a small old electric engine. However, this one didn't seem to be functional either. The further work on figuring out this one had to be postponed to the next day. I paid a visit to check on the sick crew members' life signs - they still seemed to somehow be alive - and sat down for dinner in the galley with M. and Powder, anticipating what new challenges the CANDRA would produce for us tomorrow.

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## T + 5 Epidemy

I knew it had just been a matter of time. While the two sick crew members felt slightly better today, M. had caught the sickness as well, Powder didn't seem too well either, and even I felt a bit off today. The CANDRA was sucking our life energy. I do not remember that we ever even asked how the CANDRA is powered, we knew it sometimes might have power issues at times, we just assumed it was powered by one of those old RTGs that were used back in the early days of space exploration with the nuclear fuel being largely decayed. However the power supply had been rather stable since our entering, which suggested that there must be another source of power that had been installed later on.

Given the circumstances, not much work except the routine measurements were done that day. The plants seemed to thrive and develop and grow bigger every single day. At least one thing worked out as it should.

In my idle time I tried to assist Powder in their pursuit to dismantle the engine they had tried to repair but couldn't. We found an old hand saw with a dull blade which was the only means of opening the metal casing of the engine, taking quite a while until with use of a leverage the back housing could be removed. Upon opening the engine we saw the issue. It contained three copper wire coils, two of them looking nominal, while the third had a suspicious colour change on it, probably from a short-cut. So that engine definitely was dead, but maybe the two

non-burnt coils could still be salvaged and used for the makeshift voltmeter. Unfortunately the workload side of the engine was obstructed with a gear that seemed fixed to the axle and there was no way of removing it with the means we had available on the CANDRA, so we gave up on that idea. There was still the admittedly unpreferable option to build a coil for the voltmeter, however that would involve us finding a way to coat the copper wires we found with something isolating, which was also difficult to come by, so also that idea was placed to rest.

With every day that passed, the crew felt less energetic, so we decided to scrap the evening chores and instead set everything up for a movie night. Somewhere we found a package of microwave popcorn which we prepared in the galley. Apparently the microwave had not been programmed correctly turning a part of the popcorn into charcoal and lighting it up. Maybe we should have an old-fashioned charcoal barbeque instead? But no, fire on a ship in space is not good. We thus quickly removed the coal and extinguished the ambers. Luckily the majority of the popcorn was still edible. For a movie we chose an old classical science fiction film from the end of the 20th century, the fifth element with Bruce Willis. However after the first half of the movie, the majority of the crew wished to stop and continue the next day due to exhaustion.

While the crew went into their bunks, I still had daily hydroponics measurements on my to-do list, and with no one interrupting I could close the bulkhead to the lab and perform the tests while listening to some old, long-forgotten summer party music from Earth. What? I was feeling a bit nostalgic about the good old times before it all went to

rubbish. Though I definitely was alone in the lab, I always had the feeling someone or something was there lurking in a dark corner, observing me...

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## **T + 6 Explosion**

There it was, I fell sick as well. Just like M., I also had a stomach ache, as if we had eaten something rotten. Luckily mine was not as bad as the others had had it, but I felt remarkably worse than on the day before. Nevertheless today was the day we had set to open Pandora's box and finally check the chemistry rack to find out what of it could still be used (my hydroponics plants were greedy for some more fertiliser as my daily water analysis had shown) and to create a proper inventory list.

Potentially we might need to ration the chemicals we use to last for the entire trip. The cabinet indeed lacked some very basic chemicals, but it had other, very toxic ones in there instead, many of which could kill by inhalation. What the hell was this place? What did the scientists do here? And was it all just about plant growth? I started to seriously doubt it. I had a suspicion, but for now I kept it to myself. There was no need to worry the crew whilst it was still just a suspicion.

Once the chemicals were inventorised, I cleaned out the shelves. A small piece of paper slid in between the shelf and the cabinet's back wall caught my attention. I carefully freed it from there. It was a page from a notebook, carefully folded several times. It contained a hand-written, almost fainting text, hard to decipher. 'I will do it later on' I thought and carefully put the note in my pocket, and continued my work of



cleaning and putting the chemicals back on the shelves while trying to sort them a little.

With the last perishable food gone - yes, we only brought fresh food for six days, and yes, it was bad planning - I would finish the compost potato garden with the biowaste and seal it off with the last soil substrate we had in the lab. From now on fresh produce would need to come from our hydroponics and from the compost garden, but that could take a while.

Every day the CANDRA seems to be more alive while its crew gets worse. Today I found the old shower - thought to be entirely dead - coming back to life. To be fair the technical water coming out was, as every tab in the ship, undergoing the periodic water swells provided by the Russian pump and it was cold. Yet I was delighted to finally feel water on my skin again and to wash off some of the sweat and dust.

I informed the crew which seemed to lift the spirits a little, however the overall mood was very tense.

Someone had the idea - maybe also in order to relax the tension a bit - to finish the movie we had started the day before. That went smoothly, but afterwards the tension escalated. One unreflected comment, unfortunately made by me, caused another crew member to explode into a shivering panic attack. The tension of isolation, confined space, the illness, and the mysterious events on the CANDRA may have found their first victim. Feeling incredibly sorry for being the trigger, I retreated from the galley to seek the quietness of the gym. That is also when I remembered that little note that I had found in the chemistry

closet and put in my pocket. I took it out and unfolded it. It seemed to once have been part of a log book, ripped out from it, both sides written in cursive constant and readable handwriting that showed long years of practice. Which makes sense, nowadays no one uses paper anymore, way too expensive, but in those days when the CANDRA was active, some older folks still preferred pen and paper over the screen of a tablet to write down their notes and thoughts. It missed the first part. Potentially it was on the previous page which didn't get ripped out of the book:

*“plants succeeded. Subject 138 was entirely disintegrated. The whole process took less than 15 minutes. We reported the observation to Dr. B. and that we would like to first do further studies before we perform the transformation on human subjects. For once it is still unclear whether the objects 129, 130, 135, and 138 have successfully converted into free energy, of which we believe can travel at speed of light through the universe, or where we sent them, and secondly, the system was not yet well set-up if out of the last ten trials, only four showed full disintegration. But Dr. B. responded that the logical next step had been delayed for too long now, apparently the sponsors are putting pressure otherwise they might retract the funding, so we have to start the next phase tomorrow, even though we are not happy with phase one.*

*November 23rd*

*Crewman B. F. declared himself to be the first volunteer despite the risks. I had my reservations and objected to joining the other scientists in conducting B. F.'s transformation. Apparently they did not share my concern that we are not yet at a point to conduct on human subjects. Dr. B. confined me to my quarters for the time being, so they performed the test without me.*

*November 24th*

*Something went wrong, I could see it in their faces, whenever they brought me water and food. No one said anything, apparently Dr. B. had denied them talking to me. Nevertheless someone dropped me a message in my dinner: “we lost B. F., and we lost two others the same way. They disintegrated, but we did not measure any energy signatures. You were right, we should have waited.”*

*November 25th*

*Maybe being confined to my cell isn't doing me good: I heard voices all night, familiar voices. B. F.'s voice, and some others from the crew... I saw less and less crew members bringing me food. Each of them in more and more worrisome expressions.*

*November 26th*

*Today G. G. disintegrated right in front of me while bringing me breakfast. I was shocked to see on my colleague what I had seen several times before only on cabbage and lettuce plants from the hydroponics. But the door was open, so I could leave my prison and find out what had happened. Apparently they never materialised as free energy. I ran a few analyses and it seems they, or better their minds, seem to have been absorbed by the CANDRA's on-board computer, while their material bodies had been converted into energy to feed the ship's systems. In my curiosity I had forgotten to check the ship for survivors. According to the system only Dr. B. seems to be left. I will try to overwrite the system to stop disintegrating humans and let the ship send a warning. If you find this note, I failed. RUN! LEAVE THIS SHIP! DESTROY IT!*

Not good. Not good at all. But it explains a lot, the old lady being a human-eating monster that is slowly coming alive, sucking our energy and feeding off it. The voices and strange sounds we heard, the tension, the weird time perception,... it all made sense now.

I would need to tell the others and then we would need to see if there was any way we could stop the ship from devouring us.

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### **T + 7 Resolution**

I told them about my discovery... The reason why no one knew about the CANDRA was that seemingly no one ever left the ship alive. All the scientists that worked on it, became the ship. The initial idea to speed up human evolution to become transient energy beings that can freely travel the universe did not work the way they intended. How the CANDRA then made it back to Earth, no one knew.

The crew was silent in shock for quite a while, before Justine went to the console and plotted a return path to Earth. "Wait!" B. said, "if we return and won't survive it, the ship will find more people to feed upon!". So we discussed the pros and cons of sacrificing ourselves for the little bit that was left of humanity on Earth or trying to save ourselves by going back and potentially putting others at risk.

Given the fact that the world anyways was a messed up place, one messed up human-eating ship wouldn't make much of a difference, we concluded. Plus, the plotted trajectory was a pretty fast burn back, and if we would put up watch shifts and never go anywhere alone on the ship, we might survive it back to Earth.

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## Epilogue

We were sitting in the black van of our Polish friend at full speed away from the CANDRA. We had never truly left Earth. Why? No one knows, it felt so real. We felt as though we had woken from a dream. As though we had been asleep and now energised for a new day. It was only seven days, yet none of us remembered much of what we actually did. Vaguely that there was something with material and energy, and that I wanted to ask about it, but I forgot what it was, and also none of my crew remembered. It must not have been so important then.

There was also something we wanted to do with the CANDRA after exiting it, but none of us remembered. It seemed quite important at the time back then, but whatever it was it was gone now. We were quite tired and exhausted, it felt like we spent a lifetime in there, yet memories were just very vague like after a long party with too much booze. Our Polish friend didn't seem very surprised that we did not actually leave Earth. While driving back, she found out about another space ship that is nearby under construction, and that more people had asked her about getting off of Earth. She mentioned that the next group of people were already preparing to try to lift off and leave, they called themselves Astra or something like that. She was very convinced that they would manage to finally leave Earth behind. For some reason there was now a second meaning that connotated these words, but none of us knew what it was. When we got off the van two hours later, she invited us to try again once the new space ship would be ready, she said she is

always looking for people who like to leave Earth, and she gave us her card: “Dr. B. - Neuroscientist”, it said there.

## *5. From Italy to the Moon*

*Chronicles and daily struggles of a young astronaut designer*

*Serena Crotti, Italy*

*Exp. 37 EMMPOL 8*

*9-16 Sep 2021*

When my academic supervisor asked me - and I quote - if I would be willing to "go on a little trip" to better carry out my research for my thesis in Design, I never thought I would end up having one of the most exciting and challenging experiences of my life. I clearly remember my response to her request, expressed with the promptness typical of someone with a good dose of healthy recklessness: "Of course, I'm available!". At the time, I imagined that I would go to a research centre, in some European university, to carry out my studies in absolute tranquillity, sitting at a desk while sipping a cup of tea behind the Mac. But as it is often the case in life, the Universe had much more extraordinary plans in store for me...

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**Day -2**

It was May 2021 and I would never have imagined that only four months later I would find myself on a Ryanair flight to Kraków. Goal: surviving

a week as an analog astronaut. I am sitting next to a nice Polish guy who is trying to talk to me in an improvised Italian that - unfortunately - I can hardly follow. I try to make myself understood, but we do not understand each other. I would like to have a little chat, since I do not like to travel alone. "It doesn't matter", I say to myself, "If I want to survive a week in isolation as a single woman in a crew of four guys, I have to be independent.". That is how my adventure literally took off. In my suitcase, I packed the minimum necessary to live a week in solitary confinement with some decency; in my hand luggage, a good dose of enthusiasm, many expectations and, I must admit, a little anxiety and some worries. Yes, my luggage was not very light on my departure... I am surprised that I did not exceed the kilos allowed by Ryanair!

It is a beautiful day, we are flying with a clear sky and the warm September sun casting light on the white wings of the aircraft. I lean out of the window to see my hometown, Bergamo, getting smaller and smaller, lower and lower. "Wow", I think, "Now we are leaving. There is no going back". This awareness instantly triggers a grip in my stomach. What if I am not up to this mission? What if I get a panic attack from being locked up for so many days without windows? What if I feel desperately lonely, surrounded by four guys I know very little about? What if my experiments go wrong? What if, what if, what if?... Help! This is not for me! I have never been a tough girl. I know myself. I am emotional. I need my certainties. Besides, what the hell would a designer have to do with two engineers, an astrophysicist and a psychologist?

So, now you can see what I meant when I said that my luggage on the departure was not very light. I close my eyes and try to relax. I decide to focus on the positive aspects and convince myself that everything is perfectly under control. The grip on my stomach loosens and slowly the worry gives way to a sense of pleasant euphoria. "Why shouldn't I be up to it?", I say to myself, "I have all the cards. I can do it." I feel my adrenaline rising and, with this renewed enthusiasm, I finally feel truly ready to face the challenges ahead. I know that I have been given a unique opportunity and I am determined to make the most of it, for myself and for my thesis work. The unknown thrills me and my curiosity about what lies ahead calms any anxiety.

When I arrive at the Analog Astronaut Training Center, I feel energised. I know I have found the right building when I see a branded NASA towel hanging out to dry in the sun, so I pluck up my courage and ring the bell. A smiling face appears from the balcony and immediately greets me: it is Dr. Agata, boss of the Analog Astronaut Training Center. I have already met her on video calls and I'm pleased to find a friendly presence on my arrival. Agata immediately welcomes me with a cup of coffee and we have a little chat to break the ice. I am very happy that drinking coffee is still allowed. In the Mission Manual it was in fact said that - for the purposes of the scientific experiments to which we will be subjected during our mission - we will have to abstain from drinking it for a few days. As a coffee addict (or maybe I should say Espresso addict) I was quite worried about the idea of having to abstain from my daily dose. I am surprised to find that Polish coffee is not bad at all; moreover, good coffee is the best excuse for a little conversation.



While I talk to Agata, I try to clarify the doubts I have about the days to come. I take the opportunity to ask her some questions and she answers everything with accuracy. Little by little I seem to have everything under control. While we talk, I feel observed and I realise that my mission, although it officially starts on the 9th of September, has in fact already begun a few days earlier. I know that Agata is studying me to better understand my personality and I also know that this is part of the pre-training. I'm a bit nervous... What if I do not do well? My role for the EMMPOL 8 mission is that of Vice Commander and Communication Officer. I know that these roles require good communication skills and practical sense, which I am trying to demonstrate right from the start. It is a bit of a struggle because I am always a reserved person at first, and I am definitely out of my comfort zone in this situation. I hope that Agata will be able to see beyond my initial shyness and trust my abilities.

The AATC office is a fascinating place. I look around waiting for Leander, the mission's astrobiologist, to arrive. He comes from Vienna and is expected to arrive in the early afternoon. I decided to pass the time by wandering around. A multitude of books on the stars and the Universe fill the shelves of the bookcase to my left. To my right, large aquariums with various types of fish and algae. In this place, you can feel the love for science and space. It is two o'clock in the afternoon when the doorbell rings: he has arrived! When I meet him for the first time, Leander looks very different from what he looked like on the screen. First of all, he is very tall. I immediately wonder if he will be able to keep his head from touching the ceiling in the habitat. Then I am

immediately struck by his kindness. He is very friendly and helpful and I instantly notice that he pays special attention to other people. I think that if the other members of the crew are as kind as he is, then I have nothing to fear. This makes me feel reassured and I instantly feel a bit less lonely.

The first day in Kraków is a free one, as the rest of the crew is due to arrive the next day from Belgium. Together with Leander we decide to take advantage of the free afternoon to explore Kraków. The weather is generous and we spend the day outdoors, in the narrow streets of the city centre and walking around the castle. I think that, seen from the outside, together we probably form a rather funny duo: a two-metre Austrian guy walking with an Italian woman exactly half a metre shorter than him. This thought makes me smile. During our visit we decide to allow ourselves a little pampering before a week of deprivation and so we get an ice cream. We sit and chat on the benches near the castle. At the thought that after two days we will be starting a week of complete isolation, we try to keep as much sunlight as possible in our eyes and breathe in as much fresh air as possible, as if we could take some of it with us into the habitat.

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### Day -1

The following day we have a busy schedule. There are still several things to prepare before the official start of the mission. We have to take care of some paperwork and, most importantly, get our food and water supplies for the week ahead. When Agata explains that we have to stick to a strict regime when it comes to preparing meals, I start to get tense.

I'm usually pretty easy to adapt as far as food is concerned, of course, but you never know what surprises the astronaut diet may have in store. Doing the shopping is an unexpectedly complex operation. Or, rather, it is a real test. Outside the supermarket Agata hands us two sheets of paper with a precise list of which food to buy and in what amount. One list is for me and one is for Leander. One shopping cart each, and... off we go! Our challenge is to get everything we need in the shortest time possible. You will think, "Easy, what's the big deal?!" Well, maybe you have never tried to find your way in a completely new supermarket with signs in Polish only. I do my best but I am far too slow. Every time I think I have found the right food on the shelf, I find out that I have made a mistake. Fortunately, Google Translator exists. And so, between a jar of pickles and a pack of "Pierogi" ravioli (Polish speciality and really delicious!) the cart fills up and I tick off the items on the list one by one.

In the evening, the rest of the team joins us and we start to get into the heart of the pre-training programme. When we arrive at the AATC headquarters on our way back from the crazy shopping, the guys are already there and they are waiting for us. They have travelled together and got to know each other. I have a bit of an advantage because I already know B., our Commander, quite well. We met via Skype several times before the mission. In person he is exactly like he looks on the call: cheerful and friendly. He is an outgoing guy and I am already in tune with him. He is a psychologist and I think to myself that he seems to be cut out for his job. He is very talkative and likes to be with people. The other two guys are Ali and Jenne. I had the opportunity to talk to Ali a few times before leaving, but I know little about him. As to J., he is

still an enigma to me. Here we are: the whole EMMPOL 8 crew. We are all standing in the AATC office and, arranged in a circle, we go through the initial presentations.

It is now that I begin to really realise the bizarre situation in which I find myself. A sense of weirdness pervades me as I realise that, wow, I am really the only girl in the group! Before leaving I was not worried about this at all, I have always had many male friends and, to tell the truth, I have always found it easier to get along with them than with my female friends. But now, as we put on the astronaut suits for the first time, it feels strange not to have any women friends to share the experience with. Trying on the blue suits and holding the mission patches with the mission logo, which I designed myself a few weeks before, is thrilling. Crazy, I am really an astronaut! I smile when I see that my suit, size XS, is very long on my legs and arms. I will have to think of something not to look ridiculous at tomorrow's event, which we have been asked to attend in our official astronaut uniform.

The evening is still long. We have to move from the AATC headquarters to the Mission Control Center (MCC), which is more than two hours' drive from Kraków. As we reach our destination on the AATC shuttle, the landscape around us gradually changes. As we drive further and further away from the outskirts of Kraków, the illuminated buildings of the city blocks gradually fade away, giving way to the Polish countryside. While we are on the highway, the sun is setting on the horizon and the darkness is coming on. I am sitting in the back row of the van next to B., who seems as enthusiastic as I am about the adventure we're about to begin. As we leave the main road, we take

routes that become more and more secluded, until we reach a dirt path surrounded by woods. The holes in the ground make the minibus shake and the suitcases in the back clatter noisily. Every now and then I peer to my left to check B's reaction and see if he is as worried as I am about the remote place we're being taken to. I feel a bit like in an action movie where we are kidnapped and taken who knows where. Judging by his expression, B. is thinking the same thing!

When Agata turns off the motor of our van, we are surrounded by absolute darkness. A bit suspicious, I open the door and step out. My shoes immediately sink into the wet, muddy ground. It is freezing outside, the temperature has dropped so much compared to when we were in Kraków. I instinctively turn on the phone torch to try to see something in the darkness that surrounds us. A voice warns me: "Sere, turn off the light!". At first I do not understand, but then I look up at the sky and see the most beautiful gift that the dark could give us: a show of stars illuminates the blackness above us; the white halo of the Milky Way crosses the sky in all its majesty. As my eyes adjust, I see the bright dots in the sky multiply and become more and more visible. I instantly feel grateful for the wonder I am witnessing, and it is impossible not to feel small in front of such a magnificent sight.

With eyes full of wonder and beauty, we are ready to explore the Mission Control Center, which turns out to be a fascinating place. It is a small wooden house surrounded by meadows and forest. Inside we find some supplies left over from previous crews, which we use to set up an improvised dinner. We put our sleeping bags in the dormitory, where four very spartan bunk beds await us for the night. We are all very tired

from the long day and would like to go to sleep, but we have to finish some of the pre-training activities.

In the MCC there is a very impressive telescope, which we decide to take outside to better observe the spectacular view we have just witnessed. It is very heavy and the guys immediately do their best to move it to the centre of the grass in front of the MCC. We are very lucky because with us is also Professor and astrophysicist Bernard Foing, who will be part of our Mission Control for the first two days of the mission. Thanks to his expertise we can identify Saturn, whose distinctive rings we can spot, and the Pleiades. L., as an experienced astrobiologist, helps us to handle the instrument and identify other celestial bodies in the bright multitude above us. I feel that the group is starting to build up and that the distances between us are beginning to shorten. The first bonds are forming and watching the star show makes me feel particularly close to the people with whom I am sharing this magical experience. A melancholic thought goes to my home, my family and my boyfriend, miles away. I wish they were here with me, sharing this magnificent view, but now I feel they are far away and belong to another world, exactly as those stars above our heads.

When we come in, we are all cold. Agata asks us to take a seat at the round table in the main hall to do a short pre-training exercise together. Once seated, she hands out a pen and paper and, without any preamble, explains the exercise to all of us. Each of us has to draw a man using seven signs including ellipses, rectangles and triangles. Three, two, one... Go! Agata starts the test and we cannot ask for any clarification. A little hesitantly, I take the pen and start doodling on the paper. Then I realise that it is a timed test and that I have to get a move on. In the

corner of my eye I see that J., sitting next to me, has already finished his drawing, turned the paper over and put the pen down on the table. Now he is standing there looking at us with an inscrutable expression and his hands crossed. I immediately feel inferior. How on earth did he finish the exercise so quickly? I look at my drawing and cannot help but feel frustrated. I should be good at this visual stuff, after all, I am a student of design! Will I be able to draw a stylised man afterwards... or not?! In the meantime the seconds tick by and I barely have time to add eyes to my little man when Agata tells us that time is up.

"Well, let's see your drawings!" she says. At this point I am definitely embarrassed. My horrible little man is staring at me, from the paper, looking sinister and a bit creepy. I am afraid to see what the others have drawn because I imagine that no one could have done something so badly. I take courage and look around. As I look up, I meet the eyes of my companions and I feel like laughing, it seems we are all in this together. L's little man is armless and looks more like a warning sign than a man, B's and A's are so small you would need a magnifying glass to see them. J's is in the middle of the page but, honestly, it is not that much better than mine. I breathe a sigh of relief as Agata explains the point of the exercise: "This test is to assess your ability to immediately understand the instructions. As you saw, I only told you the rules once, but they were very precise. Which of you can say that you have carried them out exactly? I see that many of you have not used the seven geometric figures as required!". I take a quick glance at my drawing and count the figures: one, two, three, four, five, six and... seven. Yes! My little man may be ugly, but at least he meets the requirements. Agata then explains that she is able to extrapolate important information

about our personalities by looking at our sketches. Looking at mine, she pauses for a moment and comments with an amused air: "That's very interesting... I understand a lot of things! I don't know what she realised, but I'm still dying to know what she thought."

## Day 0

When the alarm clock rings I can barely open my eyes. The night before, between one thing and another, we went to bed very late. The first night with the crew was quiet. To my pleasant surprise, none of the guys seem to snore in their sleep. This reassures me because in the habitat I know that we will only get a few hours' sleep, so it is important that we get quality rest. We have a busy day ahead of us. We will spend the morning and afternoon at an official event that will take place in an observatory near the MCC, where we are invited to attend as astronauts. So it's crucial that our suits are ready and fit us perfectly!

I almost choke on my breakfast when I remember that I still have not had time to sew the mission patch and the Italian flag to my suit. I have less than half an hour to do it and, given my little (if any) experience in sewing, I am a bit worried. I hopefully ask the guys if they are good with needle and thread but as I imagined the answers are not very encouraging. All that remains is to roll up my sleeves. When I try to thread the needle through the fabric I unfortunately realise that it is far too thick to be sewn by hand. Next to me, L. and J. are trying their hand at the same task and are also in visible difficulty. "EMMPOL 8 are you ready? Ten minutes and we will go!" I hear Agata's voice calling us to order from the other room.



Help! The boys and I share a look of panic. I feel like a Masterchef participant trying to prepare the perfect dish in ten minutes. Time is running out and none of us seem to be able to come up with anything. L. is looking at me in despair, while J., who is more of a solo type, is completely focused on his patch, which refuses to attach itself to the suit. We are about to resign ourselves to our sad fate of becoming anonymous astronauts and wearing suits without the EMMPOL 8 logo, when I have an epiphany. I remember that, before leaving, my mother – who is probably not very confident in my skills as a tailor – had put a reel of Velcro in my suitcase to quickly fix the patch to the fabric. When I show it to the guys, I see that they breathe a sigh of relief. We are just in time to stick the logo on the pocket when Agata tells us it is time to go. On the way out, I press the fabric tightly to avoid losing our precious mission logo and, while thanking my mum's foresight (she doesn't miss a shot even from thousands of kilometres away!), I try to make myself look like a professional astronaut, even though the blue suit is a bit oversized on me.

The event is in memory of Yuri Gagarin's extraordinary deeds. As soon as we arrive at the observatory we find a crowd, in visible excitement, forming a circle on the vast lawn in front of the main building. The children are excited about what is going to happen: we are about to witness the launching of a rocket. The enthusiasm is palpable on their faces and in their cheerful voices. When we join the crowd, everyone looks at us as if we were idols in our blue suits. Several people ask who we are and are curious to know more about our mission as analog astronauts. I can't help but feel proud. A journalist who is present at the

ceremony asks us to do an interview for the media. At first I'm intimidated and I impulsively want to give way to B., our Commander. But I realise that it is my duty as Communication Officer to take care of these things. So I decided to go for it. The journalist asks me several questions. He wants to know where the habitat of our mission is, whether we will be able to go outside, whether we will have windows, what we will eat, how we will feel, what experiments we will be doing... In the end he seems satisfied with the answers and I feel privileged to be doing this with the guys.

We entered the habitat late in the evening. We spend the afternoon following a precise schedule of things to do before the mission. Amongst other preparatory activities, we have to take some photos for the outreach. The observatory is a perfect location because it is full of equipment and literally spacelike corners. A giant antenna stands not far from the main building and someone suggests that we all go up there together to take some pictures. I take a closer look at the building. Seen from where I am now, it seems feasible. They explain to me that there is a ladder to climb up and that at the highest point the antenna is about thirty metres tall. The guys are all enthusiastic and want to climb up to take team photos. I start to feel a bit shaky in my legs, I suffer from dizziness and the thought of climbing up a thirty-metre antenna is a real cause for anxiety. If not, I think, I will look like a wimp. And what is more, the photo of EMMPOL 8 without its Vice-Commander Serena Crotti, who did not have the courage to go up, will go down in history. "I can't give up like this!", I say to myself, "I can do it," I keep mentally repeating to myself as we approach the structure.

OK, now I'm definitely panicking. What have I got myself into? When we get to the bottom of the vertical ladder we have to climb up, I cannot help but notice how much higher the antenna looks than where I was before. I want to backtrack and say "No, sorry, I just can't do it, this is too much for me!". But by now we are all queueing up, ready to go upwards. I am standing between B. and J., who are chatting away happily as if they were taking a walk with an ice cream and don't look like two people about to climb a thirty-metre antenna. If I retreat now they'll think I am an idiot! As I put my foot on the first step, I am literally cursing myself. The metal ladder is totally perpendicular to the ground. I climb the first ten steps with decision and a certain ease. Below me I can see the ground getting further and further away. I raise my head and B. is standing on it. Every now and then he calls me and makes sure I am okay. Probably with his sixth sense as a psychologist he understood that I was not very enthusiastic about climbing. I act tough and tell him it is okay, even though it's not okay at all. I am so scared that my hands and knees are shaking and I am almost afraid I will not be able to hold on to the pegs because of how bad I feel.

As we climb, I force myself not to look down. At this point we have already passed the top of the surrounding ancient trees in height. I try to concentrate on my breathing with a technique I often use in moments of nervousness. Staying focused while feeling this anxiety is difficult. As I climb, I hate myself for getting into this situation, but I cannot help but feel a touch of pride as well. "Wow", I say to myself, "I'm climbing a thirty-metre tower, and I suffer from dizziness! I am facing one of my greatest fears ever". I feel both amazed and proud of my bravery. In the past I would never have dared to say yes to such a

proposal, but here I am, in the middle of the Polish countryside, climbing an antenna with my bare hands. The "ordinary" me in Italy would never have done something like this. And yet... Is it the astronaut suit that makes me so brave? Or is it the Polish air?

Needless to say, I feel super excited when the adventure is over. The adrenaline in my bloodstream makes me hyperactive and eliminates the fatigue of the day. As we get on the van towards the habitat, I get lost in my thoughts. I realise that stepping into the shoes of an astronaut has given me courage and self-confidence that I would never have thought possible. It has allowed me to find the energy to face one of my great limits, the fear of heights, with totally unexpected courage. I feel strong and I know, in my heart, that the merit for this goes to the astronauts, true heroes who have inspired me. Thinking about their deeds has helped me push myself, in my own small way, a little bit beyond my comfort zone.

As we reach the habitat together, with Agata at the drive of our "Space Shuttle", I am more and more curious and excited. Before leaving, I had seen some photos of the base that will host us for a week on the Internet, and it looked like a very cool place. In the photos I was struck by the silver walls and the mass of equipment in the laboratory areas, which gave it all the feel of a real space base on the Moon. I cannot wait to get there. My excitement, however, is overshadowed by a subtle anxiety: what will it be like to live confined with four strangers for a week? My concern goes mainly to the lack of windows. I imagine, with some anxiety, the moment Agata leaves the habitat to the MCC, closing

the door to our base behind her, which will remain shut and sealed for the next seven days.

We arrive at sunset. The temperature has dropped and the colours of the sunset dye the Polish sky pink. From the outside, the base looks quite ordinary and resembles a small mountain hut. It is surrounded by countryside and is really quite isolated. A few deserted-looking houses in the distance and a small barn populated by a few wild animals are the only company around. To get there, we take a narrow path that cuts through the forest. And here we are, the five of us anxiously waiting while Agata is opening the front door, our gateway to Space.

When the base door opens wide, we are all instantly hit by a gust of bad smell. We had been warned that, being a closed and windowless place, unpleasant smells are frequent and the place is a concentration of "olfactory emotions", to put it gently! The body odours of the previous crews, the place itself and the biological experiments remain imprisoned there, just as they do on board the International Space Station. I am well informed on the subject thanks to my thesis research, which focuses on the role of scents in space environments. But, as in all things, theory is one thing and practice is another. Although I was prepared, I never thought the smell would be so nauseating! When I set foot inside the base, I feel close to the astronauts who, having arrived on the ISS, often throw up because of the peculiar smell of the place. I am worried that I cannot stand the stink. It is persistent and invasive, I can feel it sticking to my clothes and skin and I start to get a headache. I notice, from their suffering faces, that the boys are also in serious trouble.

Agata leads us inside for a training session on the use of on-board devices. Fortunately, the door remains open as we continue with our tour and every now and then a breath of fresh air soothes my poor nostrils. As we explore the different rooms, I am struck by how space-like the atmosphere of this place really is: exactly like in the pictures, the walls and ceiling are all covered with silver. The room is cramped and you have to watch your step to avoid tripping over pipes and equipment. The first room we pass through is the GeoLab. It is a long, narrow module, full of instruments for scientific experiments. On a high counter, among others, there is a 3D printer, a microscope and numerous other pieces of laboratory equipment. Glass tubes and Petri dishes are scattered here and there. A bulky machine emits a continuous noise and seems to be one of the causes of the unpleasant smell: it is a hydroponic culture system.

I listen carefully as Agata explains in detail how the main systems work. We all take notes and are determined not to miss a single piece of information, because our survival and the maintenance of this place will depend solely on us for the duration of the mission. While she tells us that, during the week, we will have to take care of the fish in the tanks in the laboratory, I am almost happy to have some company besides the five of us for the week. I am a little less enthusiastic when she informs us that we also have to feed the cockroaches that live in the plastic box next to the cute little fish. As she lifts the lid of the container to let us observe the insects inside, I have to use all my self-control to keep still and not run away in disgust.

I. Hate. Bugs. In all their forms! When I am at home I cannot even kill a spider, how could I feed cockroaches?! I look at them inside their box: there are so many of them. Some old egg cartons are arranged inside the box to create a comfortable habitat. Here and there a few carrot peels and other vegetables have been chewed up by the roaches, leftovers from their lunch a few hours earlier. They look terrible, or at least to me. Agatha and the boys seem to be of a different idea, as they go on repeating how extraordinary these creatures are. Agata picks one up and strokes its back lovingly. I hope she will not put it in my hands because I do not think I could really stand that. As she touches it on its back, the insect emits a frightening sound, halfway between a hiss and a horrifying scream. "Don't worry if it makes this sound", Agata explains, "When you press it on its back it expels air and makes this noise. They're usually quiet and don't bite, but I would advise you to keep the tape on the box to prevent the more curious ones from wandering around the lab". Whaaaaat? Is there a risk of them wandering around? Okay, now I am definitely panicking.

The second room we explore is the living module, where much of our daily activity during the mission will take place. It is a multi-purpose room, on one side there are several laboratory instruments, on the other there is a small kitchen with a table for four or five people. The room is very narrow and packed with stuff. Three large bins are used for the separate collection of rubbish and, on Agata's advice, they must always be closed to limit the dispersion of bad smells during the week. At first glance, they seem too small to hold the rubbish of five people for seven days, so I ask the question, "What if we run out of space in the bins, where can we put the rubbish?". I am worried about having to live with

our smelly trash. The answer I get is not very reassuring, "You have to try to limit the waste you create, especially organic food waste, because once it is produced it can only rot and will not come out until 16 September". Agata then recommends that we always eat all the food we cook, so that we minimise the production of organic waste, which is the most problematic when it comes to unpleasant odours.

Next to the dining table there is a particular area, full of cables, sockets and monitors. This, explains Agata, is a zone we can use to work during the week. Instead of the main monitor it will be our job to reset the Mission Time every day. Yes, during the simulation we will not be tuned to the local time zone, but we will live isolated according to our unique Mission Time, which will be calculated every mission day starting from Zero Hour, when Mission Control wakes us up. The total absence of windows and, therefore, of sunlight, makes us perfect test subjects for an experiment on the subjective perception of time. This means that we will be totally disoriented and will never know whether our lunch break, for example, is taking place in full daytime or in the middle of the night. The idea of not being able to have control over this scares me and is a great challenge. I am concerned about the effects that altering circadian rhythms may have on our moods and I hope that my body and brain will be able to do their duty to react well to the strange conditions which are being imposed on them.

We continue our tour in the dormitory module. Three bunk beds are arranged against the silver walls, a special hammock hangs in the middle: here, Agata explains, we will be allowed to rest during breaks. Two large ventilation hoses run through the room. We are instructed on



how to manage the ventilation system during the night, when the entire crew gathers in the crew quarters to sleep, dangerously increasing the levels of carbon dioxide in the environment. We are warned about the importance of keeping this under control at all times, so as to avoid health problems and incidents. Agata explains how to make sure that all the parameters remain within the norm and tells us that each room is equipped with both sensors to monitor the air quality and cameras to allow Mission Control to observe us 24 hours a day. The thought that we are going to be watched and heard constantly makes me feel strange. I feel like a reality show participant and I wonder if this strange feeling will go away at some point during the week or if it will accompany me until the end of our mission.

The last room we visit is the gym, a long, narrow and very small module. There is barely room for an exercise bike and a treadmill arranged in a row. We are scheduled to spend one to two hours a day doing sports, just like the astronauts do on the ISS to counteract the negative effects of microgravity on the body. I am not very fit but I think it is good to have some exercise during the mission; running is an outlet and it will definitely be useful to do some jogging during the confinement days to release some tension. Agata explains that each crew has its own record of physical activity and that we are invited to push ourselves to our maximum potential. I write down this information in my notebook as I hope to be physically fit enough to keep up with this request.

After the explanations, we are informed about the daily schedule and our duties, which include a number of body measurements. I think that

we will have a very intense routine with all these activities planned, and little time will be left for individual experiments. Keeping up with Agata who explains all the things to do is almost impossible. I try to take as many notes as I can, and I am reassured to see that Jenne, efficient as ever, is marking everything down with extreme precision, apparently without too much effort. How can this man always be so on top of everything?

It is already night when Agata says goodbye before going back to Kraków, from where she will follow our mission with the rest of the MCC. She wishes us good luck for the week and then leaves us to our astronaut fate, closing the door on the real world. The last thing I see are the blurred lights of a few houses in the hills in the distance, surrounded by darkness. After that, only the silver walls of our base remain.

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## Day 1

The first night in the habitat was surprisingly quiet. By the time we turned out the lights we were dead tired and within minutes we were all asleep except for A., whose bed is too short and took a little longer to find a comfortable sleeping arrangement. In the end he opted for something strong and moved his mattress to the floor, sleeping directly there. We wake up because we hear B's phone ringing, I have no idea what time it is but I feel recharged and rested. The MCC is calling our Commander to officially start the first day of the mission. Instinctively I pick up my phone to check the time but then I remember that the experiment on the subjective time perception has started and it could

just as well be ten in the morning as four in the afternoon and that would mean nothing. From now on I will have to try to keep in line with Mission Time and refer to it to organise my day. I am on my bed, still inside my sleeping bag, with the phone in my hands. If I were at home the first thing I would do now would be to check my Whatsapp notifications and Instagram feed. But you cannot do that here: all contact with the outside world is filtered through Mission Control. With some desolation I put the phone in my backpack and think that it will not be of much use to me this week. And then there is no time: the others have already got up and Jenne, who sleeps in the bunk bed above me, is already working at his lab bench.

I have to pee as soon as I wake up with some urgency. I glance at the bathroom door and find it fortunately open. Last night at dinner I drank a lot of water and, since our Medical Officer keeps repeating that we must stay hydrated, my bladder is practically exploding! Still half asleep, I make my way to the toilet, happy to find it free. J., who is already wearing gloves and handling a test tube with a professional manner, warns me, "Serena, remember that urine collection starts from today, I have hung a chart on the door for everyone, so you can write down how much pee you do each time. Okay?" I look at him, I am perplexed, then my neurons start to gear up and I realise that in fact yesterday Agata gave us very precise instructions about urine collection. "Of course!", I tell him, masking my irritation at the thought of having to grapple with the logistics of peeing into a jug as soon as I wake up. "Oh, and also remember that in the morning and evening you have to pour some pee into the test tube for analysis, mind you. So now it is the

first turn for the test tube." "Okay, no problem!", I say with a forced smile.

"I wish I had been born a man", I think as I try to figure out how the hell to hold the millimetre jug I have to pee into place. I try different positions and eventually my legs hurt from hanging around trying to pee inside the jug. Half of my brain is still in dreamland, the other half is trying, in every way, to muster up extraordinary precision to keep it out of the container. I feel like someone at a shooting range who has only one shot left to hit the target. Or like, when at the funfair, you have to hit the pins by throwing the rings to win the prize. Unfortunately the prize here is just to avoid pissing yourself! In the end, I managed somehow. I note down the millilitres of pee I have done this time on Jenne's paper and breathe a sigh of relief. I am about to empty the jug into the toilet when... "Oh no! I forgot!". I have to pour some of it into a test tube for the morning's analysis. At this point I am definitely irritated. I find the clean test tubes to the right of the toilet and, with a shaky hand, I fill one up. Maybe I am squeamish, but this activity disgusts me. Besides, I am a real wimp! I do not have a steady hand at all and I perform the whole procedure with the fear of spilling my pee on the sleeve of my pyjamas. "At least it is mine!", I think as I flush the toilet. In the meantime I also breathe another sigh of relief: the first one is done.

I spend the rest of the day settling in and organising the experiments that I will have to carry out over the next few days. With the guys, we divide the tasks equally and organise the shifts for the week. I propose to prepare food, I like cooking and, as the only Italian in the group, I feel a bit of an obligation! A. proposes to help me because he also loves

cooking. The others, on the other hand, will take care of maintaining the habitat and cleaning and washing the dishes. The day passes quickly, between individual work and the duties of an astronaut. After lunch I start to realise that my perception of time is definitely altered: in my head it is eight o'clock in the evening, but the Mission Time and the day chart show that it is early afternoon. I am definitely confused. In the afternoon I also do the mandatory training for the first time. It takes me a while to figure out how to turn on the treadmill and so I ask A. for help.

A good atmosphere is being established with the boys. We are on the same wavelength and so far there is no particular tension or friction. Of course it is only the first day... I get on well with them, of course, but sometimes I would like to be able to spend some time on my own. Although I am a sociable person, in this situation I feel more than usual the need to be alone. What I miss the most is the freedom to organise my day as I wish and to do things my own way. In the habitat the space is tiny and it is practically impossible to find a room where I can be by myself for a while. What is more, there are no doors between one module and another, so the lack of privacy is total. I hope that over the next few days I will get used to it and be able to cope with the situation. For today I am just gritting my teeth. I still have the strange feeling of being continuously controlled by the MCC: I feel like a lab rat and, sometimes, I get the impression of being trapped.

I find some relief by doing sports. I put my headphones in my ears and try to relax by running. I concentrate on the music and my steps, while getting into the rhythm. As I run, I find myself in a new dimension of

focus and, at last, a bit of healthy loneliness. It is just me, the treadmill and my music. Before leaving, I have prepared a playlist of songs to listen to on board. While I listen to a song by the *Pinguini Tattici Nucleari*, an Italian band I love, I feel a bit at home. The singer is from Bergamo, my hometown, and hearing a familiar voice speaking in my language and even with my accent makes me feel at ease. It is a rejuvenating moment and I would like to extend my hour of mandatory training. I finally have some time to reflect. The last days have been intense and the first impact with the habitat has been tough. I did not expect it to be so hard to adapt and I thought I would struggle less all the way through. I am a bit discouraged and doubtful about my own capabilities; it feels like everyone else is better than me and that they do things with more ease and less effort. On the other hand, however, I am also proud of myself, because I see that – despite the undeniable fatigue – I am nevertheless completing all the required tasks and holding my own. I think that maybe I just need a bit more time to settle in than the other guys and that I just have to keep persevering.

## **Day 2**

The second day I woke up feeling awful. I slept very badly because I had a strong sore throat. I spent the whole night worrying about awakening the others and bothering them, as the rasp was giving me sudden coughing attacks. At one point I even got up and went to the kitchen at the main table. Sitting alone on a chair in the middle of the living room module, I stared into the darkness. Then I thought I could optimise my time and I took the opportunity to select some photographs for the outreach, for which I am responsible as Communication Officer. As

soon as I open my eyes the next morning, I feel exhausted and I would like to stay in bed for at least another three hours.

The medical routine in the morning goes smoothly, unlike the previous day when we still had to get into gear and focus on our tasks. We all seem more organised and prepared. When I get up to pee, I am mentally ready to try my hand at urine collection and I am doing much better than the day before. Indeed, experience means everything. I am surprised to see that I am much less squeamish than yesterday. If I could, I would give myself a high five to congratulate myself! As I patiently undergo my daily medical check-up, I think that I would really like to have a good coffee, but this is not allowed on board and I quickly set my heart at rest. I decided to put sports in the morning on my daily schedule in the hope of getting some energy into my bloodstream and to wake me up after a sleepless night.

It is only the second day but the fact that I cannot wash myself with running water during the week is starting to get on my nerves. The mission rules state that only cleansing wipes are to be used for personal hygiene. My skin feels sticky and this makes me very nervous; I desperately wish I could wash myself with fresh water.

Today I have a lot of things to do for my thesis experiments. During the simulation I will be carrying out three separate experimentations, with the common goal of improving well-being on board and gathering information for the design of my habitat project. The first one has to do with monitoring the emotions of the people on board; in the second one I will try to give the astronauts moments of well-being and

relaxation through multi-sensory stimulation; in the third one I will try to surprise my fellows through the sense of smell. I am determined to carry out all the experiments in the best possible way and I have tried to organise everything down to the last detail. I hope things will go well.

I spend most of the day setting up the three experiments. First of all, I take care of the emotional monitoring. Everything is almost ready and I just have to make sure of two things: that there is a screen to project the results of the experiment and that all the astronauts complete the test when required. Both of these things go off without a hitch and the experiment is underway. For this test, the astronauts are asked to express their emotional state several times a day, after which they comment on the results anonymously through a specifically designed graphic expression. When I project the first result into the kitchen area, the beating heart of the habitat, I am thrilled. With the help of B., psychologist and mission Commander, we comment on what we all see together. A moment of sincere discussion begins, during which we all feel free to talk about our emotions. I am happy with the result and the guys give me a lot of enthusiasm for the project. This makes me even prouder because their background is more scientific than mine. Learning that the project is appreciated even by non-designers is in itself a very satisfying result.

I feel that a strong group bond is being created and it is hard to believe that I have only known these guys for a couple of days. The shared life and the extraordinary nature of the experience we are living are a bond that keeps us together and shortens distances according to a logic and timing that are totally different from what we are used to. I am starting



to feel much less lonely and I am happy that, little by little, I am settling in too. The guys are nice to me, they treat me a bit like a princess since I am the only girl in the group. As soon as they see that I am in trouble with something, they offer to help me out and come to my rescue. They are very respectful of my privacy and I appreciate that they do not make sexist jokes or innuendos, which would not surprise me, given the particular situation. Although they are very nice, they are also very reserved. At first I was surprised because I am used to my Italian friends who are almost too expressive! In this regard, I think that the feeling of distancing that I sometimes notice is mainly due to a cultural factor, which leads them to carefully respect others' personal space. They probably need more time to let themselves loose a little.

### **Day 3**

When Mission Control calls us, I am surprisingly already awake and I am lying in my sleeping bag staring at the bed above me. The guys are all sleeping peacefully and not showing any signs of life. When I hear the Commander's phone ring for the morning wake-up call, I am glad it is time to get up. Today I feel full of energy: my sore throat has finally gone away and I am determined to make the day count for the experiments I have to carry out. Plus, I feel like I am settling in.

The evening was unexpectedly prolonged: everyone enjoyed being together. The only one who went to bed early was J., who wanted to be up and active the next day. Instead, the four of us started talking and talking; we shared our ideas and ways of seeing life. In fact, the conversation took a decidedly philosophical turn. I like this aspect of

our crew, we are very different but there are always interesting discussions that leave me with a lot to think about. It is rare that so many different people are able to talk to each other in such an unprejudiced way. It seems that our personalities — although so diverse — have been selected on purpose to compensate for each other. I really feel like I have known the guys for a lifetime, and yet it has only been four days! It is a very strange feeling, and it is also a blessing. This "human" side of the mission is helping me to face the practical difficulties with a different spirit from the first days, when I felt alone. Now the hardships of astronaut life are being shared and it seems that everyone is starting to express their joys and worries to the others.

I wonder if the other crews also felt so close from the start, or if we were particularly lucky to find each other. I recognise that two unique factors in our mission are helping us on a personal level: my experiment with emotions, which calls for everyone to reflect and express their feelings, and the presence of a psychologist in the role of Commander on board. B's background is precious in helping us manage group dynamics effectively. If he sees someone a bit down in the dumps or discouraged about something that is not going right, he will come up to them and ask, "Hey, is everything OK?". It makes me smile to see how our daily briefings and debriefings (which take place twice, after breakfast and after dinner) always start with B's question, "So, how is everyone? Is everyone *happy*?". I think it is rare to have a mission where everyone is so attentive to each other's emotions, and I am happy to experience this with the guys from the EMMPOL 8.

The morning passes quickly and with a few hitches. I focus on the second experiment for my thesis, which concerns the creation of some multisensory scenarios on board through the use of light, sounds and scents. To set up the scene I have to move a few heavy things around and at first I am discouraged and almost annoyed. Movement in the cramped environment of the habitat is stressful; every time you turn, you encounter physical obstacles and risk dropping something very precious, like another astronaut's experiment or an expensive laboratory instrument. I am looking for a clear surface in the base to project my light effects, but the silver walls are everywhere and the visual output is very different to the tests I did at home. I am dejected and worried, "What if I cannot complete the experiments for my thesis? It would be a total failure", I say to myself with my usual optimism... B. sees that I am in trouble and immediately offers to help me set up the scene. Leander also follows him and the two guys really give me valuable help, both practical and psychological. They reassure me that everything will go well and that we will find a solution.

While we are taking a break from work I also tell Ali about my difficulties. He looks around and, after thinking for a while, suggests that I try to use the back of a large whiteboard we have in the kitchen area to project the light effects. At first I look at him perplexed and doubt that his proposal would work, but since I am desperate I decide to give it a try anyway. The whiteboard is very heavy and moving it by myself is almost impossible. I am not going to ask the others for help because I see that they have all gone back to their own experiments and I do not want to bother them. Moreover, a touch of pride urges me to do things on my own; I do not want the boys to think that, as a girl, I

need their help. Yet, doing things alone in this case is not a very wise choice, and as soon as I try to lift the board I almost let it fall on myself. A. and B. see that I am in trouble, drop what they are doing and rush over to help me lift it. We spend the next half hour finding the ideal position to put it in and I feel guilty for wasting the guys' time. When I apologise to them for this, I realise that they have been in fact happy to help me and I feel a sense of genuine thankfulness.

The second experiment is now installed and I can breathe a sigh of relief. Things are now going well and I can feel the pressure starting to ease off. I realise that the worry about the success of my experiments for the thesis was putting a lot of stress on me. With the second one installed, we now have an area where we can relax in the habitat by experiencing specially designed lights, sounds and scents. I decided to be the first test subject of the experiment and I took a little break. I lie down next to the multisensory installation, close my eyes and abandon myself to the pleasant sensations of the new atmosphere. When I opened them again, I discovered that only fifteen minutes had passed, but that was enough to make me feel rejuvenated.

In the afternoon I invite the guys to come close to the installation while they work on their individual experiments. I want to see if its presence on board helps them concentrate and feel more relaxed while they are engaged in their personal activities. The boys are very cooperative and volunteer without any hesitation. The rest of the day passes quickly and in a flash it is dinner time. During the debriefing it turns out that we are all physically tired, so our Crew Medical Officer, Jenne, prescribes a group stretching session. I am excited. After dinner we get our yoga

mats and settle down all together in the living module. We struggle to find an ideal arrangement — it is like playing Tetris! — in the end we manage to fit in the little space we have, and avoid finding ourselves with our feet in each other's faces. J. has prepared some exercises by following a tutorial and shows us the positions to take. The next hour is hilarious: none of us have much flexibility and the exercises put us to the test. L., tall as he is, struggles to stretch his legs all the way out on his mat. During the exercises I run the risk of B's feet landing on my face. I have a hard time not laughing when J. leads us through what appears to be some sort of dance split. We look more like five awkward dancers than a team of astronauts doing stretches! At the end of the session my neck is still hurting, but I definitely feel amused.

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## Day 4

Day four of the mission starts off on the right note. I am in a good mood and by now I feel like nothing can go wrong. Apparently, yesterday's yoga session paid off and we are all very positive. I spend the morning working on my experiments and I decide to focus on the third one, which is about scents. I ask B. for help to record a short demonstration video for the sponsor of the project, who has provided me with the necessary materials to carry out the experiment.

I try to look professional in front of the camera. I put my astronaut suit on and give my hair a quick tidy up, as it has not been a priority during these days of confinement. I decide to put a little make-up on so I will not look too dowdy in the video; as I quickly swipe mascara on my lashes I realise I am behaving like a horrible astronaut and I keep saying

to myself, "Priorities, Serena, priorities!". I berate myself for being so vain, but I have already got my left eye made up and if I do not finish the job I will look like an idiot. While we record the video, B. acts like a perfect cameraman. I give my audience a tour of the base, and as I tell the camera about our life on board, I really feel like those astronauts on the ISS who do demo videos on board. I am a little embarrassed when we pass close to Jenne, who is working on his experiments in complete concentration. I instinctively wonder what he is thinking of me and I imagine he must consider me a bit ridiculous. I decided to make fun of the situation and include A. and L. in the video. The two seem happy to be on the show.

At lunchtime A. and I start cooking, as usual. He is very precise in weighing the food and calculating the calories we need to eat according to our diet. I am a bit less accurate and I feel that cooking with this mindset limits my culinary creativity. I would like to prepare something typically Italian for the crew, but we do not have the right ingredients and we seem to have very different tastes in food. They would put spices and sauces everywhere, while I always prefer olive oil. A funny culinary debate arises. At the end of it, they just cannot convince me that mayonnaise tastes good on ravioli.

We are about to sit down to eat when we realise that we have run out of drinking water. From now on, each of us will have to boil tap water to make it drinkable and then pour it into their own water bottle. Easy to say and hard to do, apparently! When I try to pour the hot water from the kettle into my bottle there is not a square centimetre of free surface on which to place things in order to carry out the operation. The

kitchen is full of the pans we used for cooking, while the tiny table is already set for lunch. The others are waiting for me to start eating, so I decide to take a risk. I start filling my bottle by holding it directly in my hand, suspended in mid-air. *Terrible idea.* The kettle is too heavy and I cannot control my hold. Within half a second, all the boiling water spills out; half ends up on the floor and the other half on the bare skin of my hand.

Panic!!! It is scorching! It is so hot that it feels cold at the moment, and it takes a while for my brain to realise that I have been burnt. I feel flushed with fear, pain and embarrassment. I immediately try to dissimulate: I do not want the guys to think I am a wimp. I put my hand under the cold water of the tap and I pretend that nothing serious has happened. Inside, however, I am totally scared and I feel a twinge of pain on the burnt area. I must be a bad actress because the guys, who are sitting at the table with their lunch in front of them, look at me as if I were dying. They spring to their feet and mobilise. B. dries up the water that has fallen on the floor, J. and A. come to examine the burnt area to assess the gravity of the situation, while L. starts giving me psychological support and – with an apprehensive and worried look on his face – keeps telling me to keep calm. My hand and wrist are slowly turning redder and redder and I really think I am going to have a permanent scar; the burn is extensive and the thought of us being isolated on the base is terrifying. Medical Officer J. takes immediate action. First he has me hold my wrist under running water for twenty minutes; while we wait, the others go back to eating. A. comes to my aid, picks up my plate and holds it so that I can eat while keeping my other hand under the tap. A real gentleman! J. then completes the

medication: first he puts an ointment for the burns, then he bandages my wrist and acts in a super professional way. I am still worried, the pain is strong and I am afraid that the burnt area will fill up with blisters. Slowly, however, I manage to calm down. There are still two days to go and I cannot give up right now!

When the emergency is over, I reflect on what happened. I am proud of myself for not panicking that much, as I usually do in these situations. More than that, I am really surprised and happy about how the guys immediately teamed up to help me. Their support was crucial in dealing with the accident and I can only feel a sense of gratitude and closeness towards them.

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## Day 5

The fifth day arrives at the speed of light and it does not seem real to me that we are already almost at the end of our mission. My perception of time is totally altered: at times I feel as if I have been in Poland for months, at others I am surprised at how the days have flown by. The thought that we will be leaving the base in two days gives me an ambiguous feeling. On the one hand, I cannot wait to go home; but on the other, I think that I will miss the guys very much when the mission is over. During these days it feels as if we have become a bizarre family and it will be weird not to have a daily routine with them when I go back home. I hope that we will not lose sight of each other, despite the distance, when we return to our ordinary lives.



These melancholic thoughts accompany me while I carry out the morning medical tests and while I prepare breakfast for all of us. During the morning I work on my experiments, in particular today I am doing tests with the diffusion of some special fragrances for the scent experiment. I am focused on work and this makes me put nostalgia aside for a while. The emotions experiment reveals that the other guys are not in their best mood either. A. and L. are a bit frustrated because some of their research is not going as planned. I try to reassure them that it will all work out in the end and that the problems will be solved. B., on the other hand, is tense and alarmed. He explains that he finds it strange that Mission Control has not tested us with any emergency simulations so far, and he expects one today or tomorrow. In fact, he is right. I was so busy working on my research that I had not even thought about it.

The awareness that at any moment we could be subjected to some unforeseen emergency makes me tense for the rest of the day. I remember the story that another Italian girl, a member of a previous crew, told me a few days ago about their simulated emergency on board. The unlucky girl was in the toilet when a solar storm alarm went off in the base and, in a hurry, the whole crew had to shelter in the safe module. For the rest of the day I try to get to the bathroom faster than light, so as not to repeat the nasty incident. I can feel B's tension and I get particularly alert too. The only one who seems to be unperturbed by any situation is J. We are more familiar with each other now and I have realised that he can also make jokes, so sometimes I make fun of him and deliberately provoke him by telling that he is cold-hearted. At first,

I was frightened by his attitude, but now I appreciate his determination and I see him as a reference point that provides stability to the crew.

Contrary to expectations, the rest of the fifth day of the mission goes by monotonously, without any significant events. I spent the afternoon working on processing the data collected from my experiments and taking a photo report for my thesis. The guys tell me that they would like a few more pictures to remember the experience and to use for outreach, so we take some shots "in the field", while they are busy working on their experiments. B., as a perfect Commander, has been feeding the cockroaches all week, so we decide to capture this moment. While I am busy photographing him he taunts me, "Come on, touch one Sere! They will not bite you!". He knows, by now, how squeamish I am. To my surprise, I found myself answering him, "Come on... Why not?". Two seconds later I find myself stroking a cockroach on its back; I now understand why Agata said they are loving creatures. Crazy, I do not even recognise myself anymore! This week has really transformed me.

I noticed a real change in my approach to the mission on the third day of the simulation, when we had a visit from an unexpected guest. It was evening and we were having a chat in the kitchen before going to bed. I suddenly saw something move behind him, just behind his shoulder. At first I thought it was something falling off the shelf, but as soon as I focussed it I saw two beady eyes looking at me and a long pink tail on the toaster. It was a little mouse! First reaction: shock. Second reaction: running away. Third reaction: panic! Our intruder had managed to sneak into the base through a ventilation duct. The fact that there are

no doors in the habitat made my reaction even more melodramatic. I didn't even know where to escape to feel safe. I was going to open the main door and put an end to the simulation. Yet, I took shelter in the bathroom where I stayed for a good ten minutes, until the guys assured me that the danger was over and that the intruder had left, at least for the moment. After this episode it took me several hours to get used to the idea of sharing my life with a mouse. In order to get used to the new guest, we decided to give him a meaningful name: Elon, in honour of Elon Musk. By the fourth day, Elon and I had become good friends. I had realised that a good astronaut cannot afford to be picky. So here I am, in the middle of Geolab, petting cockroaches with B. without batting an eyelid.

## Day 6

The last day has come, I cannot believe that our mission is almost over. Today it is L's turn to prepare breakfast, and the diet is particularly generous with us: the menu includes pancakes. The scent of pancakes in the air fills us all with good cheer; we did not expect such a luxurious dish to be allowed on board. Apparently, even astronauts could do with a little pampering now and then... We are all in the kitchen, looking forward to eating them. L. is cooking and, since there is only one hotplate, it takes some time. In the meantime we take the opportunity to have our morning briefing. L. puts one pancake on top of another as they get ready. A wonderful multi-layered tower of pancakes now stands in the middle of the table. We are all literally devouring it with our eyes.

When L. places the last one gently on top of the tower, we can finally enjoy our breakfast.

I reach for my portion and take a bite, they are delicious. They are warm and I compliment L.. I am about to put the second bite in my mouth when... *BEEP, BEEP, BEEP, BEEEEEEP!* What is that? It takes us a second to realise that yes, it is the emergency siren. I stand up and immediately grab the phone, I am the Communication Officer and I will be responsible for keeping communication with Mission Control. The MCC confirms that we are in danger and that we must implement emergency procedures immediately. Protocol dictates that we take refuge inside the safe module which, according to the MCC, is the vestibule of the bathroom. I take a fleeting glance at my delicious pancake, which is waiting for me on my plate, while in my head I curse the MCC who has triggered off the simulation at this very moment. I can see A. and J. gobble down their portions in less than half a second, then we all take shelter in the safe zone.

Throughout the emergency I remain alert and check the notifications from the MCC, with whom I frequently communicate. We are constantly being given precise instructions and procedures to carry out. We are all tense and focused. B. uses his psychology skills to keep the crew calm, even when some of us seem to be losing patience. The MCC keeps telling us that we are too slow, that we need to be quicker at following orders; it is stressful. We are doing our best but it is not enough. When we are asked to send Mission Control some photographs of our skin to prove that it has not been damaged by any chemical residues in the environment, it is my responsibility to be the

photographer. The procedure requires the guys to take off their suits and remain in their underwear. While I take the photos, I feel like I am in a movie. I am embarrassed: the room is tiny and I am surrounded by guys in their boxers! For the second time today I cursed the MCC in my head.

When the actual emergency is over, we have to wear special protection on our heads and body extremities for one hour. We are ordered to wrap the sensitive areas in thermal blankets. All dressed up like this, we look like turkeys ready to be roasted in an oven! Judging by the temperature in the room, however, it feels like we are already in the oven. The thermal blankets make us sweat and we are all irritated. We want to rip them off and breathe again, but MCC orders are not to be questioned, they must be carried out. At all costs.

And so, in the blink of an eye, the last day of our mission has gone. When we sit down for our last supper we are all nostalgic. We promise to keep in touch and we are happy to have one more day, tomorrow, to enjoy Kraków together before leaving.

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## Day 7

As soon as I open my eyes after the last night in the base, it seems impossible to believe that today we are going to take our heads out of this place and see the sunlight again. It feels like I have been here for months! I cannot wait to feel the fresh air on my face and to see something different from the silver walls of the habitat. We have little

time: we have to pack our things and give the rooms a final tidy up before Agata arrives.

While we wait for her, we find ourselves in the living module with our suitcases and blue suits on. "What are you most looking forward to doing once you get out of here?", I ask the boys. B. cannot wait to get outside to feel the fresh air, apparently he has suffered a lot from the warm temperatures during the week. A. says he wants to see the sunlight. As for me, I am looking forward to having a shower. I am fed up with using cleansing wipes and I really want to wash my hair. I feel dirty and this sensation gives me tremendous discomfort. I cannot wait to feel warm water on my body and the scent of the shower gel on me. While I am thinking of this, I realise how hard it must be for the astronauts on the ISS, who go six months without washing. I imagine that, in their place, I would not be able to cope with that at all.

When we hear the knock on the door, our faces light up and we all immediately run to the entrance. I am excited, who knows what it will be like to see the sunlight again after all these days of confinement? The sensations we feel in the next ten minutes are unique and hard to understand if you have not lived through such an experience. It is pure joy, mixed with a sense of profound gratitude towards nature and our planet. As soon as Agata opens the door, we are flooded with a bright light. I feel it so intensely that it bothers my eyes and I have to half-close them. Looking better, the sky is not particularly clear, it seems it has just stopped raining. In fact everything is grey and I am amazed at how my eyes are blinded by a light that must not be so annoying in reality. Probably, I think, it is an effect of the confinement.

A breath of fresh air hits my face: I inhale deeply and it is pure pleasure. The smell of the rain touches me. I rush outside, attracted by a landscape which had looked anonymous seven days ago, but now seems so wonderful, surrounded as it is by all this green wildlife. I listen with joy to the rustling of the wind and the chirping of the birds in the air. A stray cat joins us: he is eager for cuddles and food. He lies down on the lawn in front of us and for a while he stays there, calm and happy on his belly. I reach down to stroke him and the feeling of the tufts of grass touching my palms, as I sit down, surprises me. I feel as if I have returned home after an endless journey. *How wonderful our planet is?!*

We spend the next few hours enjoying our newfound freedom. First, Agata takes us on a long walk in the countryside around the habitat. She says we deserve it! And I agree with her. Then we leave for Kraków to go back to civilization. While we are on the highway I am sitting on the van with A. on my right and J. on my left. The two of them are dead tired and in a short time they fall asleep. I take some embarrassing selfies to tease them with when they wake up. When we take the exit for Kraków, A. asks me about my plans for the following days once I am back in Italy. I explain that I have to write my thesis and that I have a lot of work ahead of me. He will go back to his university routine and lessons. We both realise that it will be strange to return to our lives after such intense and special days. A note of nostalgic sadness comes over our voices.

The last afternoon in Kraków is magical. We decided to go for a walk in the centre, just like proper tourists. L., who has an innate sense of orientation, leads us through the city alleys as if he were a local guide.

As we look for some last-minute souvenirs, we talk as if we had been friends for years. We take lots of pictures of the Kraków skyline. We are all cheerful and carefree. I feel light, a bit like when you pass an exam for which you have studied for a long time. When the sunset comes and the sky fills with pinkish shades, I feel some deep melancholy rise up inside me: the end has come.

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When my academic supervisor asked me – and I quote – if I would be willing to "go on a little trip" to better carry out my research for my thesis in Design, I never thought I would end up having one of the most exciting and challenging experiences of my life. And yet, that is exactly the way it went.

## *6. Houston, We Have a Report !*

*Giovanna Estefania Ramirez, Colombia*

*Exp.39 Kepleria*

*27 Sep - 6 Oct 2021*

This is how the story of a Colombian woman begins in her challenge to achieve the dream of becoming an analog astronaut, a woman who has become the communications officer of a great mission. After crossing 9,901 km of distance between Bogotá-Colombia and Kraków-Poland, 4 stops and 2 days of flight to reach the promising Poland, a European country full of landscapes, beautiful people and a lot of history to tell.



I must say that before being selected for this training, I had to wait for a long time, months of great anxiety, because our planet is going through a global pandemic that has forced us to reinvent ourselves, modify the way we work, communicate and even the way to eat! We have been locked up at home without being able to go out to do our face-to-face work.

Before arriving in Poland to begin our aerospace mission entitled KEPLERIA, I already had a small perspective of who would be my partners in the crew since previous meetings had been held for the planning of the mission, these had been more or less 5, where we talked about the activities that would take place, in addition, we were already planning the roles of the group and some experiments to carry out. I will go ahead and tell you that our crew consists of 6 members: the first is a pilot, he is from Poland and was selected as the mission commander, the second is a space engineer, she is from Tunisia and has been selected as the vice commander, in third position we have a bright young man, a high school student he is from Poland and is the data officer, the crew also has a medical officer she is from Italy and knows the subject very well, we also have the outreach officer she is a professional and comes from Warsaw, finally my position remains, I am the communications officer and I narrate this version from Colombia.

Returning to the virtual trainings, it was in these meetings where I met the woman who has raised my levels of personal admiration, she is Agata our MCC (Mission Command Center) the director of this training center, I can say, the person who makes the Aerospace dreams come true, I wonder how she manages to be a mom, a leader, a coach, a director and an astronaut if the days only have 24 hours! It is not common to see women in space sciences, but so far I know that she surpasses many, she is an inspiration and motivation for all women,

also, she is not a nerdy person! Not bad I mean, she is simply a person who apart from being intelligent is kind, funny and friendly.

After days of virtual training, the date has finally arrived, the time has come, September 27th shows the calendar, 2021 to be exact. When I arrived at the airport in Poland, I only knew that I was very far away from my family, my culture and my world, but I had the emotion of knowing that I was beginning to write a new story in my life, a space story full of science and experiences. Adventures that have marked my life and that I count today as a communications officer, the same ones that I want to record and share with you below:

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### **Adventure 0**

On arrival in Poland everything was amazing, from the landing you can see large plots, crops and houses, a new country for my travel collection. At the exit of the airport I could already breathe the city, see the letters in Polish, I must say that I did not understand anything, but, I was confident in a couple of lines of instructions on how to take the bus to get to the MCC house , where almost all of the crew members were already. Upon arrival, I rang the bell and Matt opened the door. I didn't even know who he was, but from there I knew he was a very smart and busy person, he was teaching classes and he was kind enough to come down, open me up and install me. From there I went for a walk around the town with the hope of being able to find the rest of the crew, but it was not possible since the internet connection was poor and there was no good communication, however, I got to know the historical part of Kraków, I missed someone to tell me about the history of dragons and castles, but it was something that happened right after the mission ended. That day I had lunch at McDonald's. I cannot believe that I'm

on the other side of the planet again to try new gastronomy and decide to enter McDonald's !! how traditional I am! But hey, I finally returned home and they had already started the training. How strange I arrived last! I greeted the whole team and that was the starting point of this mission, the KEPLERIA mission.

We received all kinds of instructions and documents, we also received our suits, the famous astronaut suits, after that, we went to an unknown place, I just knew that I had to walk fast, it was fun, we went to the top of a mountain, I love to climb the peaks of the mountains and spend a couple of minutes of reflection, even more when there are waterfalls, but this was no exception, we climbed to the highest point in Kraków and there we could see all the lights and buildings of the city, I remember seeing a plane take off on the runway, in this place also we took photos, the first memories of our mission. When we returned, we didn't count on that we would have to do it alone, because this time our MCC was no longer with us, she had hidden or left, I never understood it, but it was part of the mission, to solve, remember and return home by ourselves, there I realised how incredible it is to work as a team, because this is where ideas, opinions and solutions come together, and, of course, we finally do it, we get home. That day we ordered cheese pizza, ate, got organised and finally went to sleep. I was super tired, I didn't know how to adjust the jet lag and the 7 hours difference from my usual time, so I fell deep.

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### **Adventure 1**

The first day of the mission, I still felt super tired. It was like overtaking your body for 7 hours, but it was not so complicated, no options, so I adjusted to the itinerary and the activities of the day. We went to a

supermarket to do the shopping for the mission food, I got to know Polish food, interesting items only identified the Nutella and the tortillas, by the way, we had a vegetarian diet, each member of the crew was in charge of selecting different ingredients to finally get all the complete food, this time we did not size enough, so at the end of the mission there was enough left over.

When we got to the habitat it was great, it looked a thousand times better than in the photos. I saw the equipment, machines, the laboratory, the bathroom, the gym and the bedroom. The strangest thing for me was meeting the friendly cockroaches, yes cockroaches! They are the spoiled ones of the habitat, but I must say that I was not able to approach or touch them, it was a challenge for me during all the days of the mission.

When we were already locked in the habitat, it was the beginning of the mission, I knew the crew, it is a wonderful team. We divided the roles and organised the routine inside the habitat. It was a great day.

I've been selected as the communications officer, oh no!, why me? They have chosen just the person who does not speak English, the one who finds it most difficult to communicate in another language, I must say that I am not very expert in speaking English, it has been a challenge for me, because in my country there is little preparation in languages, but, I like challenges, so I said, it will be difficult but not impossible an opportunity to acquire new words and / or vocabulary. Sometimes it feels weird, it's like when you want to scream but they cover your mouth, you feel helpless, understand English but not know how to express yourself, want to add to the conversation but not be able to do it properly.

Being in a place where different cultures and languages mix is great, but you only have 2 ways of communicating: gestures and English, if you can't make yourself understood by speaking, you can do it by gestures, the “world language”, I must say that this I used it a couple of times, it was fun.

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## **Adventure 2**

This adventure began with a brainstorming on the project that would be developed within the mission, we have selected a mission with a Cansat-type satellite, in other words it is a satellite inside a can that carries all the subsystems of a real satellite on board, specifically, the energy, communications, sensors, actuators, structure and mission subsystem, but unlike real satellites, it doesn't go to orbit and can be assembled with low-cost, high-range electronic components.

On the other hand, we were also talking about the possibility of participating in the NASA Space App Challenge 2021, so we thought about selecting the challenge. Additionally, I had the opportunity to see the ESA ESERO program Cansat kit, a small bag with electronic components that my colleague Justyna brought, since I opened it, I felt like uncovering a gift, of those gifts that contain several surprises in the same bag, surely happens to many electronic engineers, when we talk about electronic parts and programming boards.

At the end of the day, I was blessed to share an online meeting for the children of the Latin American space camp, this is a group with which we meet every Tuesday and Thursday for two hours to talk about aerospace topics, we do science experiments, videos and much more ..., I liked seeing the curiosity of each one of them when they saw live what we had once learned about the International Space Station (ISS), now it

was real to see how astronauts bathe, how they eat, what medical check-ups are like , how gravity is simulated on the moon and on Mars, we also show the habitat, we present the crew and the projects we are developing to motivate all the children. It was a fantastic day.

What do you think, the day still needs to be closed with the debriefing report, is the list of activities and issues that are sent to the MCC so that it is aware of everything and also approves or not the changes or decisions of the crew, this was a task of a lot patience, hahaha only the commander will understand this, but in short, this was a space to summarise in a couple of lines everything that had been done in the day, this report was done every day with the commander, we isolated ourselves to be able to do it in the best possible way, in these spaces I got to know little by little and share more and more with the commander, an extraordinary and authentic young man, who wanted to lead all the time and ensure the safety of the entire crew, more than anything, to do that the entire mission be fully accomplished.

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### **Adventure 3**

Today we signed up for the Hackathon challenge of NASA's Space App Challenge 2021 and began preparing the documentation for the challenge. In addition, with the support of the Vice Commander of the crew, we prepared the calendar document and milestones of the Cansat project, this has been the most organised way to start and distribute the project activities, remember that on board the crew we are 6 members with knowledge very different multidisciplinary so it is important to know how to divide the tasks taking into account the different emphases. In my case, I am in charge of the electronic integration and programming of the satellite, but to begin with, today I prepared the

description of the design of the satellite mission, we agreed that the mission of the satellite would be to measure variables of pollution and air quality, Above all, we emphasised implementing a CO<sub>2</sub> sensor. Today I had the time to connect and test the main board of the cansat and additionally, connect the basic sensors of the satellite, which are: pressure, temperature and altitude. All cansat-type satellites carry a primary mission on board, this is based on measuring the basic meteorological variables, which are the 3 mentioned above, however, it is possible to implement a secondary mission in which it is added to the satellite any other sensor, it can be a GPS, humidity sensor, air quality, camera, magnetic field sensor, radiation sensor, among others. This indicates that our project cansat beyond fulfilling a primary mission, and fulfils a secondary one.

I finally made a disclosure post, then what do you think? Our debriefing report, I met with the commander, and we wrote a message summarising all the day's activities and issues. This was a good day!

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### **Adventure 4**

Today I woke up with great anxiety, a great day arrived for my professional life, today is the day of my graduation as a master's degree, I am graduating from the master's degree in Development and Integral Management of Projects, a choice that I made 2 years ago and that to speak the truth It has not been an easy task, since there have been many classes, tasks and thesis reviews, but I have finally achieved the goal, today I will not be able to attend the buildings of my university to receive the diploma, but there is a better plan, I will receive my graduation from the habitat facilities in Poland, fulfilling the dream of being an astronaut, while my parents receive my degree from Colombia,

what good facilities we have today with the internet and virtual tools! This day has remained in my memory, because I will never forget that on the day of my graduation the entire crew accompanied me, who organised behind me and together applauded while the university handed out my diploma.

To add to the excitement of the day, we tried nutella in our food. This tastes great, in the middle of a daily menu that is vegetarian, I must clarify that on this occasion, no food was left over as usual. On the other hand, we made progress in carrying out the cansat project and today I was in charge of programming the temperature and pressure sensor. Beautiful day!

\*

## **Adventure 5**

Today, we brainstormed ideas about the NASA hackathon, we were thinking about a challenge to solve, but it was finally solved, we selected a challenge about a space strategy that will help future sustainability, economy and social growth, and for this we must Investigate specific problems in Africa and space industry companies that already offer services in these areas. We should have the documentation ready for the next 24 hours.

On the other hand, I held the opening of the CANSAT COLOMBIA 2021 competition, this is an event organised by the Colombian aerospace chapter, AESS (Aerospace and Electronic Systems Society), a society in which I am fortunate to be the president of the Colombia chapter, and this year I have created the fifth version of the "Cansat Innovation Challenge", this competition is a challenge where students must build a satellite that fulfils a specific mission, this year we have 3 missions: the Sabio Caldas mission is the primary mission that contains the basic



temperature, altitude and pressure sensors; the second is the Tesla mission, which incorporates additional sensors to the Caldas mission such as GPS, camera and other sensors of the group's choice; and finally, we have the Reynolds mission in honour of a Colombian scientist who invented the heart pacemaker, the electronic device that supports the basic functions of the heart, in this case, the Reynolds mission consists of incorporating a pacemaker into the satellite in order to identify the behaviour of this device at different heights, let's imagine in the future that people with heart problems can reach space and we can support them with this device. Within the event, there are 4 categories: Parrots, Papagayos, Condors, Eagles, where children and adults from primary, secondary, university and graduate students participate in the distributed categories. Today we are opening this challenge, which lasts for 2 days, however, it has been a competition with many months of logistical preparation and of giving different courses to colleges and universities in order to build the satellites. Today I have the wonderful satisfaction of seeing 26 prototypes of 100% functional Colombian satellites, all with very creative and ambitious missions that will surely be contributing to the aerospace development of our country in the not-too-distant future.

On the other hand, I carried out electronic tests of our Cansat project, I fed the main document of the project, with the electronic information of the satellite, specifically, the guidelines of the main board and the earth station, this is the one in charge of receiving the satellite data and display them on the screen so that the operator can have them and make decisions.

Finally, we made several publications on social networks, about this aerospace mission that we are living within the habitat, many of my colleagues and friends are amazed at all this, I have even received

comments and messages from other countries in the world, how special it feels to share this experience with everyone and take the aerospace theme to the ends of the earth, that's the idea!

As a good communications officer, I must announce that today the cockroach habitat has been changed thanks to the crew commander and the support of the data officer, a task that is not done every day. Today has been a funny day.

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## **Adventure 6**

Today we started the NASA Space App Challenge, everyone in the crew divided into groups to begin to review the literature and get information for the state of the art of the challenge, I was in charge of identifying companies in Africa that offer services or provide data satellite services to the continent, it was a difficult task, because most of the companies are dedicated to offering satellite services but not to providing data. However, the Copernicus program is a good option to consider in this research.

On the other hand, I had the opportunity to close the CANSAT COLOMBIA 2021 competition from the habitat, which was super motivating for all the 80 challengers who were presenting their Cansat design, I had the opportunity to announce the awards, I felt a little Powerless from having to award only the top 2 places in each category, it is clear that each group made a great effort and have been preparing for this challenge for months. Today we close the fifth version of this great competition looking forward to being able to launch the Cansat in free field through balloons and probe rockets in the coming months.

On the other hand, I felt a bit sad when we found out that the cockroach eggs are dead, it may be because their habitat had been changed and cleaned. How can we make ourselves so small to understand their needs and know their true lifestyle? However, I gave them a piece of cookie, they surely liked it because they came to eat. I thought that, if most humans like cookies, probably them too. It is sad to know that today we would be singing a new birth, but it is not like that, they spent a night stressed, the cause of not having new cockroach babies.

Today we tried the vanilla cheesecake baked by J., delicious! Just to close a sweet day full of many activities and bitter surprises.

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## **Adventure 7**

Today we were participating in the NASA Space App Challenge all day, it was a great teamwork, a long and arduous job since we had few hours to send the final project document and the video, as I was in charge of looking for companies that will provide satellite data to Africa, finally we rely on the ESA (European Space Agency) Copernicus program, which has a network of satellites that provide accurate, reliable and continuous information, among other things, to improve the management and conservation of the environment, understand and mitigate the effects of climate change and ensure civil security.

On the other hand, we supported by making several templates with the project information, focused on the global objectives of sustainable development and outcomes. But, Houston we have a problem! There are less than 20 minutes left and we must send the presentation and make the video !, but the video is not done yet! Words of anxiety and stress are heard, we run, we have little time, we must solve now! Come

on, we are the KEPLERIA mission. Of course we have a solution for everything, we have achieved it using the most used tool in the pandemic. "Zoom" is a platform for videoconferences, but we can achieve it!

In the afternoon, I was working on my individual project which focuses on cosmic radiation and ionising particles, today I did tests with a dosimeter equipment placing it in different places in the habitat and I could see that the gym is the place where the greatest number of ionising particles is found, however the radiation that is perceived is due to static charges, which means that the habitat is safe and free of cosmic radiation. The radiation data was captured in an application that we adapted to my cell phone.

You may wonder what is cosmic radiation? It is radiation that comes from space, subatomic particles the size of a proton that are accelerated by the activity of stars, black holes, among others, are accelerated almost to the speed of the light, which we remember is approximately  $300,000\text{Km} / \text{s}$ , these cosmic rays pass through the earth with too much speed and energy, which means that we are all exposed receiving a rain of cosmic rays, however, the magnetic field of the earth and the atmosphere protects us from these rays, but there are locations on earth where there are faults and these energy rays affect them to a greater extent, a clear example is Antarctica and a part of Argentina.

At the end of this long day, I shared the experience of astronaut training in the framework of World Space Week, and I recorded 2 videos: one inviting the NASA Space App Challenge in Colombia and another for the Mexican Space Agency with the aim of conducting space outreach for all children and young people who are pending and following this mission . Today was a rush day!

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## Adventure 8

Today I finally remember what I dreamed, usually I never remember my dreams because I go to bed very tired, or I definitely don't know why. Most of the day we were working on the completion of the Cansat project, I was in charge of the electronic integration and I provided the details and description of the OBC (On board Computer) and the main board (microcontroller). We had problems with the internet for more than 10 hours. It rarely happens in the world that the WhatsApp, Instagram and social networks service goes out, today was that day, so it was difficult to finish all the assigned tasks. Meanwhile, I was able to finalise the documentation of the individual cosmic radiation project. Today we prepared with Justyna a different dish for dinner, potatoes with cheese and onion, I really liked it, finally we took many photos and boomerang, it was a moment to laugh with the crew, the photos were made with apples hanging from the ceiling simulating microgravity, we prepared a backstage for photos, it was a fun photo, I like working with Justyna because she is very professional, I admire her a lot, she is young, dedicated and never escapes the details, sometimes I feel like she is a mom.

This was our last day in the habitat, I am going to miss every detail, everything in here, but now we are waiting to go out, see the sun again after a couple of days, breathe the outside air and return to land, it also awaits us a phase 2 of this analog astronaut training, this is based on underwater training, a scuba diving course, in one of the deepest tanks in Europe called "Deepspot", a new adventure! Finally, this mission has been a giant gate, so that you understand it, it is a gate, the gate of science and opportunities, the gate has been opened to make scientific and aerospace dissemination in my country, Colombia, a nation that

until now has been it is steeping in space development, a country full of great need but above all full of dreams and hopes for future generations seeking to reach space. Since I returned from our mission, I have been invited to dozens of interviews, lectures, courses, and even on television. Everyone wants to hear this experience, they all leave motivated after knowing that a Colombian has stepped on the European terrain to participate in aerospace projects. How much curious data from space has reached my country. I would like to be a successful woman who replicates experiences, who motivates others to dream and above all I long to reach space one day, more specifically to the moon. Thanks friends from space! If any of these experiences caught your eye or you learned something new based on aerospace then we are doing it right!

To our dear space readers, we want to motivate you to continue falling in love with space science, but above all, sharing knowledge and experiences will make others dream and go further.

Here ends the report of the communications officer of the KEPLERIA mission, announcing that a story has never been told before, a lot of knowledge learned, experiences, errors and solutions, I hope you find out in Houston and in all the countries that are being done here aerospace science, experiments that we will tell soon from space. When? Soon...

Thank you, friends, missionaries, KEPLERIA, there are still secrets and experiences that will never be forgotten, memories that only you will understand: like the data officer's oven, clothes in full emergency, cockroach eggs, menus and recipes, the tears, the experiments, the personalised photos.

This report will continue! Copy that!

## 7. Bright Memories

*Aleksandra Wilczyńska, Poland*

*Exp. 11, 13, 15 Bright*

*Jul-Sep 2020*

### **How did it start?**

By accident, I was scrolling through Facebook procrastinating studying for my final exams when a very unusual ad popped up. A professional sound company was looking for volunteers to take part in a six week analog space mission. The project seemed so unique and crazy that I couldn't believe it was real. I thought maybe this is a fairy tale adventure!

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### **Six weeks is a long time, were you ready for such an ordeal?**

For me, it was very good timing in my life - because of the pandemic I was spending my summer holidays at home. Normally I go to a scout camp in the middle of the woods every year (for ten years). This prospect forced me to look for alternative ideas to spend my longest vacation yet. (In Poland after graduating high school you have almost 4 months of free time).

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### **Scout camp is very different to space camp, how did you prepare?**

In a way I had been preparing my whole life. I remember asking my

father as a child to show me pictures of galaxies and nebulae on the new, shiny Google. In kindergarten, I used to show off my knowledge of the planets of the Solar System or the structure of the Earth's interior. I had just finished high school, was 19 years old and spending my days scrolling through Facebook. I came out of school completely disappointed with the way science was taught. My passion for space and physics was killed by thousands of monotonous calculation tasks. I missed the experiments and learning about life through science and experience. My love for space remained dormant, occasionally piqued by reading books or watching YouTube videos. So when I saw the ad, I realised that by participating in the mission I would begin a great adventure and reignite my passion on a larger scale.

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### **How did the application process go, was it quite extensive?**

At first I wrote an enquiry email and waited for a response. Looking back now, I can't believe my luck - my gmail inbox was locked while I was waiting for a reply. It wasn't until a few weeks later that I managed to access it, there were emails from Agata saying she had been trying to contact me for a few days. Luckily she had attached her phone number so I gave her a call.

\*

### **How did the call with Agata go?**

During the call I fell in love. In love with the vision that Agata had set out - a unique space project full of professional equipment, exceptional people and the extraordinary experience of being an astronaut. After talking to her, I was inspired and wrote a motivation letter for a



mission. I realised that taking part in such a mission would not only allow me to embark on a space career path, but would also open the door to the world of science. In my CV I focused on presenting my qualities and skills from scouting, after all, 11 out of the 12 people who have stepped on the moon were scouts in their youth. I laughed at that because I had slept in a tent for many years so had experience being with people in small areas, which proved useful during the mission. As you can guess my letter and CV turned out to be a great success as I was accepted as a member of the BRIGHT II mission.

\*

### **Once selected for the mission how did you meet your crewmates?**

Due to the pandemic (COVID-19), my first meeting with the crew took place remotely. It was delayed by connectivity problems at the AATC. I remember shyly texting my co-crewmate M. at the time to see if she was having trouble getting to the meeting. I did not know then that this was how one of the most important friendships in my life would start. We met in front of screens. Getting to know these people in the middle of my final exams and university recruitment allowed me to really become inspired to make more concrete plans about my further education.

\*

### **What was the mission about?**

The premise of our mission was a six-week dietary experiment. The aim was to find out how the human body behaves in isolation while following different diets. Every fortnight we were to exchange with the crew of the BRIGHT I mission. The first phase would be based on a

general diet, the second on a high protein diet and the third on a vegetarian diet. In addition to this, the aim of the mission was to test solar imitation lamps and their effect on our biological clock.

\*

### **Who was in your crew and what were your roles?**

Our mission commander was H., a very hardworking and responsible future pilot and flight engineer. M. was our communication officer, a very talented programmer writing applications for ESA at that time. Ma. was an astrobiologist, my peer with aspirations to become an astronomer. I decided to become a crew medical officer.

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### **When did your crew meet?**

We first met in person in July, the day before the mission. I tried to find information about the BRIGHT I crew to get a taste of what awaited us. Dr. Agata had terrified us at the outset that the previous crew had had a very hard time with the diets and the overtraining procedures. I also remember a conversation with Matt (co owner of AATC), who advised us to take care of proper communication in the habitat as any small quarrel in isolation could lead to civil war. The mission's success was going to entirely depend on our willingness and commitment.

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### **It sounds like an intense adjustment, how was your first night in the habitat?**

Our first night in the habitat passed on integration. We were very shy,

we had to be very careful because we knew our first impression would influence our perception of each other in the following weeks. The mission had an idyllic start, we were very impressed with our mission and our results. At that time, we kept very detailed measurements and adhered to our designed diets. We loved playing the card game uno together during the mandatory lamp exposure session.

\*

### **Did you have any other projects on the mission?**

The mission was rich in all sorts of experiments, I was so excited to get started. I had the opportunity to grow cress on a device that imitated lunar gravity. Together with M. we also conducted radiation measurements in the habitat, using an old Soviet dosimeter. Taking care of fish and breeding aquaponics was a great attraction. The crew and I had a laugh when we had to change the water in the aquarium, we probably used all the pots we had in the kitchen. We didn't notice that the air filter in the aquarium was broken, which resulted in the fish almost dying and a very unpleasant smell in the habitat (there were no windows for ventilation). Another interesting experiment was writing my thoughts in a detailed form which analysed our stress levels on the basis of our writing.

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### **Was that the end of your animal experiments?**

We really didn't seem to have a good hand with animals which made Agata laugh because our other responsibility - this time for cockroaches - almost led them to their deaths.

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### **Was that the end of the animal saga?**

A few of us were quite daring and tried fried cockroaches. I must admit that the taste was fine but the aftertaste left an unpleasantly bitter impression.

\*

### **What was the scientific equipment like in the habitat, was it professional?**

For the first time in my life I had the chance to use a laboratory microscope. It was a very interesting experience for me.

\*

### **Did you work on any group projects?**

Yes, we took on a very big project - setting up a base on the moon as part of The Aldrin Foundation's Home On The Moon competition. This was my first exposure to such a large project and at first I felt very overwhelmed. With help came the BRIGHT I crew with whom we joined forces. It turned out that they had an innovative idea to create a hospital combined with a research institute. It was a hit! We spent the rest of the mission working on the project.

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### **You stayed in the habitat for 6 weeks, how did you stay sane?**

From the beginning of the mission we were prepared for the fact that it would not be easy. We became overwhelmed and exhausted, isolation exposed our true colours. I think that the warning from Agata helped us in the long run to survive those 6 weeks. At first the mission was

quite easy and pleasant. Unfortunately, all good things must come to an end, the entertainment and repetitive schedule lead to monotony.

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### **How did you overcome the feelings of monotony?**

The monotony had its advantages. I had a lot of time to think and reflect on life. My stay in the habitat made me face my good and bad sides. It showed me how an entangled lifestyle can affect my self-esteem. Regular training gave me so much satisfaction just from physical movement. I fell in love with yoga and running. I also learnt under which circumstances I am most productive.

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### **What did your average day look like?**

Our days were measurements and meals. Waking up followed by measuring weight, temperature and blood pressure. Then the perception test, emoji test and breakfast. At 10 a.m. more measurements. Experiments, free time, next measurements, emoji test and lunch. Midday training, afternoon snack and measurements. Evening measurements, emoji test, dinner, yoga, a moment to relax and more measurements. During the last perception test of the day I must admit I fell asleep more than once. You cannot forget about my "favourite" measurement of the day, namely counting the volume of urine. On the bathroom door we hung a piece of paper where everyone could write down their measurements. Mission BRIGHT I laughed that we were doing the Olympics in peeing. And that's how the days passed every day for over 6 weeks. Each week it got harder and harder. Our motivation was decreasing and we were focusing less

and less on the mission and more on reaching the end. When I returned home I had the impulse to repeat the schedule from inside the habitat which was a bit funny.

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### **What was the food like?**

Thinking about it now, this was probably one of my favourite parts of the day, although it was the source of the first arguments. We had really different meals on the general diet. I was delighted with the chicken with rice or various salads. Unfortunately we also had some very tragic combinations such as dried apricots with tuna! The high protein diet resulted in drama, after a few days of drinking protein shakes every day, we had had enough. The worst for me was eating cottage cheese, which I honestly still hate because we had to eat it almost every day. Unfortunately for us, the fridge started to malfunction and our food was often frozen. Thankfully the microwave came into play, which made the meals disgustingly watered down. My favourite meal, however, was jam and peanut butter sandwiches. I always looked forward to the day they would be served. Following such a specific diet showed me how much my mood could depend on the meal. Being hungry made me much more prone to irritation. A sweet bar after a workout, on the other hand, could improve my mood considerably. I also found it interesting how the diets affected my strength for training. On a high-protein diet I was strong enough to train for several hours, but mentally I was more tired. On a vegetarian diet this was reversed - I had less strength to train but more peace of mind.

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## **Were there arguments on your mission?**

No huge brawl broke out, we also had quiet days where everyone was simply occupied with themselves. Unpleasant external situations could affect the atmosphere within the group but there were also moments when I cried from laughter. One of the funniest moments during the mission was dancing with the Just Dance app to the Britney Spears song Toxic. I can't forget about the fly hunt where we ran around the habitat and tried to kill it. Eventually it was slaughtered to the accompaniment of a protest over our friend's bed. There were a lot of inside jokes during the mission, which only showed how compatible our crew was.

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## **To conclude, any advice for future analog astronauts?**

Going on an analog mission is something I would undoubtedly recommend to anyone interested in space. It was an amazing experience that allowed me to learn about the space sector. It allowed me to reignite my passion and encouraged me to pursue it on a wider scale. I met amazing people who became my friends. This project allowed me to get involved with the Innspace group, with whom I designed another space base. I learnt a lot about myself, my weaknesses and how I can develop my strengths. Most rewarding, was the real contribution to science that was generated through the mission.

## *8. Commander's Report*

### *Murray Mackay, Scotland*

*Exp. 40 Yuriya*

*13-19 Oct 2021*

Limited information, a lot of uncertainty, very short notice and plenty of excitement... That sounds like an Analog mission!

By the time I arrived in Poland, one crew member had already navigated their way to AATC HQ and greeted me with a warm welcome. As the night progressed, one by one, each crew member gave a knock at the door. Before the night was done, 5 out of 6 crew members had arrived with the final member of our team completing the crew the next morning.

I think from the onset, everyone took a bit of time to figure one another out. Our team was very diverse, in both cultural and educational backgrounds. We were a team of engineers, life scientists, aspiring doctors and astrophysicists. Equally, we all called a different nation home.

Despite our geographical differences, we all shared a passion for space and we all wanted to make our mission a success. We quickly learned that everyone's individual skillset, based in a different type of scientific or engineering discipline, was a valuable asset to the team and we were all quick to embrace each other's culture.

During our mission, we focussed much of our time working to develop a scientific protocol that focussed on the topic of "Privacy in Space." How could increased access to privacy, via implementation of privacy shelters



within our sleeping modules, influence our physiological stress parameters, potentially decreasing our stress responses, thus facilitating better crew dynamics and increasing the likelihood of a mission's success. Within the habitat, our crew also gained our first experience of presenting ourselves as analog astronauts to a wide audience. We were invited to take part in a teleconference with NASA's International Observe the Moon evening and we joined the ESA Space Medicine team for one of their regular virtual social events.

During our time in the habitat, we bonded quickly. Working through a number of challenging situations and spending such a prolonged time together within a confined environment could easily have resulted in a number of confrontations; however, the opposite occurred and the whole experience brought us closer together.

On our return to the terrestrial world, our crew's astrobiologist was able to enhance our experiences of presenting at an international level by quickly being flown over to Dubai to present at the International Astronautical Conference (IAC). We were all amazed at how she adapted to taking on the role so quickly and were all really impressed at what a fantastic job she did representing our crew!

Once we were all settled back into our home nations, we were quick to implement the scheduling of regular weekly meetings. We didn't want to lose touch with each other, even if we were all now based on opposite sides of the world!

We were all initially very happy to be able to catch up with one another on a regular basis, but the focus of our meeting's not too slowly turned to how we could use our experience within the Analog Habitat to further our passion for space and how we could then use this to bring us all physically back together in the one place. After a couple of months

of regular catch-ups, supporting each other with our space and separate career ambitions, we decided to submit our first abstract, focussing on our main experiment of privacy in space, to the Lunar and Planetary Science Conference. We were delighted to have it accepted and myself, as crew commander, gained the opportunity to present our work and crew, at our first international conference.

We quickly caught the conference bug, and although most of our crew had limited experience in submitting publications and presenting work at conference level, we decided that our new ambition would be to maximise this type of experience for as many crew members as possible.

Next on the list was the Advancing IDEA in planetary science conference where our crew worked to produce an interactive poster. Each member of the crew was able to create an introductory video of themselves that also contained a brief description of their background and this was delivered to a wide audience too.

This set us up well for our third conference, the European Geosciences Union General Assembly where our crew engineer was able to present our work to a conference hall full of space and geoscience enthusiasts. We were all immensely proud of her achievement in this.

Our final conference was our most ambitious and thankfully we now had the summer to prepare. The International Astronautical Conference (IAC) had been a great ambition of ours since we left the habitat and we were over the moon to have our abstract accepted. This provided us with our greatest workload to date though. Whilst balancing our other commitments outside of the space sector, our crew had to work remotely with one another, across different time zones, to produce an interactive poster, a presentation and a full publication. I was so proud of my team when we managed to achieve this and even

prouder to be able to see our crew's communication officer do a fantastic job at presenting our work here.

A year had passed since our crew first came together in Poland, but we only became closer as the time progressed and I could never have imagined what we would go on to achieve together.

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### **To My Fellow Crew**

It was an absolute pleasure spending those 7 days in confinement with you. I learned a lot about myself, and I felt very privileged to learn a lot about you too. The skills you brought to the mission, and displayed admirably, coupled with your academic achievements will, I hope, prepare you for whatever you decide to do in the future and I wish you every success.

## *9. Astrobiologist*

*Eleonora Kaiser, Cyprus*

*Exp. 40 Yuriya*

*13-19 Oct 2021*

Applying to this mission, I had no idea what to expect. Even though it was always my dream to be an astronaut and I had a general idea (I thought) of what it meant to be one, still it felt like I really was taking a trip into the total unknown. I wanted to test my limits, experience the astronaut life and to find out if I had the mental and physical capacity to become a real astronaut one day. Ping. An email from the Analog

Astronaut Training Center (AATC) came through. It was an acceptance email. I couldn't describe my happiness, with no hesitation I immediately replied. The mission was due to take place in Poland, in Rzepiennik, the South. Travelling to a foreign country on your own and to live with total strangers from different countries (most of which I had never visited), with different ages and different backgrounds in a completely new environment, may have sounded stressful. However for me, it was the complete opposite. I felt a wave of excitement and impatience rushing through my body. At first, one of my main concerns was that I had no idea what to expect. The first stage of the mission was to manage the little to no information at our disposal of what we were about to experience. With the days passing by, I could not wait anymore and I already wanted to join the mission.

My trip to Poland began early in the morning, I was very happy and excited for what was waiting for me. I arrived two days early so I had the chance to meet the previous crew as they "undocked" and landed back on Earth. With that being said, the crew was very welcoming and they were very pleased with their mission. Which made me less nervous in anticipation of what I was about to face (key word being what, as I didn't know much about my mission). By arriving early, I struck luck and was given an amazing tour of the beautiful city of Krakow. The same night Dr. Agata, the previous crew and I went through the mission briefing with some whiskey on the side. I was listening very carefully and closely to their stories and their experiences, taking mental notes and preparing myself. What impressed me most was the fact that I had to live with cockroaches. Disgusting. That too an insect which I hated so much, my odd crew were talking about it with so much love, compassion and respect. Ew! I couldn't even fathom that I was about to live with those creatures. The next day arrived and so did my fellow crewmates. M. from Scotland, A. from Italy and S. from Lithuania. The truth is that before meeting them I was curious as to what kind of people they were and whether we would connect.

However, as soon as we met, I felt a very warm feeling, it was comfortable and homey and all my worries went away. Just as we were about to relax, Agata had other plans for us. An alarming survival night.

We left a few moments before midnight in extreme cold weather where we were not allowed to take our mobile phones with us. We walked for around 20 minutes from base camp. Agata explained our task. The survival night's purpose was to test our eyesight, hearing, endurance and bonded the crew. We had to reach a specific destination without talking to each other and in a single file. As the only girl, I was afraid of being left behind in the dark, so my crew respected my choice and placed me in the middle. A. was at the back and M. was at the front. We had to find a way to communicate in case an emergency occurred. A gentle hit on our upper leg was the emergency signal. We set off on our collision course to the top of the tallest mountain in Kraków through the darkness of the forest. We could hear many sounds all around us, such as insects, the wind and small animals scampering through the crunchy leaves. I could only hear our breathing, but also our hearts beating so fast, perhaps it was the walking onwards or the adrenaline of the unknown. I really thought at some point that I could not make it, as the pace was quite fast. However, for the sake of our group I conjured all of the strength I had within me to continue walking up the mountain. The reason why this was so difficult for me, was the fact that I was relatively short compared to the rest of the crew which made me try twice as hard to catch up with the others. What really touched me was the support of those "strangers", because they were so motivational towards me to continue. Those small gestures will stay forever in my heart and my mind. For instance, M. held my forearm and guided me to the top, supporting me and giving me a helping hand. Also, A. gave me tips on how to breathe properly and also offered me a tissue for my runny nose, considering the coldness of the night. After approximately 40 minutes we made it to the top, and needless to say, it was worth the struggle. The view was breathtaking, I could see all of Kraków and its

city lights. I was so proud of myself but also of my team as it was the first task we had to work together on and we made it. We connected on a level that not even we would have expected for the first night together. The next task was to get back down the same way we had hiked up, this time without Agata's guidance. Walking again as a team we found our way out of the forest but, with much complication as I merely slipped and fell to the ground many times. However, this was the easy part. We didn't know that we had to walk all the way back to base camp by ourselves. As a result we hadn't paid attention to the start of our journey. After some failed attempts and wrong turns we made it to the house. A very warm and cosy house welcomed us as soon as we got in and we talked about our adventure. That night we had a brilliant time as we were drinking delicious Ouzo with traditional Cypriot snacks. Needless to say, that night I slept like a log and felt comfortable with my other three crew members.

The smell of breakfast whipped me out of bed; that day our final two crewmates would arrive. Sa. from France and P. from Poland. Agata gifted us with a guided tour of Kraków showcasing the historical architecture from different rulers across time, the vibrant colours establishing each building, the professional musicians who busked in Rynek Główny (the main square) and best of all, the traditional Polish cuisine. However A. was quite displeased by my take on Italian cuisine. Yes, I put ketchup in my spaghetti... and pizza. Luckily he didn't drink coffee, which is essential for every good Italian person to love, so we were even. We drove back to the office to complete our initiation.

Agata gave us a piece of paper and a pen. It was our first communication test. She instructed us only once that we had to draw a person using three types of figures, a circle, a square and a triangle. We revealed our drawings and instantly burst into laughter. I had drawn a

person with only three fingers, not three figures. I had misheard Agata's instructions. Luckily Agata kept my drawing as a souvenir. I had drawn my person in a wheelchair. This was quite a unique outcome to the test. We partook in further tests and quickly packed our bags into the "Astrovan" for "launch". Our final destination was the space station i.e. the habitat. We had a brief stopoff at the supermarket, where a list was designated to groups. P. was the only one from Poland, so he helped me to find the things in the supermarket easier. In total, we filled up six trolleys. We were all ravenous and ate some sausages and bread together, when there was only one sausage left I noticed that S. was the hungriest of all six of us. I really admired him, he was a very thoughtful and selfless person, instead of keeping it for himself he shared it with each of us. We soon docked at the habitat. Our adventure was about to begin.

Agata gave us yet another tour and left us to settle and get on with our mission. The main experiment of the Yuirja mission was "Privacy in Space ". Once she left, we walked outside for the last time before our mission would start. The first night, we just sat down and spoke to each other. We agreed that M. had the skills for Commander and the Medical Officer. A. was the Vice-Commander, P. and Sa. the Space Engineers, S. the Communication officer and I had the role of the Astrobiologist. I climbed into my bunk and fell asleep settled at the thought of a very peaceful mission. The alarm rang.

We woke up very early. Performed the first medical checks and the STP (subjective time perception) test. We explored our lunar habitat, uncovering scientific equipment and deciding on our experiments. Salome and I worked together on "growing plants in a microgravity environment" and the second one was "growing plant sprouts into different light conditions". We made our schedule and decided to take turns cooking. We were becoming more comfortable with each other as we grew in companionship. I knew just one Polish song and

unfortunately told P. about it. It was the Polish Cow! From that moment on the polish cow was playing on repeat everyday in the habitat. We were eating together like a family and laughing together a lot. We selected our priorities and decided to work in two teams. One team focused on the research of the experiment, what is the importance of privacy in space, and the other team would work on the practical stuff, the structure of the private shelters.

Sa. and I checked the leftovers from the previous crew, hoping after our salads from the day before for some real food. We found puddings! This lifted our morale. MCC sent us an update. We had to change our clocks into a USA time zone. That was one of the most disorientating challenges. I had no idea what time actually was. Truth be told, I never fully adjusted to this time change.

I slept around 5-6 hours and woke up a little bit tired., I had a terrible headache. I have to confess, I am a coffee addict. There was no coffee in the habitat. No energy drinks. I was deprived of caffeine. It was awful. Of course A. did not share my pain as he doesn't like coffee. I still cannot believe it! We went about our daily tasks, we also did the urine test for the first time.

In the morning, we focused on our secondary experiments, so I was working with Salome. The first experiment had some failures but we made it and put the plants in a sterile chamber until the next day so we could check if they would grow even a bit. We began our second experiment, placing the Mung beans into different Petri dishes as an alternative to the sprouts culture container. We were unsure if the experiment would produce proper results so we did not continue with the experiment. What I really liked about our crew was our ability to help each other with our experiments, even if they were not our own.



We were working as a team, and we could understand each other. We could count on each other. Our days were productive, we were doing a lot of things and we were almost not complaining about anything except for food and a shower!

After lunch, which by the way was delicious, we focused on our main experiment of the mission. S. also started the Vinci nap experiment, which was my favourite experiment because of the sudoku test which was completed before and after our nap.

From day two, the word CIRCADIAN (medical checks) became my worst nightmare!!! I just remember M. saying the word Circadian and I was like, here we go again... That night we enjoyed some Scottish candies that M. brought for us and we really enjoyed them, especially S.. He was starving for some Nutella!

Over the next two days, we spent most of our time sewing. Honestly, we were like grannies, sewing, watching Friends and of course drinking tea! M. every half an hour was like, "Does anyone want some tea?" Even though I was not getting enough sleep, I was not tired. I was mostly excited to start my day with my team. I swear everyone was very nice and I feel so lucky that I had these people on my team.

The next day we attended zoom meetings, our usual EuroMoonMars (EMM) meeting and one with M. from the European Space Agency. We participated in the International Observe the Moon night event, in collaboration with the KITION planetarium and observatory in Cyprus. We introduced ourselves, made a quick tour around the habitat, we explained what experiments we were doing and then we answered some questions that they had. We were exhausted that night and we still had hours of sewing ahead of us. Knock! A package from Earth had arrived,

inside holding essential goods with nutella, polish chocolates and finally the wire for the sewing machine. S' dream came true thanks to Agata!

The next day was the best day. We had so much fun taking microgravity pictures. We tried to make it look as realistic as possible, as though we were actually floating in space. I then had a terrible headache from the CO<sub>2</sub> levels, they were too high. It was the first day that I took a shower in the habitat, it was freezing. The rest of the crew could hear my screams as each painful drop of water landed on my scalp. We finally completed our sewing soon after.

From that day on we began to sleep with private shelters which were within our habitat. We wanted to test whether privacy affected sleep. We decided that two members of the crew had to be active controls so they did not have a shelter, two members had a white shelter which was semi-transparent privacy and as I had nyctophobia, I knew from the beginning that my sleep would get worse. I was right. The next day while we were doing our daily sleep report I could see that my deep sleep was less and I had a lot of wake ups during the night whilst previously I did not. This was a very good point for our research as we had to take into consideration people who have nyctophobia and claustrophobia, as the private shelters will not help their sleep.

On day six, we slept an extra hour and felt well-rested. After completing our morning routine, filling all the excel forms, performing our experiments and having breakfast together as usual. Ping! Suddenly we had an emergency. MCC notified us that there was a meteor shower headed our way. We acted quickly as a team and closely followed MCC's briefing instructions. Everyone was calm and able to focus on our tasks. The funnest part of the emergency was that we were all together in the emergency shelter (the shower). It was so hot and we were sweating. We split into two teams, one measured the electromagnetic fields and the other measured the alpha, beta and gamma radiation levels.

This took up a lot of time, we were trying to measure these levels with a machine which we eventually realised was not working. Despite this problem, we found another working one and quickly measured the beta and gamma radiation levels. We could only compute the alpha levels and after researching we did it. At the end of the day we had accurate and correct results.

M. and I set to work in the bedroom module. We covered all the wood strips of the beds with a silver cover to look more space-like. It took us hours but the result was excellent. That night we drew our “dragons”. This was another psychology experiment, we had to draw our hand on a piece of paper and then draw or write some words to describe what we thought of ourselves on the inside of the hand and then on the outside of how we thought people saw us. It was an emotional moment for all of us but I believe that we came even closer.

We landed back on Earth the next day. Agata and G. came very early in the morning to pick us up. It was so weird to walk outside and see someone new after a week. We went straight to visit Agata’s father, a wonderful man. He was so friendly and full of knowledge. He had made us a present, a unique book. The only problem was that it was in Polish so now I must learn Polish. Agata presented us with our certificates. It was a great moment for us all and I was so proud of myself and my team.

After that, because of S., we went to a very cold lake! It was freezing. Everyone was so relaxed in the water except for me. Everyone was like “come on Cypriot girl”, and I was like, I AM FROM CYPRUS, WE HAVE 40 DEGREES THERE!!! I did not have a choice, I just dived in and was shaking the whole time. Then, we went to the sauna and we did our mission de-briefing there. It was a unique way to do the debriefing but I liked it. We shared some stories with Agata and she told us how our performance was. As soon as we went back home, I took a

long, hot shower. As I was the first one to be departing in the early morning the following day, we enjoyed our final hours together with some drinks and war stories.

I am so thankful and happy that I had the chance to live this experience and meet five great people. I feel like I have five new friends, and I am so thankful for that. I am happy that we all did a great job together and had great results without any arguments. I will definitely miss all of them, our daily routine, the Polish cow and, of course, the STP test (#not). If I had the chance to live this experience again I would definitely choose the same people without a second thought. I hope we will meet again to continue our adventures, next time perhaps, underwater.

## *10. Crush*

*Asit Rahman, UK*

*Exp. 53 Emmpol 13*

*11-17 Oct 2022*

During the course of the mission, I had romantic feelings for our communication officer (CO). It sprung up on me by surprise, and at the start I thought something might develop between the two of us, however, she seemed to have feelings for our vice commander instead, and the two were getting more involved throughout the course of the mission.

I was fortunate that this did not cause a distraction from my duties as commander or distract me from working on my own experiment. Romance was not allowed in the habitat, and I was fortunate and even

grateful to our vice commander that nothing had happened between myself and our CO.

This report recalls my experience of the events, and how my feelings developed over the course of the mission to better understand the reasoning.

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Though I have never had a girlfriend before, I have dated a few women, none for longer than a month before deciding we were better off as friends, or not even being compatible as friends.

Appearance wise, I generally tend to be attracted to slim built, often small (but I have dated a few women taller than me) ginger or brunettes. Blondes never seemed to appeal to me as much for some reason. I have had romantic feelings for one or two, but they make up a very small fraction. By some statistical factor I cannot explain, most of the women I have been interested in have been Irish (most of them I only found out their heritage after taking an interest in them), as if there's some sort of Irish appearance. But in university I seemed to have developed a few crushes on central/eastern European women, including the tennis girl I am hoping to ask out soon.

All of the girls I have liked have had a shy and sweet personality. I'd often meet them at parties or ceilidhs where they would often be slightly isolated from the social circle, or hardly speak to anyone. They would also be soft spoken and be very caring and loving to everyone. Perhaps that's what drew me to E. in the mission. I have a strange attraction to shy people.

I would say I'm drawn to shy people in social situations as I want everyone to feel included, since I knew all too well the pain of being

excluded. However, I could not explain my attraction to shy women. I seem to have this strange desire to “unlock their secrets”, this desire for them to reveal themselves to no one but me because they trust me or reside in me the most. Perhaps the element of mystery is a universal attraction experienced by everyone.

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My interest in E. started on the evening of day 1 when I first noticed her green eyes. They really were beautiful and I wanted her to know. Because of my personality, I flirt with everyone (I often do that to get customers to buy more products back in my tea shop). Most of the time I mean nothing by it, especially with the other guys on E13, but with E. I almost felt like I was flirting to try and charm her into actually liking me. I initially dismissed that thought at first because I saw it as no different to flirting with any of the guys, but recalling it now, I think there was a very tiny part of me that day that had some other intentions.

On day 2, I continued commenting on her eyes and kept telling her what a good job she was doing as a CO. Again, on the actual day I thought I was just doing my job as a commander, but recalling it back now, there definitely was a small part that wanted to charm her and to get her to have some feelings for me. At that stage it may have been due to vanity – having the aesthetic of being a space commander and having all the girls swoon for me. But those feelings did later develop into wanting her to reciprocate my feelings for her.

Day 3 was when I realised that I had feelings for her. It started in the afternoon when she came to see me about not being able to sleep because of MCC. I tried to do my job as a commander to help her out. I invited her to sit next to me on my bed while I was uploading the

images onto the drive, which I later realised I created an intimate setting rather than a friendly and calming one. My feelings did grow stronger knowing that she trusted me enough to come to me with her problems and that she was able to seek comfort and emotional support from me.

I did refrain from hugging her because I had acknowledged that I had feelings for her at that stage and I did not want to make any advances on her while she was vulnerable or during the course of the mission. Also because I am British and we repress our feelings and are uncomfortable with displays of affection. After the dragon session however, I had reasons to suspect that perhaps she felt the same way when she hugged me at the end. I felt guilty that I was disobeying orders to not initiate romances in the habitat, so I just hugged everyone to make it seem platonic.

She always seemed quite depressed in the mornings, and when I asked her if she was ok on the morning of day 4 she went to hug me to comfort herself. Of course from then my feelings grew stronger. I initiated a conversation later on about previous romances, with the intent to find out if she was single and tell her I was as well. Unfortunately she spent a long time showing me photos on social media. I really wanted to continue with my work, but I didn't want to be impolite (the Britishness in me). I was starting to understand why romance was banned in the habitat.

There was sunlight coming into her bed from the emergency exit, which I helped to fix before she took her power nap. I then jokingly lay down on her bed and told her to leave so I could take a nap after a job well done. But she pulled the curtains over and lay down next to me. I didn't think she was going to actually make any forward advances at me from there, and I'll be honest, I did want to lie down next to her and

cuddle up to her. But the entire time I was entirely extremely anxious, and I didn't want MCC to get the wrong idea. I didn't want them thinking I was disobeying orders and not doing my job properly. So I jokingly told her I was scared and left.

That was probably where I let things go wrong because I found her and the vice commander cuddling up to each other on the chair the next day (day 5). Although I was slightly hurt, I was more relieved than anything because it meant that there was no hope for me, I didn't need to pursue things any further and I could continue with the mission and continue my job as the commander and help the other crew members while the vice commander was looking after her.

Still, there was a part of me that hoped that she was just being very friendly with him. I am often that affectionate with some of my female friends, so I was hoping that would also be the case between them. I did try and have a chat with her and ask if she was feeling ok, and if N. was only comforting her. She told me she wasn't and when I went to comfort her, she started crying. It was a recurring pattern of mine that whenever a girl I'd be interested in trusted me enough to share her problems, I'd automatically put myself in the "friend zone" and refuse to make any further advances. It was a combination of N. and the fact that she was vulnerable that I completely stopped pursuing anything with her at all.

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I still harboured some feelings towards her after the mission, but I knew that she liked N. and that even if she did feel the same way about me, it was unrealistic to pursue anything at all since we lived half a continent apart.



She seemed very visibly upset after the mission as she was back to her quiet self again like she was on the night we all met. She wouldn't tell me what was on her mind, and even asking N., he claimed that he didn't know and thought that I would since he thought I was a lot closer to her.

Talking to N. about the situation, it seemed he felt the same about E. during the mission. Both he and she went along with each others' advances, despite him not feeling that strongly about her, and not thinking it was sensible to pursue anything further with her. He also claimed it was the isolation and close-knit environment that influenced his feelings and actions

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Overall, the rate my feelings developed were quite rapid in the isolated environment. The lack of sleep and close-knit environment allowed us to be more open and get to know each other more, which accelerated and amplified how strong the feelings grew. Even though I wasn't initially attracted to E. physically, her shy and friendly personality did draw me towards her, which in most usual cases would not have been enough for me to develop feelings for someone, but in the case of isolation was all it took for me to latch onto something and develop feelings. Perhaps it would take a girl who I wasn't physically attracted to or drawn by their personality for me to not develop feelings for them

Prior to her interest in the vice commander, my intentions were to show her that I was interested, but I wanted to balance it out by keeping her interest enough to ask her on a date by the end of the mission, but also not allowing my feelings to get in the way of the mission or my duty as the commander. It was mostly my guilt that stopped me from making any further advances on her.

Throughout the course of the mission, even before something happened between her and the vice commander, I knew it was impractical to pursue anything with her. I did have surprisingly strong feelings, but I didn't think we connected enough for me to pursue anything further. In a case where I'd feel very strongly about a girl and felt like we had a connection, I would try and keep a long distance relationship. But I didn't see that worthwhile with E. and did think that it was mostly a combination of the isolated environment we were in and her being very friendly to me that I developed such feelings for her

Compiling this report, I hope to understand why I developed such feelings for someone and to hopefully either prevent myself from being in a similar situation or control my actions for any future missions I would be a part of.

E. and I finally talked about the love triangle during the mission. One thing we both had in common was that we had crushes on people very quickly and very easily. She did have a crush on N. during the mission, perhaps even from the run we went on when he was kind enough to stay behind with her. And of course I also had a crush on her later on during the mission.

We recalled the events of the mission and I told her I thought I had reasons to believe she liked me since she was being quite affectionate. She did admit that she could see us ending up together had she not been crushing on N. during the mission, and if I had reciprocated the affection she showed me. I unfortunately could not do that for two reasons. The most important being that I wanted to remain professional and not allow my feelings to interfere in the mission, and the second was because I'm British and repressed.

However, my biggest blunder was the fact that she suspected that I had feelings for her from the things I wrote about her in my daily reports and the way I interacted with her in person. However, she was not sure as I had also jokingly flirted with the guys in the same way too.

E. was very worried that she had hurt me, however I reassured her that these things just happen, that she had no reason to feel bad as her being with N. provided me some relief that I had a reason to let go and focus on the mission. I also told her that I was just very glad we could move on from the awkwardness and stay friends

She did however disagree when I told her that another reason was because I played it out logically in my head and didn't think we were compatible. At first she began to debate otherwise, but luckily I managed to distract her with another topic. The truth was, I couldn't explain exactly why I felt we weren't compatible. I've dated women who were incredibly attractive and on paper would have been the perfect person I'd want to be with, but just could not develop any feelings for them. I've also dated girls who were polar opposites to me, and I wouldn't even initially find them attractive, but I'd fall head over heels in love with.

I won't lie though, some of those feelings did slightly re-emerge throughout the day. Especially when I'd look into her beautiful green eyes. And throughout the day I felt perhaps something could happen with us and I would be so happy to be with her, but ultimately I realised it wouldn't feel right, and it would hurt us both very badly in the long term.

With E., it was mostly that I loved her affection more than I had feelings for her. I've realised that I've never actually had that sort of

affection for a very long time. I really want companionship, and honestly I've wanted that kind of affection from someone I liked for such a long time. But I'd be completely guilt ridden if I couldn't reciprocate. It's always better to see the funny side and it always makes a good story.

## *11. Time in isolation*

### *Evandros Theodosiou, Cyprus*

*Exp. 45 ASTRA*

*17-25 June 2022*

Time is only relevant, time is just a perception and it is a human creation. This is something I realised after finishing my mission as part of the ASTRA 45 crew at the Analogue Astronaut Training Center. One of the experiments held during the mission was the monitoring of time perception of the crew as we had no sunlight entering the habitat and we were constantly instructed to change the time zones on our smart devices. Therefore, this resulted in us losing track of time; we were unsure whether it was day or night. The most confusing thing was when I realised that time was passing much faster in the habitat than outside the mission. As a crew, we had to fulfil a test every day first thing when waking up and right before sleeping which was called Subjective Time Perception (STP) in order to monitor how time is passing for each individual after each day in isolation. Personally, I was

fulfilling this experiment an additional two times during the day, before and after my nap, as I was instructed. I am really looking forward to the analysis of those results, as I was totally adapted to the time system we used in the habitat with hour zero being the time we were woken up. Time is relative and this experiment made me think that everything can be changed, even our biological clock. This is an intriguing conclusion and I am looking forward to future experiments on time perception.

*12. Ad Astra*  
*Daniel Bister, USA*  
*Exp. 45 ASTRA*  
*17-25 June 2022*

Astra 45 is a family, one of multicultural, young, and energetic space enthusiasts. My experience with AATC has been great, most importantly the connections I made along the journey. The collaboration in each other's experiments, the team bonding activities, and the time spent getting to know one another has empowered me to work harder in my tasks. Viewing team members not as peers, but as family determines the quality of experience and overall impact of the mission. Analog astronauts must display resiliency, efficiency, and adaptability to be successful. We motivate each other to achieve greatness.

Being my first analog mission, I feel that this experience was a unique, valuable introduction to living in isolation and collaborating with other analog astronauts. I will forever cherish this memory. I look forward to

future analog missions with the knowledge I will gain from Astra 45. I hope our family will set the standard for the AATC and that one day, once the mission is over, we will meet again. Ad Astra - “To the stars”.

### *13. Rapid jump into the mission*

*Salome Gervasoni, France*

*Exp. 40 Yuriya*

*13-19 Oct 2021*

The Yuriya mission was my very first analogue astronaut mission compared to two of my crewmates, which intimidated me a lot at first. I didn't have any expectations about being an analogue astronaut, nevertheless, I was into the unknown. The unknown may be the thing that stressed me the most before leaving for Poland. I am quite a shy person at first and I like things to be tidy in my life and in my head. I remember myself in the plane before landing to Kraków thinking “so here we are, in a country I have never set foot in. After this address, I have no idea what I am doing, where I am going and how”. I had mixed feelings between excitement and fear. On top of that, the time between my spontaneous candidature and the announcement of me going to Poland was really quick. I have had an email from Miss Agatha and 3 weeks later I was participating in a mission.

I remember, over the summer, I saw an article on my school's website where it was depicting the journey of 2 students who did an analogue mission, thus I remember myself wandering on the AATC website, to see if there was an opportunity for me to do something similar. Since forever, I was drawn toward science, I always had the urge to understand what was surrounding me. As a kid what I could do for hours was look at the stars, so first I fell in love with astronomy and then growing up and having more and more knowledge I decided that I would focus on astrophysics. So, participating in an analogue mission felt obvious.

Maybe because of our fields of studies, I went toward E. at first, since she has some good vibes and she seemed really nice. As I said earlier, I am more the reserved type at first, so I was worried about being surrounded by 5 people I didn't know before. We were all coming from different countries, with different native languages, cultures but no matter our differences what bonded us was our common urge to learn and understand space.

During the first remote meeting I told the crew I wanted to be the commander, I wanted to do the most out of the mission and if I were to do an analogue mission, I wanted to do it fully and put myself at risk. I might be coy/bashful, but I can be bold and spontaneous at the same time. What I can surely remember is my arrival at Agatha's house: after landing I took the first cab and came directly. I still had clogged ears, and with stress and excitement I could not sleep the day before, so I was not at my best. I was hosted by G.. He approached me with so many things that I had done or not done. For example about me being the commander and arriving last, about me not having done the survival

mission the day before etc. I felt like shit there is no other word. I was lost and didn't know about the survival mission I came on the day I was told, not sooner. Since I missed school for being in Poland, I could not afford to miss more days of class. I rethought events in my head and kind of lost the confidence I might have had. Therefore, I let M. oversee the commander role as he asked. He was the oldest I was one of the youngest, he was the only English native speaker so I thought it might be easier for him to take a fast decision and communicate those to us, on top of that since the rest of the crew already bonded a bit, I felt not at ease, so I let myself aside. It turned out this was a wise choice. He was calm, efficient, receptive, and supportive and not stressful at all. He could have used his position as a support for his opinion. He did not. I really felt as if everyone had his word to say, and no one was let aside. Moreover 2 days before the end of the mission I felt sick, you can even see it in the pictures, as I am paler as the day of the mission passes by. I even thought I was going to have to stop the mission and go out because I had so much nausea and headache.

Anyway, during this mission, we really had a marvellous time. I didn't expect to find people so kind, have interesting conversations about anything that came up to our minds and be open-minded about even touchy topics like politics, sexism in the STEM field and deep-frying everything! I think one of the biggest laughs we had during the mission was on day 5 when we made real teamwork to take our microgravity pictures. We all had many ideas and trying to achieve them with our materials was kind of a challenge. We all put ourselves in a weird position to achieve the desired photograph and it turned out better than we thought in some scenarios!



The journey passed by, and we bonded quite rapidly in fact. As far as I can remember we did not have any arguments during the week. It was crazy, we were so busy every day, the hours passed by super-fast even though we were sleeping so little. Basically, we were doing something all the time, and for the first time in my entire life sport really felt like a relief. This hour every day really was our only “me time”, where we could answer our private messages, listen to our music, watch some YouTube videos etc while running or cycling. The sport area is kind of a recessed zone, consequently out of the eyesight of the rest of the crew, therefore it may be the only time where you don't feel observed (except from Agata with the camera).

As a consequence, if I were to do it all over again I definitely would. I have met incredible people which I would like them to stay in my life for a long period of time. I have learned things about myself, mastered the description of a word by mimicking its function to M. in the hope of a translation, know more about my physical boundaries, and shared some of my knowledge. I can only say positive things about my experience in the Lunar habitat.

## 14. *Angelo was here*

*Angelo Micoli, Italy*

*Exp. 40 Yuriya*

*13-19 Oct 2021*

When I found out the existence of this opportunity, I was psyched. Since I was a kid, I always felt an enormous attraction for space and survival, maybe this is the reason for my excitement when I found out that I was chosen for the analog mission. I didn't really tell that to many people before because I knew they couldn't understand what that did mean to me. So, I just prepared everything and waited until the very last moment to advise everyone that I was going to be missing for a week. We laughed when they found this out.

The first day I came to the structure, I thought I was in the wrong place. I was expecting a tall building instead of a normal house as a general quarter for AATC.

I really enjoyed the pre-test to enlighten the leadership and the characteristics of everyone in the crew, or at least 4 of us, because the last 2 members weren't there yet. Personally, I was feeling too tense to take the leader role, even if I felt, as usual, that command roles suited me naturally. That's why I kept thinking about letting the only other person that could have been a good alternative, M.. Fun fact, he proposed to be commander, so in the end I decided to set myself apart. Starting a mission with a power conflict wasn't really a good idea. Long story short, I was concerned the first few days, but in the end, he proved to be a very good commander, and I was right behind him as his vice.

The first big laugh came out from S. while we were making role decisions, he cut the dialogue shouting “can you pass me that banana?” I literally exploded with laughter. He reminded me of my grandfather on the dining table.

Anyway, the journey started, 4 of us were together a bit longer so it was important to properly integrate the others, and to be honest, it was easier than expected. I must say thank you to them, because their personality was not at all in conflict with ours, so the process of making a strong crew developed itself without almost no need to interfere.

If I should reassume the whole mission, I would like to use these words: hard work, strong determination, incredible amount of laughs. And I can assure you, the last one is just a euphemism. We really started to think that there was a bubble formation of CO<sub>2</sub> inside the habitat at a certain hour of the day, because we started to laugh about the most random thing almost at the same time everyday.

But we worked a lot. We were divided into teams to work in parallel, so me, M., and Sa. put our effort in the research of any kind of publication that was proving any relations between privacy and any kind of stress, and things that can reduce stress levels during sleep, like colored lights. In the meantime, the operative squad took care of the implementation of the devices to give a privacy break to everyone during bedtime and while sleeping.

Meanwhile, I was struggling with my secondary experiment. I wanted to find a way to make a device to detect the water flow rate of our only pipe that wasn't possible to detect. The process was long, and I thought about giving up more than one time. But the hell I was. During gym time I spent most of the time on the phone looking for an alternative solution affordable with the materials inside the habitat, because we

were out of components, and I had some gap in my electrical knowledge. So, after 3 days of struggle, I decided to make it in the old-fashioned way: using a turbine or a windmill wheel, a gearbox, a dynamo, and a voltmeter.

I can't thank P. enough for teaching me how to build things in CAD and how to use the 3D printer, and a special thank you goes to the rover inside the habitat, from which I took the dynamo away. The entire process of trial and error and redesign took me all the remaining days, without the possibility to finish my prototype and test it, because of a couple of issues. But if in the future someone wants to finish my job, they will have a cleaner route to walk on.

If someone asks me “what do you remember the most about the mission?” I would tell him that I remember how I made an unforgettable experience full of challenges, dynamicity, struggle, effort, satisfaction, and happiness. We were an amazing crew, and that experience will be a part of us, forever. You can't just forget that, because there was not a single negative episode inside there, and that was because of the crew. If we have been able to face every challenge and every discomfort, it was because we supported each other like a real squad.

I was expecting to make an incredible experience, that makes you struggle and put your skills on the table, but I wasn't expecting it to be such a good memory. If I had the opportunity to do it all over again with them, there will be only one thing that I won't do: letting M. cook alone anything that is not fried. I can still feel the taste of eggs and charcoal.

## ***15. 4 strong women, a teenager and a sexist***

*Grzegorz Marzec, Poland*

*Exp.39 Kepleria*

*27 Sep - 6 Oct 2021*

This is not the first time I have participated in an analog simulation of a space mission. It was also not the first time that I was a Mission Commander. However, I wasn't prepared for what it looked like. The first mission I attended was in 2020 and we spent 6 days in isolation. I chose the crew mostly by myself to make sure that I would be chosen as the Mission Commander. So I knew my crew members before and what is probably important, we were a completely male crew. Another mission that is the subject of this story took place in 2021. We stayed in isolation for 10 days. Moreover, I didn't know any of the crew before, I was not sure what function I would get and it turned out that I was the only adult male in the crew. Is it wrong, of course not, but surely, it's interesting... said the sexist.

### **Day zero**

The main part of the mission begins with the arrival of the crew at the Analog Astronaut Training Center in Kraków. However, it's true that the crew gets to know each other before online meetings, during which the mission assumptions, main experiments or even the appearance of the mission logo are decided. I participated in the first of such meetings

where I think I was the only one who showed my face. Unfortunately, due to personal reasons, I was unable to attend the next three meetings. So I was a bit back at the start. In fact, I even considered quitting the mission. Of course, PhD Agata convinced me using various arguments. It's obvious that it worked ... A week before the start of the mission, I took control of the situation and started contacting the crews to finalise the mission logo, because it was the most pressing topic in terms of time. We managed to reach an agreement without any problems. On the day the main part of the mission began, I watched on internet communicators as my crew members met in Kraków and began their joint integration. I was the last one to arrive ... It's true that one of my crew members was in Kraków earlier, but she had a problem with getting to the meeting place. Let's call it "Hot Blood", because this, in my opinion, reflects her character. In order to clarify, I will add that I will use certain pseudonyms to protect the privacy of my fellow crew members.

The first meeting was very polite. I could say even artificial. I understand, everyone wants to be professional. I learned from MCC (Mission Control Center) that one of my companions (let's call her Ambitious Queen) cannot imagine performing any other function than mission commander. I treated it as an interesting challenge, although I didn't intend to treat her as my competition. It happened quickly, both for me and for her. It was time to face reality. The same evening we had to do an endurance run, which was to show MCC our teamwork skills and the level of our physical fitness. For me it was a moment to showcase my leadership skills ... The Ambitious Queen was also aware of it. Without further ado, we started our struggle with nature. It was

assumed that the task would be easy, to reach the top of the Kościuszko Mound, the highest point in Kraków. The problem was that it was the evening hours, and the route led through the forest, which meant practically zero visibility. MCC informed us that time is also of essence. I knew, however, that the most important thing was that we should reach our destination in a group. The beginning of the run was quite cheerful. The crew began to integrate and everyone tried to get to know the rest. I remember having a good conversation with my friend, let's call her "Sad Smile". The challenge came when we entered the forest. There was a thick darkness, and PhD Agata told us to keep silent, stay in a group and try to remember what we experience with other senses (smells, sounds, etc.). I instinctively positioned myself at the end of the group to see all my companions, to provide help when needed, and to keep the group unity. The Ambitious Queen was right in front of or next to me. You can see that she also understood what was going on. We set off with a brisk step, but the darkness was impenetrable and the path was steeper and steeper. After several minutes, the MCC stopped to count us, giving a sign to stop with a double tap on the thighs. I reacted instinctively again, and when I was the last one arriving, a few seconds later, I responded to MCC with a double tap. It worked, our guide immediately signalled us to leave. I don't know if the rest of the group thought we had settled this in advance, but we didn't. Until the peak of the mound, at each stop, I had this non-verbal communication with the march leader, for which I was praised at the top.

The view was beautiful, we watched planes take off from the international airport and talked about the history of the city. We took a few photos and went back. Now we could talk so we tried to get to know each other quickly. This time I talked a lot with the Ambitious Queen

and I found that she probably doesn't treat me like a competitor either. What a relief, because I knew that crew unity is extremely important during analog missions, and the slightest misunderstanding can very easily turn into huge problems when staying in isolation. Of course, at that time I could not have guessed how many problems this issue would cause me. The return march was smooth and cheerful until we realised that our guide was not ahead. "This is it, I knew it wasn't over yet," I thought. I took the initiative right away. I ordered them to stay in the place where we lost Agata. Part of the crew which stayed was Sad Smile and the other two crew members, whom we will call Battery of Happiness (another strong woman) and Teenager (I think I don't need to explain that). On the other hand, I took the Hot Blood and the Ambitious Queen to come back a bit and carry out the "rescue and search operation". We shouted a little, went back several metres and checked the surrounding bushes. No sign of MCC. So we went back to the three that stayed below. They also tried to find our guide. With no result. So I decided we must admit that we have one missing person. However, since none of us could take our phone with us, we had neither light nor communication. I made the decision to return to the starting point of the march. I decided that the most important thing was the safety of the rest of the crew. We let Agata know by screaming that we were going to the emergency meeting place, i.e. the place from which we started the run, and when we were there, we would inform the special services about the disappearance and start a coordinated search action. It later turned out that this was exactly what we should have done. The next task was to find the way to the starting point. I thought it would go smoothly. However, I wasn't entirely sure which route we came here exactly, so I trusted teamwork. We reached the main



thoroughfare without any problems. Then by using the available information, we checked at the nearest bus stop, where exactly we were and after half an hour of walking we were in place. Honestly, we all had a great time doing this task. Everyone took an active part in carrying out the task and integrated himself with the group. We started to become the crew. On the spot, it turned out that we passed the test. We went for a well-deserved rest. And there was evening and there was morning.

### **Day one**

We started the next day very early. Task for today is get to the habitat and start the main part of the mission. We wake up at 6 am and lets go! We were taken by a AATC space lines spacecraft, "Trapezov" - Mercedes Benz. On the way, another task was waiting for us. Purchase of food for the whole period of isolation. Each of us got a list of products to find and a specific time to complete the task. Of course, everyone did a great job, even though the amount of products purchased was overwhelming. None of us expected that this will be part of one of the strangest psychological experiments. On the way, we were also informed by the AATC that we had to make a decision regarding the division of roles during the mission. We had the following positions to be allocated: Mission Commander, Vice Commander, Data Officer, Communication Officer, and Medical Officer. Agata mentioned immediately that it will not be an easy task because we have two alphas in the crew. Yes, I knew it was said about me and the Ambitious Queen. I thought that it will be an interesting beginning of the mission, but at the same time I assumed that the good of the mission is the most

important, so I will not try to become a commander at any cost, but I will not just give up the function. "We'll see how it works out," I thought.

The arrival to the habitat was not a surprise to me, after all, it's not the first time for me. However, I was curious about the reaction of my fellow crew members. As I thought, they were positively surprised and impressed. To quote my colleagues: "The habitat itself made an impression on me. I thought there would be less space, which surprised me pleasantly. And a nicely prepared bathroom"; "Once inside the air smelled different and felt heavier". Let me just add that the quotes of my fellow crew members used in this text, come from their daily personal reports. The habitat inside looks very cosmic. It is filled with a huge amount of specialised equipment, including specialised laboratory equipment. MCC introduced us to the habitat layout. We learned how the air quality system works, the adaptation of which to the current crew working conditions was the basic task every day. We obtained information about individual experiments and guidelines for the main objectives of the mission. Then the door closed. We are officially on the Moon from now on. The mission has begun.

Tasks for the rest of the day were to prepare our flight suits, arrange the division of duties, prepare data collection tables and prepare the first meals. The data we collect on a daily basis include information on the amount of water we drank, the amount of water we used (we used wet wipes for personal hygiene, showering was not an option), and of course also the amount of water we excrete ... yes, we pissed into a measuring cup and we saved the data. I was surprised that the ladies had

no problem with that. True analog astronauts, respect. Other data that we collected on a daily basis was information on meals, i.e. the amount of extra grams eaten or left by each crew member. We eagerly started sewing patches with the AATC logo to our flight suits. Then we also decided to make meals in pairs, each day one couple prepares one meal. There were three meals a day plus a snack that didn't require any preparation. Since there were six of us, it was perfect. One couple is doing breakfast, the other is preparing lunch, and the third is making dinner. The next day we shift one meal so that the couple who were making breakfast today will do lunch tomorrow and dinner the day after tomorrow, and so on. We chose the composition of the pairs by lot. It went smooth and professional, I was proud of what a professional crew I have worked with. The last question remained, the division of roles. So we sat down at the table in the main module and started brainstorming. Sad Smile was chosen as Medical Officer and Astrobiologist while exploring the habitat, when Agata explained to us how to use medical devices. I proposed that Battery of Happiness should become our Outreach Officer because this is what she deals with every day, and her personal task during the mission was to prepare educational movies for teachers and to promote the mission itself. The Teenager was given the function of Data Officer, which he was happy with because collecting and sorting data was simple, but also very interesting because it allowed him to learn a lot about the preferences and physiology of the co-crew members. I proposed to make Hot Blood our Communication Officer because she had the biggest problems with speaking English and all of us liked challenges. Besides, messages sent to MCC were always delegated and consulted with the mission commander, so I knew that in case of problems she would receive the

help she needed. The question of choosing a Commander remained. So I started a gentle debate. Battery of Happiness suggested that I should become the commander because I know the habitat and it may make our work easier, especially at the beginning. Sad Smile, however, rightly noticed that we are here to take up challenges and learn to perform tasks that we have never done before. The Ambitious Queen stated that it was not really necessary for her to become a commander, but she was sure that she would be perfect for this role. Hot Blood noted that I had already proven my leadership skills and Teenager endorsed my candidature to simplify the time spent in isolation. Agreed. But I just wanted to be okay at all costs. So I proposed to solve the situation in a diplomatic manner. In fact, my skills and knowledge of the habitat will help us in the early stages of the mission, although after acclimatisation it won't matter much. My idea was that I would take the position of commander, the Ambitious Queen would be my vice commander, and we would switch duties halfway through the mission. The Queen took the idea coolly, and at the time I thought she must have been displeased. Today, however, I found that I misread her intentions. The fact is, however, that the women chose a man as their commander, although I was sure that they would want the mission to be typically feminine. Yes, that's pretty sexist thinking, I admit. The tension was relieved by the evening meal, which was strange for my friends from abroad. Tortillas replaced pancakes, but the biggest surprise was eating cottage cheese with sugar. Sad Smile was outright indignant at such a combination. Citing "Who the hell puts this combination together? Someone that's not happy with life". This cultural exchange gave us a lot of joy. After dinner, we took entrance photos, both individual and group one. The Battery of Happiness turned out to be a great photographer. Together

with Hot Blood, I prepared the first official message to MCC, reminded everyone to fill out daily personal reports and set up wristbands which measure the quality of our sleep. We officially became a crew of analog astronauts during the mission. I was excited. And there was evening and there was morning.

## Day two

The next day started not very nicely. Ventilators, and worse, the lights didn't go out at night. We were all sleepy. The morning medical measurements were rather slow. The equipment wouldn't work, and we were all unfamiliar with the morning routine yet. We were also supposed to collect urine samples for analysis that day. I recalled it several times, but as it turned out later, the Teenager forgot about him. I already knew that as a commander I would have to take care of him in part. I actively helped Sad Smile collect all the medical data from the crew members. Every day after waking up, we had to measure our temperature, blood pressure, heart beat, as well as weigh, read our BIM, muscle weight and body water content. My friends, whose weight was not ideal, were concerned about their biological age. It was great that the definitely overstated indications (in their case) only motivated them to work on themselves, which could be seen later in the gym. My biological age indicator was 14 years old ... yes I definitely don't believe in the accuracy of this machine, I thought. However, since it motivates my friends, I will not correct them. After dealing with the morning measurements, we had to start the next measurements immediately, because the day plan assumed Circadian Rhythm measurements every

two hours, starting from hour 1:00. So we barely dealt with one medical measurement, and we had to move on to the next ones. In this regard, I knew we had to work out a system and hurry up in the morning. However, I expected, based on the experience from my previous mission, that there should be no problem with this. It's worth mentioning here that during the mission we live according to the time of the mission day. The MCC wakes the commander, and the commander starts the mission clock, which starts counting the hours from zero. Starting at 1:00 (i.e. an hour after waking up), we collect data for Circadian Rhythm (weight, body temperature, blood pressure, well-being) every two hours. 2:00 breakfast, 6:00 lunch, 12:00 dinner. The working day officially ended 15 hours after waking up. An interesting point is the experiment with the perception of time. After waking up, we filled in the information collected by the bands about our sleep (the length of deep sleep, light sleep and REM phase) in specially prepared tables, and then we started the STP test. Subjective Time Perception was one of the most boring tests we had to do during our missions. It consisted of staring at differently colored boards and clicking any key every 5 seconds. We had to count the seconds ourselves. In this way, our subjective feeling of time was tested on us. Of course, Agata woke us up at different times to disturb our daily cycle as much as possible, because it's interesting from a scientific point of view. Great ... but I understand :) The entire crew was not aware of the time outside, as on the first day we were instructed to reset all our watches to Houston time.

Coming back to the topic, after the morning measurements, we collected Circadian Rhythm data and started breakfast. After breakfast it was time for the first briefing. It was routine for me and a signal to the

rest of the crew that this is a serious mission. The plan of the day was discussed, the tasks delegated and we sat down to debate the most important assumptions of the mission. The main goal was to prove that it is possible to design a small research satellite in such a short time, which will be sent into the stratosphere after the mission. We have established that the tests to be performed by our satellite are measurements of the quality and composition of the atmosphere. We have also established a plan for the coming days and a general time frame for the project. Then we proceeded to the second main task of the mission, i.e. participation in the hackathon organised by NASA. Of course, the hackathon itself took place on the weekend, i.e. on the 6th and 7th day of the mission, but today we had to decide what topic we chose. Both debates were very substantive, but also quite stormy. Although I tried to express my opinion, of course I didn't want to be dominant, as I wrote in my report "I try to be a leader, but leader not the boss". Ultimately, a satisfactory agreement was reached, and although my topic was not chosen, I was pleased with the results. For the rest of the crew, not everything was so conflict-free. As one of my colleagues wrote: "During the brainstorming I see the tense between vice commander and commander. He tries to be a gentleman and she doesn't like that. But I think we are able to manage 2 alphas in this habitat". On the other hand, in my personal report of the day, I wrote: "Vice commander is never asking for help and she tries to be a great leader. I let her do this because she is good at that". As you can see, I tried to be nice, but the more I did it, the more I was disciplined. It was also the first time I heard that I was a sexist. Over time, I realised that when I try to help too much or relieve ladies, they feel like I treat them as weak, and we are all analog astronauts. We are all aware of our worth

and very ambitious. I understand it now, but it took me a while to come to this truth. On the other hand, I wanted to build up the Ambitious Queen a bit after she didn't become commander, so I let her become the manager of these two most important projects.

After this difficult meeting, everyone went to their activities. For the rest of the day I had an impression that all the ladies were a bit lazy. Each of them locked themselves in their laptops, and although we did tests every two hours and had lunch together, I didn't feel the same enthusiasm as before the mission. In the report, I wrote "I don't see so much will of work in this crew". And this is only the second day. It scared me a bit. After a while, however, I knew that the tension from the debate was still in the air. I took care of the repair and maintenance of the habitat, as that was my personal task during the mission. I got a whole lot of engineering work from MCC, from both Agata and Matt, and I was very happy about it. Since the Teenager was not assigned to his own personal experiments or work, he should learn from everyone. So he helped me that day in preparations for the construction of a third electric line that would supply all sensors and cameras in the habitat independently. At some point, the Battery of Happiness asked me to help cover the lamp in the sleeping module. As she wrote in her report, "I saw a dream report of all and they had a lot of awakenings, and low percent of deep sleep. So I started to make darker areas in our sleeping module. With the commander we make the coverage of the light. I'm proud of us". As you can see, she was concerned about the well-being of all crew members. You already understand why I call her Battery of Happiness. Hot Blood also earned her nickname that day. She came up with some great ideas for photo sessions that we can do in the habitat. It



was probably not a good time though. However, it cannot be concealed that her enthusiasm and smile somehow broke the tense atmosphere that we were all tired of. By supper it had relaxed a bit. Dinner itself was something. While making it, we started to realise that there was something wrong with the recipe document for our dishes. We had the exact amount of ingredients we were going to use in grams. However, some of the ingredients we didn't have at all, and the ones we had somehow didn't fit together very well. Well it's for the sake of science, so no one was picky. Our meal is powdered borscht with noodles filled with something that was supposed to simulate mushrooms. Although it didn't taste very good, it resembled traditional Polish borscht with dumplings, a Christmas Eve dish. I said it out loud and before I knew it we all sang Christmas songs together. As I wrote in the report “We started to laugh with each other so I have less worries than yesterday”. It was a lot of fun for the rest of the crew as well. Citing “We even played a Christmas song during the meal. Wonderful experience, I felt like I was on Mars or the Moon celebrating Christmas' '. The day ended in a relaxed atmosphere. We did Circadian Rhythm measurements, STP tests, personal and sleeping reports. Finally we slept in the dark. And there was evening and there was morning.

### **Day three**

Covering the lamp in the bedroom module was a great decision. I slept like a baby, it's indicated not only by my feelings but also by my data. I knew we would learn the morning testing routine, but I didn't expect it to happen so quickly. That day, the morning medical tests went

extremely smoothly and quickly. Everyone then went on to the STP test. The Teenager provided his urine samples. Circadian Rhythm, no problem. Actually, we could all loosen up at breakfast. We joked that the Teenager heats everything in the microwave and it's probably his favourite device in the habitat. The jokes about this situation remained our entertainment until the end of the mission. After breakfast, we had a meeting about our satellite project. Of course, they were led by the Ambitious Queen. As for me, she was very businesslike, but I know from the personal reports that the crew had a rather wrong impression that she was not happy with our progress. Citing “she’s not satisfied with how our projects are going, especially the CubeSat. I don’t know if she’s holding something back ”. Moreover, her period was approaching, and I knew she would not be the only one who would get one on the mission. Should I be more careful with her? As one of my colleagues remarked, “she is feeling down because her period is starting. It's interesting from a scientific point of view, but I still wonder how I can help her, as it seems she doesn't want to be helped ”. After a while, I knew that the Queen didn't need mercy, in fact none of us needed it. She herself was aware of her behaviour, but more on that later. The Queen's bad mood wasn't my only concern. She wasn't the only one who seemed downcast. I found out from reports that Sad Smile feels undervalued. To quote “I’m also afraid that I’m the one not progressing even because that’s how I feel”. One of the most difficult tasks of the commander is to take care of the morale of the entire crew. That's what I decided to focus on. To be the glue that will hold it all together. It cannot be denied that I was happy to have Battery of Happiness, because it came out naturally for her. However, she had concerns about her own health. Her blood pressure was high. During analog missions

you get to know your companions very thoroughly. Not only from a psychological point of view, but also from a physical point of view. We all have access to our parameters, so there is no chance to hide anything. I was worried about the Battery of Happiness problem because, as she wrote herself, "Since the beginning of the day and first medical measurements I have had high blood pressure and I'm worried about it. I had an issue some time ago with too high blood pressure but it occurred on a nervous background. I know that I have pressure problems in my family that it worries me. I hope it's a temporary situation and I will learn more about my health to take action". So many problems on the head, everyone has their own, and as a commander I care, or at least try to take care of them all.

However, my engineering work gave me a lot of joy. We got on well with the Teenager. He completely didn't complain about the hardships of "construction" or service works, if you can call them that. I was pleased with the progress and the ideas we had. He evidently also because in the report he wrote "I am happy that I repaired air condition pipes in the bed module with the commander, so much fun". Am I becoming a teacher ... I must admit that my private meetings with Hot Blood in order to write reports for MCC are very nice. She has minor communication problems, but I am patient and I recognize her gratitude. What's more, I notice that the rest of the ladies don't really take her seriously because of her temperament. That was about to change in the following days. That day, the snack was a total improvisation. The recipe completely didn't match the products we have. So we partied. While I was spending my hour in the gym, the crew prepared the pudding. They burned the pot, but that's no problem.

We laughed at it a little while savouring the thick chocolate decoction. Integration was in full swing. I myself wrote in my report that “I think we start to really integrate together and that's good”. At dinner, the Ambitious Queen opened up and told us about health problems she had to deal with in the past. She also mentioned that she has had headaches since she entered the habitat and were afraid that these are relapses of old problems. As it turned out after the mission, it was rather related to her period and probably to the specific light and aura prevailing in the habitat. For her, staying in the habitat was much more physiognomically difficult than it was for the rest of the crew. I sincerely felt sorry for her, but she could not yet open up to help. Well, I didn't want to be called a sexist again for trying to be a gentleman and for trying to help. When we went to bed, I thought it was the end of a busy day. Unfortunately not for everyone, not for me. Moments after lying down, I got a message on a private channel from the Ambitious Queen. She advised me to take care of planning our time. I got the impression that she longs to be a commander and needs to feel the power. As I wrote myself, “she isn't happy with our relationship. I think she is thinking she will be a better commander. Maybe. Honestly I don't care about this role any more and I really want to see how she can do it. I need to stop being a gentleman because she thinks I take her as a weak person... which is totally opposite that I am thinking. Or Maybe it is her hormones ”. Oh, how wrong I was then. Mea culpa. I reacted quite impulsively because I thought he meant the whole day plan. The next day I found out that it was about an action plan for the satellite project. That evening, however, I wrote back that I do not like writing on private channels and it looks suspicious. If she wants to talk, it should be done face to face. She was not pleased with this, as she knew there

was no way to have such a conversation without the rest of the crew knowing. Due to the lack of privacy in the habitat. However, she agreed. It was a tough exchange, and I'm sure I reacted too harshly. I fell asleep worried with just the opposite of the humour I had when I went to bed 10 minutes earlier. It was difficult. PhD Agata said that being a mission commander is the most difficult job. I was already him, but I really only realised it now. And there was evening and there was morning.

### **Day four**

I woke up tired. In my sleep quality report, I wrote "apprehensive" under the general sleep sensation I had during the night. It was definitely because of yesterday's chat with the Ambitious Queen and the conversation which I will have with her this day. However, I decided that I would step down as much as possible and listen to what she had to say without any prejudices. I decided to be a leader again, not a boss, and I actually waited with interest for her attitude. We performed the morning measurements and duties with dizzying speed. It has become our routine. Sad Smile was a great Medical Officer and I even wrote in my report "She is Best Medical Officer I have ever seen. I can see how She wants to do her job in Best way ". The Battery of Happiness once again expressed concern over her high blood pressure. All crew members were concerned about the condition of the Battery and were trying to help her somehow. I know it because in her report she wrote: "The team was helpful. Vice commander sent me an article about how to decrease blood pressure using home methods. And they were all understanding and helpful". Then it was time for my conversation with

the Ambitious Queen. We met at the gym, possibly the most "isolated" place from the rest of the crew in the habitat. Of course, everyone saw that we were having some serious conversation there, but they were kind enough not to disturb us. Admirable crew, I thought. The conversation turned out to be much simpler than I thought. In fact, it was even pleasant. The Ambitious Queen seemed to approach it with the same attitude as I did. We have explained to ourselves what we expect in a very substantive and kindly way. What is best for the success of the mission and crew and how we would like our cooperation to look like. The Queen also noticed that she may have moods because of her period. It's great that she is aware of this, I thought, I will try to help her, not add extra worries to her. I think it was the moment that the Queen realised that I was not her competitor, on the contrary, we were on the same page. But I understood that she is simply extremely ambitious and cannot be hidden that she is great at what she does. And the plan she wanted to manage is a plan for the implementation of a specific task. She also made me feel that she saw that I was great as a commander and she didn't need to deal with the whole day's plan and the problems of the rest of the crew. It was also the first time that I felt that she felt alienated by the rest of the ladies. Well, beautiful, smart and successful... probably the rest subconsciously envy her, I thought. The queen felt it too. Today I know that we were both wrong or the thinking of the rest of the ladies has changed over time. In the reports, the ladies wrote: "I think that the vice commander ran away from the group". Meanwhile, the Queen had her problems, which I began to notice. Today I know that this is how you get to know a person. Over time, all crew members learned about their strengths and weaknesses. We got respect for each other and, in some sense, we started to admire

each other. But that was not the moment yet. It took time ... the rest of the mission. We're only on the fourth day after all ...

This time we made breakfast a little celebration. Since the recipes completely didn't match the ingredients we had in the habitat, I let the crew enjoy the Nutella sandwiches. It definitely improved the morale of the whole team. As they wrote in their reports: "We really have problems with our diet. We didn't buy a lot of products which are in the recipe. We are able to make some tasty food but we do not know the amount of calories or distribution of nutritional values in a meal, to make our diet really be compared with other teams or be able to be used in university research. This is something for consideration". So we wrote to the MCC about diet-related issues and suspicions that we had the wrong recipe file. After breakfast, I met again alone (as far as possible in a cramped habitat) with Hot Blood to prepare the morning report for MCC. I have to admit that these meetings give me more and more joy and I think I notice that is true for her too. Could I sense a slight tension between us, or maybe I'm just telling myself. I decided not to think about it during the mission. As it turned out later, I was not far from the truth at all. Later on everyone started their job. Work on the satellite project was in full swing. Everyone knew what to do and I think most of us were satisfied. During the mission we were in isolation, although the ladies very often conducted various kinds of meetings and talks with the outside world. This disturbed our time-sense experiment a bit, but we tried not to pay attention to the hour outside. I had to be aware of it to remind the crew of their scheduled meetings. Hot Blood had the most of them. On that day, for example, there was her master's graduate ceremony. We immediately came up with ideas to participate in it as a crew. Her parents attended a ceremony at her college, her dad

was receiving her diploma. Hot Blood, on the other hand, was appearing on the large display. She was not the only graduate to attend the ceremony in this way. However, thanks to us, she was definitely the most special. They all appeared with a white walls in the background, while five analogue astronauts in blue suits stood behind her, expressing their approval with applause. I think both Hot Blood and the crew felt special. In the report she wrote: “it was my master's graduation, I was very happy because the whole crew accompanied me”. Another beautiful aspect of integration. Battery of Happiness also had an important meeting with teachers today. I was sorry because she was not satisfied with the attendance. I comforted her that unfortunately this is how it looks in our country. However, it is hard to compare several dozen participants to the hundreds of likes that Hot Blood collected under each photo, not to mention the thousands under the posts of the Ambitious Queen. It doesn't bother me anymore. I learned from running my own popular science website that science is always less attractive than simple entertainment, especially in this country. Forgive me if I offended someone, but these are the facts. I spent the rest of the day doing engineering. Together with the Teenager, we were building a third line of electrics and we dealt with maintaining the efficiency of sensors. Dinner was another festival of fun. Although we got a diet response from MCC, it didn't help us much as we got the information that the file was okay. It's a bit puzzling because there was clearly something wrong, but we decided we would try and do our best to stick to the diet. It cannot be denied that the Teenager and his passion for using microwaves and the difficulty of choosing the right food for him, amused everyone. Including himself. In addition, in the evening I had a great time with Hot Blood while feeding the fish. She taught me her



language and I taught her Polish. It was quite intimate until the rest of the crew joined us. Which was great fun too. Cultural exchange at the highest level. Learning several languages at once is great fun. It was a very important day for me when it comes to creating relationships in the crew. In the report, I wrote “I think something clicked today. Finally, I think that the crew just need more time to integrate. We are working together, eating together and laughing together. I don't consider it as my success but I am very happy”. The evening routine was as great as the morning routine. Yes, we were a crew on a mission in the full sense of the word. And there was evening and there was morning.

### **Day five**

That day just flew by, not only for me. Everyone mentioned it in their reports. I suspect it was because breakfast was almost an hour late. But what breakfast!!! The Battery of Happiness has made the truest pancakes, not some random mix of ingredients that usually fills our plates... science. Routine duties such as morning measurements, Circadian Rhythm, training, collecting food, water and urine data were a typical part of the day for us and we performed them mechanically and quickly. One could say that they didn't constitute any problem, and actually determined our daily cycle. Interestingly, the solar cycle is usually responsible for this. However, man is an interesting organism. Today, not only I noticed that we are already full-fledged crews. Battery of Happiness wrote in her report “The daily routine works for us, we take care of each other. We ask if everything is OK”. The first part of the day was mainly devoted to discussions and decisions regarding the

Hackathon, which has to take place the next day and the day after tomorrow. Participation in the Hackathon was a great idea proposed by the Sad Smile. However, I knew from reports that she didn't feel confident, although she did a great job. She wrote: "We then did the hackathon brainstorming. I failed so badly. I just don't know what to do to gain confidence. I wasn't in charge of anything". I decided to show her support, although today I know that I was afraid of being called sexist again, or to make her feel that I think she is weak. It was difficult for me and I don't think I did the best job of it. However, we exchanged the cockroach habitat together. No one else wanted to take this assignment with me, and Sad Smile seemed downright excited. I was glad to finally see a happy smile on her face. Unfortunately, I have to admit that I messed that up a bit, wanted to remain rational and refused her idea to put some simulated lunar regolith inside the cockroach box. "We changed the cockroaches' habitat!!! I wanted to use the Moon regolith to create the new habitat, but they wouldn't let me. I mean, I get why but it would have been fun to see what happened, because once we are up there we'll have to use regolith as soil", wrote Sad Smile. When I read it in the evening, I decided to redeem myself the next day.

The next part of the day I spent working on my contribution to the construction of the satellite, cleaning works, building the third power line and work related to the habitat. Due to the fact that as a commander I tried to help everybody and take part in everything, I was a bit behind with my own tasks, which I mentioned in the report, to reassure the MCC, which checked the progress of work both in reports and on cameras. When I started soldering, the entire crew showed an unexpected interest in this topic. First, the Sad Smile took a short

soldering lesson from me, and she was great at it. Then Battery of Happiness improvised a wonderful photo session of all crew members “during soldering”. It looked professional. Finally, the Hot Blood made me realise that I was poor at it and showed me how she did it hundreds of times. At least we all had a great time and learned something new. This is what these missions are all about. After dinner, Hot Blood told us her story which made everyone dumbfounded. I knew no one would take her lightly from that moment on. I myself was so impressed that I wondered if I had wasted the last 10 years of my life. As the ladies wrote in their reports, “Our communication officer is 26 years old and she was already scientist of the year in her country. She invented a sensor checking if the diaper is full and needs to be replaced. It's used now in hospitals. The profit from the patent is transferred mainly to a foundation for poor children, where she also conducts space classes for them. She made a huge impression on me. WOW ". I totally agree just WOW. In addition, I noticed in the personal report of Hot Blood that she called me "her partner". My guess is she meant mission partner, but she didn't call anyone else that. I decided to investigate the matter a bit more in the following days. I went to sleep full of hope and my report said “We are definitely a crew. I am calm about the rest of the Mission. Everybody knows what to do, help each other and are open, on that level”. I must admit that I fell asleep happily. And there was evening and there was morning.

### **Day six**

Hackathon, day one of two. The NASA Space App Challenge Hackathon dominated our day. We split into two groups. The first one,

which included Sad Smile, Battery of Happiness and Hot Blood, dealt with the so-called Case Study. The second group, which included me, the Ambitious Queen and the Teenager, was tasked with developing an innovative solution to the problem. The topic we selected was "Using Earth Observation Data". I was pleased with this topic because I myself had extensive experience in working with observation satellites (I participated in the design of the first Polish observation satellites). Moreover, satellites were the specialisation of the Ambitious Queen. So I believed that our chances were huge. After the morning brainstorming session, we agreed that we would propose a solution for Africa. It is a region that, despite its large natural resources, doesn't develop very dynamically. Thus, it was possible to find many branches of the economy where satellite data could be used. Moreover, the impact of our solution would affect a large group of people. These were the guidelines necessary to obtain a high score when evaluating the proposed solutions by the competition judges. Of course we wanted to win so we tried to meet the requirements very precisely. Sad Smile has already participated in the previous edition of this hackathon. Her knowledge and skills were extremely useful during this competition. But she herself didn't seem to notice it. As she wrote in her report, "The full day was dedicated to the hackathon. I also think that I didn't communicate well with the team. The communication officer didn't clearly understand what we had to do, and for sure it was because I couldn't explain well enough the challenge and scope of the project". But at the same time, she really wanted us to be successful. To quote "I think I've made the crew choose the wrong challenge in the hackathon. I feel we're going outside the purpose of our challenge, which in a way is great, cause the other guys developed an amazing project! I really

hope that we'll pass to the finals and the project receives an award". I really didn't want to disappoint her. During our work, we had a great time together with the Teenager and the Queen. I was afraid that because of our jokes we weren't trying hard enough and it might make Sad Smile sad. However, the Queen had an exceptionally good mood, I didn't want to stop it in any way. At the end of the day, I was hoping that we had managed to keep the balance between work and group integration. In my report, I wrote, "Today was a day fully dedicated to the hackathon. I think we are doing good but a little bit off track. Sad Smile is really worrying and I don't want to disappoint her. I think I have a nice idea and knowledge but I don't put enough work into the project. I need to do better tomorrow. It was a pretty good day in terms of crew relations. Ambitious Queen had a headache but she was laughing a lot with all of us and I think she had a pretty nice time. We probably joked half time and half time working. It seems like there is no more conflict between us ". I promised myself that the next day I would do my best.

As for the other events of the day, dead cockroach eggs and cheesecakes were definitely noteworthy. Let me start with this unpleasant situation. That day, we discovered that something new had appeared in the cockroach habitat. Strange white balls. Since our job was also to watch for new cockroaches to be born and then collect their mother's milk, we were very excited. Unfortunately, when we sent pictures of what we suspected were eggs to MCC, it turned out that they were actually eggs, albeit dead. It made us very sad. I was practically sure it was because of our interference with their habitat the previous day. We probably cleaned it too much and put the pregnant cockroach under too much

stress. It made me very sad. Not only me. Sad Smile in her report also mentioned it “Today, unfortunately, the pregnant cockroach had a miscarriage. I feel responsible because it happened right after we cleaned the habitat... The habitat had these really small white like parasites walking everywhere (even outside the box) and we wanted to get rid of them. We almost surely cleaned the habitat so that the cockroaches didn’t recognize it anymore”. I completely agreed with her. It's true that after the mission, PhD Agata explained to us that it's normal and that it often happens, but I felt guilty anyway. Now that we had killed the baby cockroaches anyway, I decided to at least rehabilitate myself in the eyes of Sad Smile after yesterday forbidding her from placing simulated lunar regolith in the cockroach habitat. We killed the children, what worse could have happened. It was probably too obvious a move, because Sad Smile that evening wrote in the report “This evening, we also added lunar regolith and mixed it with soil. Was weird because Greg called me, I thought to start preparing dinner, instead, he said to bring the regolith. He said that we’ll be putting a bit on a corner of the cockroaches' habitat to see what happens because when we go to the Moon, we’ll need to use regolith.... Weird because he basically said the same thing that I wrote yesterday... .. I hope he's not reading my reports ”... Yes, I read your reports, absolutely. I'm probably gonna be called sexist, but I'm used to it by now. I couldn't have done otherwise. Men, when a problem arises during this type of mission, talk about it directly. Sometimes they will say something inappropriate to each other, but at least the problem is known. The women, on the other hand, play the game. You never know if the problem has occurred or has been long forgotten, or if they just think it's on. My dear fellow crew members, without reading your personal reports every day, I wouldn't know what

you really feel, so I wouldn't be able to command you efficiently and effectively. Moreover, after the mission, PhD Agata admitted that all reports were available to everyone during the mission for this very reason and recommended reading them to those who had not yet done so. Uf, what a relief.

The last interesting event of the day was the cheesecake!!! But it is not possible to make cheesecake on a lunar mission? I thought so too. There was no oven in the habitat, the kitchen equipment was very modest, and the ingredients we had... I don't even want to recall. But Battery of Happiness turned out to be a real wizard in this matter. While I was doing my hour in the gym, she was baking. In glasses and steam, she managed to cook 6 portions of delicious cake. It tasted really good. We all asked about them because the Battery had promised a few days earlier that she would do something like that, but I thought she was joking. I was very impressed, and probably not only me. It had a great effect on the morale of the group on this hard day. I am not surprised that Battery of Happiness wrote in the report, "We have really little kitchen equipment, but I was able to make a cheesecake. Which everybody asked for and really likes :) I think I can cook tasty food in any place I am". It cannot be denied that she is right. The daily duties related to experiments and measurements were so learned that it can be said that they didn't interfere even in such a difficult task as NASA's Hackathon. We were already halfway through the mission, so during the evening debriefing, I proposed to the Ambitious Queen to switch her to the mission commander function which was promised on the first day. She firmly refused. I was eager to convey this position to her, but she clearly didn't want it. I mentioned this in my report "On

debriefing I propose the Vice Commander to be commander of the mission like I had promised, but she definitely refuses. I hope she was honest and this isn't the game". In the following days, I became convinced that it was not a game. And there was evening and there was morning.

### **Day seven**

Hackathon day two. This day was totally dominated by the NASA competition. Everybody worked at top speed until the very end. Everyone gave their best, did what they could and helped others. Battery of Happiness did a great job with the graphics that made our project much more professional. She also put a lot of work into the case study, which she prepared together with Hot Blood and Sad Smile. Hot Blood was great in raising the morale of the entire team and was invaluable in the computation and detail work with the Ambitious Queen. The Queen herself, despite her headaches, was of course invaluable in terms of the idea and its implementation. She asked me many times for my opinion and help, which I consider a great success. As I wrote in my report, "Vice Commander gives all that she can and she sums up the main idea. Of course she wanted to do even more ideas but she was asking me a lot and we decided to not overthink. If it is not just being nice to me, I think she finally sees me as a valuable person". Sad Smile, she probably also finally found her confidence. She was a great leader of the group and I could see that she liked it. Her reports show that she is very insecure about herself, while I notice that she shouldn't be at all. "The Medical Officer was very good at making



decisions and being in charge of the team. She was very polite and helpful. I hope we don't disappoint her... I was afraid of that. She is very delicate, "I wrote. But the Teenager, oh, it was interesting here. I watched his behaviour with great curiosity from a scientific point of view, of course. The closer we got to the end of time, the more stressed the crew was. However, everyone already has some learned defence systems in case of stress. The Teenager, however, we see evidence that he had not yet produced such. It wasn't just me who saw it, the reports said, citing "Poor Data Officer was too stressed. Hope he'll learn fast to deal with and find his stress-coping mechanism"; "We all were stressed in some moments, but Data Officer so far he has not appeared in such a situation many times. He has such a defence mechanism that he pretends that he was not stressed. But his voice betrayed everything. We talked about it later. We present to him our ways to cope with stress". It was interesting to watch how his stress level increased, as evidenced by the increasing timbre of his voice and increased nervousness. With Hot Blood, he was losing his patience at times. But this is where I always came in. I tried to calm down the atmosphere and make work comfortable for everyone. I also tried to participate in the tasks that each of them had. I think Hot Blood noticed my concern for her. I guess I'm doing it subconsciously.

Well, to sum up, we managed to submit all the documents on time. Sad Smile wrote: "We submitted on time, but very very very last minute! Could have gone better". The Ambitious Queen, of course, was not completely satisfied, because only the first place counts for her. Actually, for me too, whatever else is a failure. However, in this case, I was more interested in the interactions and the way the crew work as a

whole. I was really impressed. My personal report definitely revealed this - “We were the perfect crew. I was astonished. Now I can say that in this group there is more will of work and fight that the man group can have.... How fast opinions can change”. We were all tired because we were unable to lie down in the 15th hour since waking up almost every day. This time it was extremely hard and we went to sleep almost 18 hours after waking up. Even though we were tired, I think we were all proud of ourselves and the rest of the crew. Certainly me. We managed to get some really valuable work done for NASA's Hackathon and did all the daily chores and measurements. Respect. I am proud to be the commander of such a crew. In the meantime, we managed to observe something interesting, saying “I need to mention that me and the Vice Commander notice a lack of words and we think this is because of the higher level of CO<sub>2</sub> in our environment”. And there was evening and there was morning.

### **Day eight**

I had to catch up with my job that day. I spent a lot of time keeping my crew in good shape and working during the NASA hackathon. My report from the day before showed “I sacrifice my maintenance duties for the crew projects and I have a lot to do. For the crew the next two days will be nice adventures, for me it will be hard work”. I was right, the most stressful period of the mission began for me. I also got to know my crew members enough to start having concerns. In the evening I wrote: “I'm starting to think that I am not sure if I am a good enough commander for this crew. I think maybe ladies will actually prefer the

vice commander to be a commander. Am I good enough? But at least I know that I can be a leader in full meaning of that word. I wake up first, go to sleep last, cleaning always when I can and I serve for the good of my crew. I hope it isn't only my opinion". This is not all. Maybe it was the CO<sub>2</sub> level, or maybe it was my own complexes, but I felt kind of terrible, as reflected in the rest of my report. "When I am listening to my crew I start to feel bad... I start to think that I am nobody. I waste so much time. I did so much stupid things... mostly on purpose. I think I wasted most of my life and I will never be able to catch up. I wanted to make too many things at the same time. I own nothing and I achieve really nothing big. I know that thinking is caused by me but it isn't the first time and it is happening more and more often. The Communication Officer in age less than 25 years becomes a scientist of the Year. The Outreach Officer owns a flat already, working for ESA and she found love. The Medical Officer is constantly travelling around the world to take part in space conferences. About the Vice Commander I don't even wanna talk. Even Data Officer is on the start of the road and he is already an Analog Astronaut. I came here with nice confidence. I think I will go away thinking I am worthless. Only being a good Commander is making me happy. But I see mistakes and problems in that topic too". In retrospect, it was also due to the conditions of isolation itself. I also think I heard enough times on this mission that I was sexist, and that was killing me too. Luckily I'm not an easy person to break, so I put myself to work and chased the dark clouds away. What's more, the next few days have also shown me how valuable I am. It was a difficult path, but I thank fate that put in my path the people I met during this mission, even, and perhaps especially because, sometimes I felt worthless in comparison to them.

Returning, however, to the course of the day itself. The NASA competition was behind us. So everyone focused on the satellite project. This time Hot Blood turned out to be invaluable, as she was the only one who knew programming and electronics. She coped with all the tasks very well, I think she was aware of it herself. In the report, she wrote, “Most of the day we were working on the completion of the Cansat project, I was in charge of the electronic integration and providing the details and description of the OBC (On board Computer) and the main board (microcontroller). I am proud of that”. Something that broke the routine of the day was an internet failure. However, it was not a typical failure. Facebook has fallen on Earth. It can be said that it was a historic failure. Not only Facebook didn't work, but also instagram, whatsapp and many sites that were based on facebook servers. Even our internet provider has lost the ability to deliver its services. This paralysis affected us all, and it only caused me more stress. I shared my private internet package with the crew so that we can continue working on the satellite project. However, it was a significant inconvenience, but no one complained. Fortunately, I was able to finish the construction of the third electric line, and Teenager finished servicing the sensors, which he was supposed to do on my behalf. Catching up with my own work calmed me down a bit. While working, the Teenager also noticed an interesting thing. He noted in his report “Emergency light which we used in the sleeping module during building the third line of electricity, caused me a headache and eye sore”. As we later found out with the Ambitious Queen, the same is true for her headaches, which is why she enjoys working in her dark personal room so much. Another observation important to MCC. We

reported it. In the evening, however, we finally managed to make photo sessions using the ideas of Hot Blood. I'm sure she was happy with it because she wrote: "we finally took many photos and boomerangs, it was a time to laugh with the crew, the photos were made with apples hanging from the ceiling simulating microgravity. I have a lot of fun". The rest of the crew liked it too, "Then we took the famous microgravity picture and boomerangs. It was great, " they wrote. Sad Smile decided to take care of the cockroaches once again and save the algae colony. As she wrote, "I've added some soil to the cockroaches to mix it with the regolith soil. Now they seem to be more comfortable with their new house. Unfortunately, those small parasites are still there. We also saw the males fighting, or at least I think so. They were pushing their tails against each other, so without facing each other, which was weird and super funny at the same time. I'm really gonna miss those guys". The last task of the day was to draw Kepler's horoscopes. I'm not the type of person to believe such things, but we were on a Kepleria mission, named in honour of the famous astronomer Kepler, who made money by designing such horoscopes on a daily basis. So I took part in our workshop on this subject with a smile. The Battery of Happiness actually took care of their organisation and described them nicely: - "I found an app which helps us to create our Kepler's horoscopes. We create digital ones and then we make a small workshop to make one by hand. We had really good fun". After the last measurements, most of the crew went to sleep.

It was a surprise that for me it was not the end of the day. While feeding the fish, I got into conversation with the Ambitious Queen. It started out innocently at first, I wanted to show her support so I thanked her

for participating in all our activities despite the headache and period. The Queen herself apologised for not being as active as she would have liked. Our conversation quickly shifted to a different path. We talked for three hours in the gym about her life. The Queen was very open then and told me about the pressure she was under. Of course, I tried to cheer her up and prove to her how valuable a person she is. It seems to me that I succeeded because at the end she already mentioned her advantages by herself. However, she also told me about how difficult it was for her during the mission, because as I wrote at the beginning, she felt alienated by the rest of the ladies. She admitted reading their reports and felt attacked and misjudged. At that point, I was sure that it was not at all like the Queen was thinking. I believe I have convinced her as well. Although I see in her a great need to be appreciated (which I didn't consider to be a bad thing, because I also had such a need), I also saw how much work she has to put in to be in the place where she is and what a huge pressure is on her. It is interesting that although I struggled all day with similar thoughts about myself, I was able to comfort her. It was a very intimate and inspiring conversation that I wouldn't have expected at all. I think I acted like a real friend back then, though I can't be sure because since the Queen got her period, she stopped filling out the daily reports. So I wasn't sure what he really thought. Unfortunately, the most difficult day of the mission for each of us was still ahead. And there was evening and there was morning.

## Day nine

This day didn't start normally. We knew that at some point in the mission we could expect a simulation of an emergency. We had a lot of satellite and hackathon work, so I was very proud when the crew themselves suggested, the day before (on the eighth day), to review and discuss emergency procedures during breakfast. Thanks to this, I knew that they had not fallen into a routine and were constantly ready for action. I was proud again. Oh, how useful this exercise was this morning. Right before breakfast started, we got information about an emergency. A large group of micrometeors was approaching our station on the surface of the Moon. However, according to the procedures we studied, we remained calm. We turned off the working kitchen equipment and computers, and then went to the shelter in the bathroom. We received orders to place the entire crew (6 people, I remind you) in a steel protective chamber. I mean, in a bathtub that we couldn't use for the entire mission, but now it's made clear why it was in the habitat. It was actually hilarious. However, it was not the time to play. The next task was to change into white protective coveralls, which were placed in the bathroom. What a pity the ladies wore their underwear under their blue astronaut suits... yeah, yeah, I know I'm sexist, it doesn't bother me anymore. We completed this task very quickly. Now it was time to turn off unnecessary electrical appliances. I crawled to the gym modules to turn off the fuses, and the Ambitious Queen to the laboratory, turning off the lights and equipment. At that time, the Sad Smile would be in command if the MCC wanted to simulate the unconsciousness of me as commander or the Queen as vice commander. I felt we were prepared for anything. After our return to

the shelter, we waited for the "meteors to hit us" and were given further instructions. Take a picture of our veins on our hands to send to the MCC for a visual assessment of our condition. Then heart rate, blood pressure and temperature measurements. But the medical devices are in the kitchen module. Quick question for MCC and after a while I was crawling back to the kitchen modules for the apparatus. When I returned to the shelter, we quickly got on with the task. We have a hole in the habitat !!! We need gloves and goggles. Quick discussion and the Battery of Happiness was already heading with her face near the floor to the kitchen module, she knew where the necessary assortment was. When she came back it was time to fix the hole. Someone has to seal it. I went with Teenager to the lab. We quickly sealed the hole and sent the photo to MCC. The situation is under control, but the simulation isn't over. The next tasks flowed in quickly. The Queen will lead the people to the kitchen module. We need to measure the electromagnetic field and cosmic rays. We found the dosimeter efficiently, but the EM meter was nowhere to be found. While Hot Blood, the Queen, and the Battery were trying to figure out how to use the dosimeter, me and Sad Smile went to search the habitat to locate the EM meter. Of course, we all still moved in soldier-like style, crawling. It all took so long that Teenager had a nap on the floor. During an emergency!!! This is called trusting your own crew. Meanwhile, Hot Blood had pulled out her own dosimeter and we were able to send measurements of the kitchen module. MCC was not pleased. We got the dosimeter's manual ... in Polish and Russian. Crack! We didn't give up. When we managed to determine what indications we should look for ... the battery began to discharge. Fortunately, the EM indicator was successfully located in the meantime. Its battery was also running out. We split into groups and



finally started sending measurements from individual modules. One second before turning off the dosimeter, we were able to read the last measurement. "Safe environment" was the message from the MCC. We were able to walk normally, turn on the lights and appliances. It was the end of the emergency simulation. Admittedly, it was a very learning experience. It has revived us all. After all, when we sat down to a late breakfast, we received a report. The entire simulation took us 1h 42 minutes. If there weren't any problems with measuring devices, we were faster. At the time, it seemed to me that it took too long. Today I know that we were one of the fastest crews.

The rest of the day wasn't any easier. We put all the crew members to work on completing the satellite project. The Queen has finalised an article for publication, summarising our work. Hot Blood, on the other hand, took care of the equipment. I think we can agree that it worked. MCC, on the other hand, didn't give us peace. As Agata herself told us after we left the habitat, he tried to piss us off at all costs. In my case, she succeeded a little. She gave us more tasks while I still had an inventory of the entire habitat to do. The crew noticed my irritation because I refused to conduct an experiment called Space Dragon by the crew. It consisted of drawing your own hand on a piece of paper. What we drew inside was supposed to reflect our internal state, what outside the outline was supposed to reflect the outside world. I knew from experience from the previous mission that this is an unnecessary experiment that has to be performed during simulated missions, precisely to irritate us. But the MCC insisted it was one of NASA's tests... Nice fake. During lunch, seeing that I was under pressure, the crew interviewed me. I explained to them how much work still had to

be done, and they decided to help me. As they wrote later in their reports, “The 8th day was also tense because the commander was really worried to let down Agata and Matt if he wouldn’t have finished all the tasks. I wish, like the rest of the crew, that he would have told us since the start of the mission that we had to clean up the habitat, all of it, because in this way we could have done a section each day and no one would have been stressed. He was a great captain, but he was so concerned with us that he forgot himself. He should have trusted us more with this, we could have managed both our projects and helped him with cleaning up ”; “We got information from MCC about instructions to do the SMT test. Greg was unhappy about this idea. We didn’t understand why. He presents his point of view, that he still has a lot of work. He has a lot of projects with maintenance, cleaning and organising habitat. We decided to help him with part of the tasks”. I have to admit it was stressful for me. I felt that I had disappointed my crew because, like the Queen, I was only 100% interested in doing the job. Everything else was a failure. In retrospect, I can see that we were the crew and the fact that they decided to solve my problem and didn't leave me alone was the best that could have happened. This is how the crew should act. We shared tasks and we got clean-up work very quickly. Then it was time to do a small AATC museum inside the habitat. The Sad Smile designed it, and I did the physical work of placing the exhibits on the wall. It looked spectacular.

In the evening we were supposed to start a real psychological test of astronauts and the Space Dragon. However, another unexpected situation delayed us. Nothing to dwell on, but I think we managed to cope with the entire crew. As Battery of Happiness wrote: “Vice

Commander broke up with her fiancé and she is very upset. We tried to make her feel better but in this situation it was difficult to do something. So we listen to her, show that we will help and we are supportive. Then we gave her some space". I felt very sorry for her. Period, headaches, and now this. By the way, I had a pure disgust with her boyfriend for doing it at that moment, on the phone, while she was in isolation. What an asshole! It was a really tough mission for the Ambitious Queen, and I am delighted that she just didn't open the door and stop the simulation. In the meantime, I managed to complete the last task, i.e. building a new door to the bedroom module. Of course, the crew was helping me. The idea of the solution was the Teenager idea, which he didn't forget to put in his report "building a door according to my idea was very satisfying". I'm glad we managed to finish everything. Already in the 16th hour of the mission, we did the astronaut test. There was a lot of counting and psychological plays, but I didn't do this test for the first time. Besides, not only me. Hot Blood was also a pilot like me, so we basically blew this test. The rest of the crew didn't do any worse. Finally, we drew that stupid Space Dragon. It cannot be denied that it was also an interesting integration and the rest of the crew liked it. Because they wrote: "The SMT test was interesting, long but interesting. I enjoy doing exercises but I was extremely tired. We did it at around 3 am. I'm proud I was able to remember quite a lot of things at such a late hour. We did a Space Dragon and it was a nice project to do". At 19 hours on the 9th day of missions, we were able to go to sleep. It's probably been 4 or 5 days in a row when I slept less than 2 hours. Well, it's a mission, after all. And I wasn't the only one exhausted. And there was evening and there was morning.

## Day ten

Day of departure. Even though we were all sleepy, the atmosphere in the habitat was great. Today we were to finish the main part of the mission and leave this extraordinary place. Recent urine samples collected, data complete, breakfast eaten. Medical measurements were a piece of cake. Everything worked like clockwork and the mission tasks were completed. I was happy. From the morning we were shooting videos presenting the experiments and what we managed to achieve during the mission. Battery of Happiness recorded interviews with all of us as part of her personal project. Together with Hot Blood, I caught fish from the aquarium to take them to the MCC headquarters. Others were cleaning up. Around noon, the AATC "Trapezov" space shuttle was supposed to arrive for us. In the meantime, the last talks took place. For example, Hot Blood talked to the president of her country... Yes, we found it amazing too. We waited impatiently. Everyone was smiling and probably proud that we managed to survive this wonderful mission. On the other hand, we talked about how quickly the time in the habitat has passed and that we will miss this place and its unique atmosphere. It's true that it was not the end of the mission for us, but we were happy that we would be able to get out of here, and at the same time we were sad. In their reports, the crew wrote: "Finally, i'm gonna miss the habitat, the crew, this place is nice is where time pass very fast, i'm really grateful for staying here, i don't have words to describe all the amazing things we did during these two weeks"; "We are happily out (hope the cockroaches survive even with no water for 1 weeks) and I can't wait to write to you again in the future from the new habitat, my dairy". I didn't pour water into the cockroach's habitat ... I thought they

didn't drink ... or something. In any case, Matt finally came for us. We solemnly opened the door. It felt like I had just shut them down the day before. Green grass, blue skies, clean and, most importantly, fresh mountain air. It was great. We received certificates, took souvenir photos and started packing. This time I didn't leave the habitat with such nostalgia as the first time, because I knew that servicing it would become my job after the mission. However, I observed the sad and at the same time joyful gaze of my crew. We even found time to sit on the rocking bench in front of the habitat. Hot Blood pressed against my shoulder. Though I didn't have much time to develop our relationship in isolation in recent days, I felt she was close to me. Wonderful day.

And that would be it for bitter memories. The mission was on and the schedule was very tight. Straight from the habitat we went to the building site of habitat 2.0, where real astronauts will also train. Then we were transported to the Queen Jadwiga Astronomical Observatory, where we were able to climb the radio telescope tower and talk to its owner and initiator of the construction of the observatory. From the top of the tower, with the canopy of the radio telescope above us, we could see the Tatra Mountains. The weather was good for us, but there was no time to enjoy the views. We had to return to Kraków quickly, because today we had theoretical training, and tomorrow we were to start diving. On the way to Kraków, most of the crew fell asleep. Meanwhile, me and Battery of Happiness spoke to AATC President Matt about the future. Unfortunately, PhD Agata could not pick us up because she was in Germany at the ESA centre at the second stage of recruitment for an astronaut. We couldn't wait for her to come back and tell us how it was. After reaching Kraków, we were finally able to take a

shower. It was as pleasant as the fresh air when the habitat was opened. Then, until late at night, Matt taught us the theory of diving. Even though we were all super tired, we held on bravely. And there was evening and there was morning.

### **Day eleven**

Though we had left the habitat, the mission continued. I was still the commander and this was what the MCC required of me. So I was now in charge of administrative matters and crew discipline. Likewise, the entire crew also adhered to the rigour of the mission. Wake up in the morning and go straight to Warsaw. On the way, I was sitting next to Hot Blood and I admit that I flirted, and she obviously did too. Our diving course was to take place in the deepest swimming pool in the world. For a few months at least, until Dubai got jealous. In any case, Deepspot was a multilevel diving simulator. This name isn't an exaggeration. The pool looked quite ordinary from the water level. One could even say, modestly. All the fun started below. Many platforms located at different levels, a ship sunk at a depth of 20m, tunnels and caves with artificial stalactites, stalagmites and underwater sculptures straight from the movie "Prometheus". And the cherry on top, which is 45 metres deep. It was really impressive. Not all of the crew were on the same level. Sad Smile already had Advanced Open Water Diver training, so she got her own instructor and trained in freediving. The Teenager had an Open Water Diver course, so Matt was training to Advance level with him. Me, Hot Blood, The Ambitious Queen and Battery of Happiness were newbies and trained to the Open Water Diver level. When the time came, we quickly got our equipment ready,

got dressed and jumped into the pool. I remember my first breath under the water. It was something special. It's impossible to describe it completely, you have to try it yourself. However, I can say that it is quite an unnatural feeling, but very pleasant for someone who likes extreme sports. As the first one I was taken by Matt on a little tour around the pool. It was the only nice part of my first dive. When we started the exercises, it was not so colourful. I remember that I was aware that I could die literally every second. When we started practising with the mask, I admit I was afraid. However, I jumped with a parachute, I was in a hyperbaric chamber, I passed tests in an overload centrifuge and made an emergency landing with a broken aeroplane. I knew fear was in my head and I knew how to overcome it. It's true, however, the first lesson of diving seemed to me to be more terrible than skydiving. In the air, you are seconds away from death, you do not have such comfort under water, you do not have even those seconds. But I wanted to be the best, of course.

The next lessons came easier. Even so, at the end of the day, I was not at all satisfied with myself, and found no pleasure in diving. It worried me. But I saw that other crew members also have problems. Hot Blood was doing the best at this point, but it was not her first dive in life, unlike the other three of us. However, I liked the support we gave each other. We were a real crew. We took care of ourselves and tried to help each other. On that first day of training, I noticed that all our worries seemed to stay in the habitat. Nobody felt sorry for anyone anymore, we didn't feel alienated, and we all really liked each other. We all had some problems, but that was the training and we were there to learn. The Queen's ear hurt, the Battery had a problem with exercising without a

mask, and I didn't feel the pleasure of swimming and had a toothache. But we supported each other and no one was going to quit. After diving, we had a great time together during theoretical training, which only confirmed this belief. Again I was very proud to be the commander of this crew, that I met such wonderful people and I could learn from them, and they from me. Exhausted, we went to bed very late. I fell asleep hoping that tomorrow I would find pleasure in diving. And there was evening and there was morning.

### **Day twelve**

I was not mistaken. I was doing much better that day. We also trained more complex underwater activities. I was glad when instructor Matt selected me to show new assignments. I loved the task of strapping the unbuckled cylinder to my dive buddy. I didn't like mask classes because I have always swam underwater with my nose closed. Now, in less than an hour, I had to learn not only to swim with an open nose and the water inside it, but also how to breathe without choking on the water, how to pour water into the mask and release it, and how to remove and put on the mask while underwater. We also learned how to react in emergency situations. How to donate a spare breathing apparatus to our colleague and how to use it yourself. Then it was time to go deeper. I felt confident now and saw that I was doing very well. The Queen didn't participate in the last dive with us due to her ear problems. However, we were not going to leave her. The three of us were getting ready to descend into deeper water. First, however, we trained for an emergency ascent. I was able to swim 9 metres continuously exhaling



for the second time. Again, I thought I had to be the best, and when my lungs started running out of air, I continued to keep pumping out the remnants of it. Managed to. After some time, all three of us mastered this exercise and could go lower. It was then when it enlightened me, I saw the beauty in this sport and I just wanted to go deeper and farther. The last assignments were pure pleasure. I was great at buoyancy control and Hot Blood was a master of underwater flips. This training was the next step in my professional career. I could feel it. Ultimately, me and Hot Blood were the first to finish the training. Battery of Happiness was given an extra hour to exercise with a mask. After leaving the pool with Hot Blood we went to the Queen. We quickly persuaded her to return to the pool, and we went for a well-deserved rest.

I was able to get us a room at the Deepspot hotel with windows below the water level. It's true that the ladies spent the night there, but have already checked out. However, I decided to celebrate with Hot Blood the end of the training and, in fact, the mission. I have very pleasant memories of that hour bathed in the azure light cast by the pool water. I hope she does too. When everyone officially completed the training, we were able to eat and return to Kraków, for the official end of the mission, where PhD Agata was waiting for us. The road passed quickly, I had interesting conversations again with Hot Blood nestled in my arms. In the evening it was time for mission debriefing. It was not an easy task. We had to collect and process all the data collected during the mission. We found out how much water we used, both individually and as a whole crew. The same was true for the amount of urine, used wet wipes, absorbed calories, and kilometres on the treadmill. We also

finally learned what our diet problem was. It was a test!!! We were specially given ingredients incompatible with the diet to test our creativity and ability to use and manage the available resources. If I had known sooner, we would have eaten more Nutella. It was another long day. I was exhausted but happy as ever. And there was evening and there was morning.

### **Day thirteen**

We officially completed the mission with its debriefing. This day was meant for us. We had no responsibilities anymore, we knew each other well and wanted to enjoy our company in a simple human way, without cameras, guidelines or pressure. In fact, it was a bit weird. I was wondering if someone would take off their professional mask and let themselves fly away. It was different. I knew the weaknesses of these people, I also knew their strengths. How they behaved in the normal world, however, didn't always correlate with how I knew them. To be honest, I thought then that we wear masks every day. During missions, in isolation, when life's problems disappear behind closed doors, and all we can focus on is here and now, we reveal our true faces. Anyway, we spent the day exploring beautiful Kraków. We all felt this nostalgia and the approaching moment of saying goodbye. We visited the beautiful market square, we ate Polish donuts, we looked at the Wawel castle. At the right time, we took our foreign friends for a typical Polish lunch. Pork chops and de volaille with potatoes evidently were liked by everyone. We ended the day with a boozy party.

Here I must admit that it was not easy for me as a male again. Unfortunately, the Teenager left us that evening. The goodbye was warm. Matt went to the USA that day for training. I was the only man in the house. Moreover, the first crew member of the next mission has already arrived. Also a lady from Cyprus. Oh, all the ladies, staring at PhD Agata, messing with them after a few deeper ones, it was quite a peculiar sight. How many times have I heard that I am sexist? Probably twice as many times as during the mission. I knew, however, that Agata examined them with her psychologist's senses, but I would work with her and become her employee, and they, my ladies, had to show themselves in a situation of alcohol intoxication. Well welcome to Poland. I endured all the reproaches with dignity, even though I was on the verge of endurance. We also tried to upset our new friend by telling her, for example, that she would have to eat cockroaches that Agata kept in the kitchen and which the Cypriot girl was very afraid of. The ladies didn't mention that during the mission only Sad Smile was not afraid to touch them. Ultimately, however, I can say that it was a nice party and a good farewell. I don't even know how late it was when we went to sleep. But I do know that we were all in a bubbly mood. And there was evening and there was morning.

### **Day fourteen**

The last one. I woke up at four in the morning to carry bags and say goodbye to the Ambitious Queen. No, calling me a sexist didn't kill my gentleman's spirit, although it did change it significantly. Our goodbye was quite chilly, but it was the fault of a hangover. I know I valued her

and she valued me to some extent, at least for a man. Then I went back to sleep. Around noon we said goodbye to the Battery of Happiness. It was a warm goodbye. I saw that she was glad to be returning to her husband. I spent the rest of the day with Hot Blood, making another trip around Kraków, this time to show the city to a Cyprus girl. In the evening I went to the airport with Hot Blood to do a COVID test for her and say goodbye to Sad Smile. In the eyes of the Smile I saw a real regret at the end of the mission. It was, however, a different sadness than I have been noticing through the whole mission. I think she has gained self-confidence. After returning to the MCC office, there was one final assignment for me and for Hot Blood.

A new crew has arrived. Their mission was to begin the next day. They were on day zero. Day zero of our mission seemed very distant both to me and to Hot Blood. As if years have passed, and certainly so much has changed in my relationship with the crew of the Kepleria mission. During the orienteering running of the Yuriya mission, in which I participated with Hot Blood as a rear protection, I felt a great sadness. I didn't really want this to end. I already missed the inexhaustible ocean of positive energy and the goodness of the Battery of Happiness, the wonderful approach to life and the joy of experiencing a Sad Smile, the youthful attitude and creativity of a Teenager, finally the ambition and steadfastness of the Ambitious Queen, and even, although I still had her with me, I missed warmth, kindness, empathy and the wisdom of Hot Blood. In this run, I was the closest to crying from a very long time. I got to know these people very deeply and I really missed them. I spent the night talking with Hot Blood about our common future. In the

morning she flew back to her country. It was the real end of the mission for me.

To sum up. I am surprised. This is not how I imagined the mission. I've participated in one before, but this one was exceptional. I experienced the full emotional spectrum. The habitat has stripped me, stripped me before myself. Although I knew myself, I proved myself during this mission. Ultimately, I am happy with myself. Unfortunately, after leaving, we were no longer obliged to write daily personnel reports, so I can only speak for myself. I don't know what my crew really thinks anymore. It seems to me that I didn't mess up. The mission was a complete success. We survived 10 days in isolation, we all completed our diving training, we designed the satellite that we plan to send into the stratosphere from Antarctica, we took part in the NASA Space App Challenge Hackathon and we were nominated for the world rank, we collected several hundred gigabytes of scientific data, we got to know our friends and ourselves, we acquired new skills and tested ourselves in conditions where most of the people would never find themselves, we became Analog Astronauts. Has it changed our thinking... I'm sure it has, to some extent, all of us, yes. As Matt told us after the mission: "You know. People think they know, and YOU know. You know what it's like to stay isolated, what will be like to go into space, what you'll have to face. And you know you can do it". Really. I heard the same thing from psychologists after the emergency landing. That I know I won't panic in an emergency. Now I also knew that I would survive in the space mission and I also knew that I would prove myself as a commander. There was nothing else left for me at this point to thank both PhD Agata and MSc Matt from the Analog Astronaut Training

Center, for the opportunity to participate in such a great mission. Above all, however, I must thank my squad, the crew of the Kepleria mission, and in particular the ladies, for enduring themselves with a sexist as their commander. Per Aspera ad Astra or through hardships to the Stars ... and see you crew, I would even fly with you into space. Oh, and special thanks to Jan (Agata's son) who wanted me to write this sentence...

## *16. In short*

*Jan Kołodziejczyk, Poland*

*Exp. 47 Junior Space Camp*

*27 Jul-3 Aug 2022*

When I arrived at my Mom's habitat I was wondering how it's going to be inside there with all of the new people I met. At first glance the habitat looked like an ordinary countryside hut which made me kind of disappointed, but when the doors opened I was shocked by the amount of professional equipment in there. I felt like everything from the outer world popped out of existence the very same moment I closed the door: sound, smell, sunlight everything.

After we got instructed by MCC on how to use everything, we spent some time getting to know each other and since it was only us and the habitat for the next few days I think it was wise to make friends from the people you are working with. And in case you are an antisocial person and don't want to actively participate in the integration process,

you can't get out of this place without new bonds. For example I even now, after half a year, am actively talking with my other crew members across the globe. If you seek interesting people or access to lots of scientific equipment, or even just to have fun completing a bunch of practical experiments, you couldn't find a better place than a confined space such as the habitat.

## *17. Hydroponics*

*Marcin Matczak, Poland*

*Exp.33 Da Vinci*

*29 Jul - 12 Aug 2021*

Many people wrote about what living in a habitat looks like, so I want to show how it was for me from a creativity point of view.

Our mission was scheduled to last 14 days, however my mission started way before the official launch and took about 3 months. As a space engineer my main objective was to maintain operational readiness of all equipment necessary in our missions (and if needed, come up with new ideas in case something broke down). I was also given a creative task: to design a hydroponic system for the habitat (or rather a proof of concept - POC). I could use the 3D printer that was onboard. There are many existing designs and solutions. However I decided to challenge myself and design my own system because where is fun in recreating something that was already done? I set myself some goals and design points:

- **To use as few external mechanisms or parts as possible.** It ensures that if something breaks, it can be repaired using stuff from the habitat (or just be reprinted).
- **To design everything from scratch.** (That includes mechanisms like locks, hinges, etc.) To reignite my creativity and for pure fun of discovering solutions.
- **To make the system modular.** As needs grow so has the hydroponic system. It also seemed beneficial to grow more than one plant type using the same system and various plants might have different needs.
- **To try and make everything print without support.** In order to minimise material waste.

And so I started a task much more complicated than I initially thought. I designed the first prototype in Blender. Just to block it out, see how much space it will take, what components I would need. I was not concerned about execution (how to print it, how to connect the parts, how exactly they function) at this point. I needed to understand what I wanted to design, what I needed to design (in terms of parts and their roles), what was the big picture: how the subsystems relate to each other and how to make the whole thing functional. That part of the process is called **validation**. I also had to do extensive research because I had to provide the list of necessary equipment and parts before I even designed the whole thing. I also took advantage of the Blender's renderer to make sure that the system looks presentable and is not just a big, ugly chunk of plastic.



After presenting my idea to Mission Control it got rejected. Duh - the first idea is never the best idea (and I ought to rediscover this truism again and again over the course of upcoming months). I made some tweaks, got my approval and got to the main question: "how do I build it?".

Still in Blender, I experimented with various ways of connecting pipes and elements together. I needed to iterate fast over many different approaches and having the ability to easily modify the geometry was a great decision. Once one goes to CAD software, testing out weird ideas does not go so smoothly. At this stage I also started considering **if** the geometry I design even **can** be 3D printed (since the positioning and angles matter). Another important factor was how not to waste too much plastic.

The most interesting challenge I was facing at this point was how to make connections between modules watertight. The principle was known for ages: just use a washer and squeeze elements into each other. The struggle was how to do it without using threads, bolts, screws, etc. and still maintain rigidity of the connected elements. I've come up with a reasonable prototype after ten or so iterations. I was also working up concepts for hinges and interlocking mechanisms. When the concepts were **verified** I moved on to the next, equally challenging phase.

I started moving my ideas one by one to Onshape, carefully designing each element based on what I've learned in the previous stages. Frankly, none of the final designs matched its prototype. And it is a good thing! I found many ways to improve every single thing I prototyped. Many times I was astonished how I overcomplicated things or just how plain stupid I was to think "that would work". If only

all engineers would do this, our technology would be much more useful. Few designs I found interesting were:

### *Hinges*

This was an easy task, kind of like a warmup. A solution turned out to be simple: a cylindrical shape that can rotate freely inside a dedicated groove and another shape that won't rotate inside a dedicated hole. Separating the pieces let me print everything without supports and with a lid lying on the bed (to have a nice and smooth wall).

### *Locks*

Having a hinged door I needed a way to make it stay in place when closed. It was meant to be a maintenance hatch, so it would be rarely opened so a mechanism that would work with some common tool would be enough. The coin was too big, but a flathead screwdriver did the trick. I used an idea of a bolt lock, and worked my way to make it a single part and rotating. There is a trapezoidal (not square - because of the 3D printing technology) extrusion around a cylinder that goes inside of the groove in a main part body. Part of it is removed, so that when positioned right, none of the ridge would be inside the groove, making it possible to open the lock. The cylindrical part sits in the housing thanks to a tight fitting, not only holding it in place but also allows precise positioning when the lock is turned.

### *Watertight Connections*

That was the most challenging part. I needed (preferably a

one-fits-all solution) a way to connect different parts together. The final version is shown in figure.

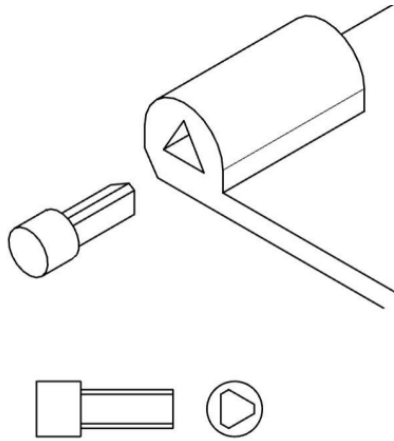
I was blindly trying to make the connecting mechanism keep the rigidity of the structure (to avoid a situation where it simply breaks because of the weight of the plants). Only after a shameful amount of time did I realise that those are two separate functions that separate objects may take care of. To make the construction stiff, all it took was 8 holes and 4 pegs. With them, two connected elements could only move in one direction related to each other - forwards/backwards. Which happened to be the exact axis I needed to apply a tension in order for a washer to work. From that point, the task was easy. After several adjustments I designed a clip system that holds the two pieces together and pushes one into the other. With a washer between them - it becomes both watertight and rigid. At this point it was **only a design**. I came up with two other ideas as a backup plan - which also took some time.

Just a few days after I finally finished designing all the elements a mission has started. I was very proud of myself and confident of my ideas, so the reality struck quite hard. It took me no more than 3 prints to realise the design process was not over yet. With limited material I needed to squeeze out the most from my failures. The most important finding was quite obvious and almost 90% true: you can always remove some material, but you cannot add it (at least with the printer I had at my disposal). So the first order of business was to make all fittings tighter, so I can sand the material if I needed more freeplay. The more parts I printed the more parts I needed to adjust or redesign. I really needed to get to the next level of time management. So almost the entirety of my time (including free time) consisted of a mixture of duty

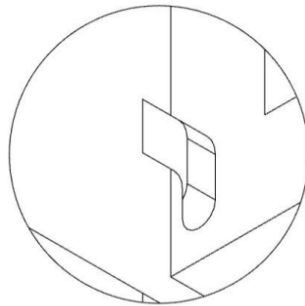
responsibilities, assembling, experimenting with assemblies/test parts and redesigning. All laced with making prints.

Fortunately, I managed to complete the task even though I had no previous experience in 3D printing. Overall I needed to reprint only 2 parts. Rest of the mistakes were fixable - either by adjusting other (not yet printed) parts or by using tools. By accident, I discovered that in some cases it is possible to add some material to the prints. I was using Acetone to smooth the surface of certain ABS parts. I left one small part overnight (because it was not smoothing as fast as others) only to discover in the morning it turned into a pulp. However, for a minute after being removed from the container this pulp was plastic enough to mould and was very adhesive to ABS. So I used it to make some parts more functional.

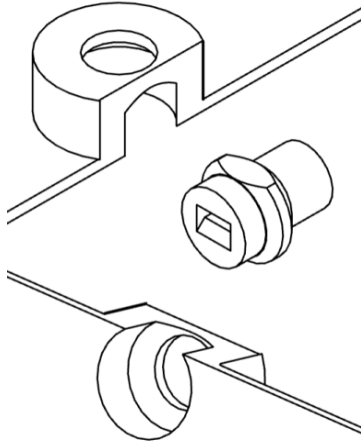
There were many more little ups and downs, too boring to be writing about. But what is important here is that even a simple project may become really complicated once it comes to turning ideas into actual objects. Overall I have learned a lot, especially how to improvise and come with working solutions having limited resources. I totally recommend that experience to anyone who would dare to say: "I am creative enough, I am full of ideas, I'm ready for a challenge. Now bring it on!".



Simple 2-pieces hinge design.



Groove in the main body, where the hinge can be inserted and freely rotated.



Rotating bolt and its housing in the lid.

## *18. Mathematician*

*José David Villanueva, Spain*

*Exp.31 Solaris*

*10-17 Jul 2021*

At the very beginning, I was very surprised when AATC selected me to be part of the Solaris mission. I thought that I was “too old” for that kind of adventure, and more importantly, I was going to be the Mission Commander. I conveyed this to my PhD. Agata. Although I had vast experience managing projects in the space sector, I had not participated

in any analog mission until now, much less as mission commander. Besides, as a mathematician, I did not have any specific experiment to carry out, although my skills were quite useful working on some random events over the mission and for writing my manuscript, which I will describe in the following chapters.

To Summarise, I had a significant experience working on space projects, even on real Mission Control Centers (MCCs) for some European Space Agency missions, but I needed to catch up on Analog Missions, at least, theoretically. And, as I suspected, it was quite different to manage a team in the frame of the space industry than commanding a space crew in very hard environment conditions.

I knew the crew members in a couple of virtual meetings, some of them with experience in others analog missions. They came from the United States, Switzerland and Kuwait. The main purpose of the mission was to perform chronobiologic studies and subjective time perception experiments under isolation. Besides, we were going to perform a large amount of astrobiological projects onboard, a large number of various species of animals, plants, bacteria and algae. It looked quite thrilling and challenging.

I arrived at the Analog Astronaut Training Center in Kraków, where I met PhD. Agata the first time in person. Also, I met part of the crew, and our first task was to prepare our flight suits and designate the mission duties, when I was designated Mission Commander officially. For one member of the crew, it was quite challenging to arrive at the Analog Astronaut Training Center from the United States due to some severe storms. Definitely, this mission was an adventure from the very beginning!

Please, let me introduce the mission crew:

**Commander:** Jose David Villanueva Garcia, from Spain. Bachelor in Computer Science, Bachelor in Mathematics, MSc in Mathematics and PhD. Student researching in Mathematics and Physics with more than 20 years of experience working in the space sector.

**Astrobiologist:** Aidyl Gonzalez-Serricchio, from the United States. Bachelor of Science in Molecular Biology, Cum Laude. She got her PhD. In Molecular Genetics in the California Institute of Technology. Energetic and collaborative initiator successfully delivers on organisational objectives directed at inclusion and social justice. Skilled manager ready to create strategies, establish best practices, and implement DEI and Social Justice Goals in STEAM.

**Communication Officer:** Ghahim Alotaibi, from Kuwait. Oil Industry, Solar Energy, Astronomy and Space Sciences seem to be unconnected areas. However, Ghanim Alotaibi is an active mechanical engineer who has various projects and activities on the previously mentioned topics. Since 2009, he has worked with various groups and teams in Kuwait Oil Company. This gave Ghanim the opportunity to gain some knowledge about everything in the oil industry, from exploration to exportation with a deeper knowledge in slickline and surface well testing operations. Heavy Oil Development, Minagish Reservoir Development and Well Surveillance operation are the main activities performed during the last 4 years. Also, Ghanim has experience with the job distribution model (including market share) for KOC business partners. The most exciting of all, is the field touring all over Kuwait deserts. Far away from the Energy Sector, Ghanim Alotaibi is an amateur astronomer with serious scientific activities. With his 8" Schmidt Cassegrain Telescope and his StarShoot CCD camera, he is currently observing Variables Stars to plot their light curves from the Kuwait sky. Astrophotography and



Visual Double Stars are other topics of interest. Since 2008, Ghanim has been a lecturer in topics related to space science in the Department of Astronomy and Space Science – Kuwait Science Club. These amateur level lectures, the diploma course earned by the International Space University and the role of National Point of Contact for the Space Generation Advisory Council, gave Ghanim a general overview about the space industry. This analog mission will be the third one for him.

**Crew medical Officer:** Simon Joel Kälin, from Switzerland. He is a student from Switzerland and he loves being involved in space sciences, biomedical, neuroscience and extreme environment research. Besides his education, he does firefighting, SCUBA & freediving, and he is a Swiss Army sergeant specialised in finding and sampling CBRN weapons (Chemical, Biological, Radiological and Nuclear Weapons) in hazardous environments.

In the Mission Control Center, of course **PhD. Agata** and:

**Jas Purewal:** Master of Science in Physics with Astrophysics. Passionate about Space, adventurous travel, nature, animals and being active, either by playing sport, hiking or learning something practical such as scuba diving. Over 15 years of experience working in research on multiple projects both in the UK and US. Many design challenges have required being part of diverse teams of varying sizes and also working independently, both of which I have adapted to and enjoyed. Motivated by novelty, helping others and learning new things.

**Vatasta Koul:** Bachelor of Technology – B Tech Aerospace Engineering with Splz. in Avionics. She worked in NASA as a citizen scientist for the International Astronomical Search Campaign- Target Asteroids/Target NEOs asteroid measuring campaign and she is member of The Mars Society.

For the Solaris mission, one of the critical mission experiments was the Subjective Time Perception. The aim of this study was to analyse effects of modified circadian rhythms on subjective time perception in humans isolated from the natural environment. The tested hypothesis is an assumption that isolated conditions can support learning processes in precise time estimations because of lack of external stimuli which may overlap with brain temporal processing. The participant started to monitor activity and sleep hours one week prior to the mission by performing a measurement of subjective time perception (STP test), using a specific application just after waking up and just before going to sleep. During all the time of the experiment: before the mission, during and after the mission, the participant was not allowed to consume caffeine. Subjective time perception training was conducted during a 1/2-week mission inside the mobile research station for space mission simulations. The participant performed the same STP tests at the same time points, with the only difference that at the end of the test participant received feedback on the computer screen to be able to correct performance during the next test trial. Because of lack of natural light, there was a modulation of circadian rhythms similarly as it is on board the International Space Station. Analog astronauts were exposed to the automated background lighting and schedule developed by the Mission Control Center. At this time, mission participants could feel jet lag, which was verified by a psychologist's questionnaire. After completing the mission, the participants performed the STP test for another week, without receiving the feedback.

The results of the study will support the treatment through the use of non-invasive light therapy of jet lag and sleep disorders caused by the desynchronization of the biological clock. In addition, research will bring a deeper understanding of time awareness in humans.

Subjective time perception is one of the very important factors astronauts should train before missions in space, where they rely only on digital clocks and scheduling. Subjective time perception can play a crucial role in behavioural performance and life safety, especially during very long duration episodes accompanying such missions, where boredom and monotony is likely to occur, or in case of technical failures. Subjective time perception implies connection to cognitive functions, attention, memory and awareness, but little is known about connections with homeostatic states of the body coordinated by circadian clock and interpersonal relations.

Another experiment was the psychosocial dynamics over the period of the Lunar Expedition Objectives. Since courageous future projects of human space exploration such are: Moon Village, manned missions to Mars, or near asteroid exploration are planned, research on psychosocial aspects of a crew is becoming an increasingly important issue that requires great attention. Cohabitation in extreme conditions means many challenges and risks for humans. Monitoring of psychosocial aspects and psychological support needs to be provided. Humans' behaviour is relatively unpredictable, driven by various needs and motivations. Any failure may be disastrous, even fatal. To prevent potential conflicts and failures, adequate monitoring of psychosocial aspects of a team is necessary. Such investigation needs to consider team dynamics and team development over time. Space exploration still lacks enough relevant studies relating to such aspects. Furthermore, generalisation of findings from previously conducted investigations is very difficult thus many basic questions relating to the human factor in space remain unanswered. A comprehensive study based on psychosocial aspects of a crew is needed in order to provide relevant findings and lessons learned for future research. This research project aimed to capture the crew's dynamics during the course of the isolation.

The results are also going to provide deep insight into the intra-team processes including team structure, relations among crewmembers, and identification of the phases associated with intragroup conflicts as well as their causes. Research designs, regarding this area, applied in the past research projects are disunited in methods as well as in their findings. Thus, this research project is explorative in terms of methods. It requires a new, quality, sustainable, and complex research design that could be repeatedly applied in various experiments for possible capture of recurring phenomena and generalisation of findings.

However, the team dynamics is very complex and represents a real challenge for a researcher. When assessing crew's dynamics several methods were used (as described below). Thus, there are several aspects that can be studied out of this research design.

Let's start the mission!

### *Day zero*

Finally, all the crew met in the Center and we were ready to go to the supermarket to buy food and drink for the whole mission, one week in total. The whole menu was scheduled for the entire week and everything was measured for breakfast, lunch and dinner. Therefore, we needed to be extremely accurate when shopping. It was already dark when we headed towards the habitat.

Once we were in the habitat location, we were not able to see the environment, since it was already night, and we put all the food, drink and our belongings into the habitat. We already knew that, once closed the habitat, we would not see the exterior world in 7 days, and it was in this moment when I really realise that the isolated conditions was going

to be hard, more than expected, even taking into account that we were allowed to have our smartphone with us, and we could communicate with the exterior world for a limited amount of time, often at night.

Although it was too late, we had some time to talk and get to know each other a little bit, and PhD Agata showed us the habitat in detail. We had just enough time to get familiar with the habitat and arrange our belongings.

The mission looked quite challenging. We will follow a daily strict schedule, practising sport, yoga, doing experiments, calculations and collecting data on a daily basis, including information on the amount of water we drank, the amount of water we used for personal hygiene and also the amount of water we excrete. We pissed into a measuring cup and we measured the data. Showering will be limited to 5 minutes. The habitat looks good, although the beds were not the most comfortable in the world, but we were not there on vacations.

Due to the time-limited and dynamically changing environment of space missions, it is important to communicate with a crew from the Mission Control Center, and provide crucial technical/medical data. The idea of the ground control team is conceived to supplement, augment, and assist the crew on board during the simulation. We assumed that the most essential and efficient way to communicate with and support the crew is voice communication. Voice/text communications followed certain protocols to be clear and concise. Voice communication was used to update both the astronaut' crew and the ground control team on current tasks, activities, procedures and operations.

## *Day first*

The previous day we went to bed too late, so we were allowed to wake up at 10:00 CEST and we did the organisation in the base and the adaptation to the new environment. I checked the mission documentation in the Google Drive shared. We did not manage to find the weight scale.

I got familiar with the habitat and the schedule that we had to follow to accomplish the mission. There were some tasks which we had to perform daily, like doing sport, the short nap, yoga and the circadian measurements. Besides, the schedule describes all the individual experiments and tasks to be done by all the crew members. All these tasks were strictly scheduled.

One of the biggest challenges that we had to address was cooking. From the very beginning of the mission, the device used for cooking did not work. That meant, we would hit food using the microwaves and boiling water. One of my best friends from Spain provided me with a delicious recipe to cook chicken. Unfortunately, if we wanted to cook that recipe, we needed to use the oven. We had to reschedule the whole menu for those days. We were not able to find the weight scale. This device was crucial for us.

We were all very tired and we started to get familiar with the habitat and with the experiments to carry out.

Simon started with reculturing the algae bacteria so that he could start the experiments the following day. He got familiar with all the medical devices, drugs and recalled some medical procedures necessary for typical medical emergencies. During recent and past microgravity experiments and expeditions on the International Space Station (ISS) and simulated environment, many new problems and challenges have

been discovered. These challenges include cardiovascular, neurological problems and fluctuations of hormonal circulation. Related to space life sciences with plants and bacteria, changes are linked to the absence or reduced presence of gravity. Plants are especially receptive to gravitational forces and accordingly show effects to reduced gravity like changed direction of its leaves or reorientation of its roots. Innovative projects try to recreate or stimulate normal plant growth with artificial gravity or aligned direction of aquaponics culture. Another option to be considered is the compensation of the missed gravitational forces with magnetic forces. The project looks quite interesting!

At dinner, we had a cultural talk, where we shared some of the customs of our respective countries. It was very interesting to hear different points of view about so many different countries. Aidyl shared with us the different customs between Puerto Rico and the rest of the United States. She speaks Spanish quite well. Ghahim told us about the customs of Kuwait, where he told us what life is like for some nomadic people in the desert, and what life is like in the big cities. Simon told us about the different regions of Switzerland and their differences in languages, as well as the origin of Swiss punctuality. I told them about the Spanish gastronomy and the different regions in Spain. We also shared the way we say different colloquial expressions in our respective languages.

### *Day second*

Today we woke up at 8:00 am after a message from MCC. We all came up with the Subjective Time Perception test together. We finished our tests in time before check-in. I was confirmed that everything was updated and ok. We did not manage to carry out the polarised light experiment and we did not find the weight scale yet.

Simon was trying to get into the rhythm of all the daily activities. After breakfast and a short briefing he continued setting up the experiments and took some photos of the experiment. Almost all morning he was trying to assemble everything for the microgravity experiment, since this is more challenging than the other experiment set-ups. After lunch he worked out on the treadmill and did the vinci experiment. Some first experiments were performed with help of the astrobiologist including magnets and cockroaches.

Aidyl focused on setting the tubes for the experiment which took 6 hours and she also created two educational videos.

I could notice that all of us were really tired, and we were not even in the middle of the mission. This is something that we had to cope with over the entire mission.

### *Day third*

As usual, the day started with all the crew coming up with the STP test. Before lunch, I updated the daily report documents to be filled out by all the crew, and updated the missing information in the spreadsheets, due to the crazy two first days. I also supported the crew medical officer to measure the temperature of the crew each 2 hours, since he was very busy performing experiments and, afterwards, I prepared the polarised machine. I looked for the scale, but without success, so I have requested a new one to be included in the next lunar lander delivery. I have recorded a video with Simon explaining one of his experiments.

The Communication Officer, Ghahim, had difficulties waking up. Either before the mission he had sleeping problems or he was not yet used to sleeping in a confined place. His day and mood was not the best.



However, he started with his normal duties as we were starting to create a routine. This day was when I realised that, as Commander, it was going to be very difficult to follow strictly the daily schedule. Besides accomplishing the goals of the mission, I would have had to cope with potential conflicts among the crew, due to the hard work and confined status. I have to say here that there was not a single conflict over the whole mission. We all got along well and I decided to increase the schedule flexibility, of course covering all the missions' goals.

The Crew Medical Officer, Simon, cared for the algae and started to look for further experiments to be conducted since his proposed experiment won't take for the rest of the week. Beside that he started looking into the aquaponic material (what is available / what is missing and not clear).

The Crew Astrobiologist, Aidyl, started compiling images and videos over the past few days to make little movies as outreach and educational videos. She also helped to search for the missing scale, something that was a mystery for all of us. She researched how to perform the polarised light experiment in order to see Haidinger's brush and realised using a polarised lens will help. Unfortunately she can't find any in the habitat. Another solution to enhance our ability to see the brush was to use one of the LCD monitors in the habitat. We just needed to connect one of our computers to the monitor in order to use a YouTube video to practise our polar vision. We also figured out the lighting issue in the bathroom, we placed a little lamp in there (YAY).

After lunch, we performed our nap experiment and sport, and we calculated the estimation of a magnetic field, based on the specification of a toaster. We were informed that we would have an imminent geo storm, and we needed to be able to measure the magnetic field values in any part of the habitat. Of course, logically, we tried to find a proper

electromagnetic field (EMF) metre to perform the measurement. We found one, but unfortunately, it did not work. We did some calculations using the Biot-Savart law, and we were able to calculate the magnetic field by using the electrical current passing through the microwave that we use to “cook”. Of course, this theoretical calculation is a nice try to survive, but without any measuring device or, at least, the proper material to build one, it is not possible to make an accurate measurement. By the way, why did we not try to use our smartphones to get an application to measure the magnetic field? I am quite sure that there exists such an application, but this is not as fun as using mathematics! I was pretty happy and excited above all because of the electromagnetic field calculation without any measuring instrument. The MCC looked excited too. It was an amazing day.

### *Day forth*

I woke up at 6:00 UTC (Coordinated Universal Time) after a message from MCC. After waking up, we all came up with the STP test together, as usual. We finished our tests in time before check-in. I was confirmed that everything was updated and ok. I kindly requested the crew to drink 2 litres of water per day, at the request of MCC. We were not drinking enough water, according to the urine measurements.

After breakfast, we had the briefing which the Communication Officer sent to MCC, and we read the daily schedule. In the morning, we experienced some instability in the internet connection. It was needed to tailor the daily schedule again in order to maximise the time working for all the crew, informing the MCC in advance, of course. Besides, we had an unscheduled outreach event at 16:00 UTC. The crew took part in a podcast organised by Aidyl for high schoolers in the states. Then I

realised that making a little bit of a flexible daily schedule from the beginning was a wise decision.

The communication officer felt better today, although he woke up at 3:30 UTC. He was not able to sleep and rest properly yet, and I had to monitor this fact closely.

The Crew medical Officer continued with his scientific paper for the algae experiment and took more photos to improve the quality of the report. He made the analysis for the tank water and tried continuously to improve the quality of the water in the tank, but couldn't really find out what was wrong. He also helped with the biosphere experiment and advised the crew as best as possible and proposed possible solutions. It is exciting to be part of all these experiments, of course I am ignorant about them, very interesting though and always willing to learn from others science fields.

Aidyl began scoring her tubes for worm survival. Each tube took about 30-40 minutes because she had to disassemble, view under the scope then reassemble the tube. She had to continually adjust the scope in order not to cause her neck problems. As I said, another event was our outreach with Mind Magazine & Full STEAM (Science, Technology, Education, Arts, Mathematics) Ahead Podcast. It was about an hour long. It was wonderful for her to see her former students again. We will have another outreach event with students from Las Vegas Nevada, ages 5-~13. A task presented by the team was the 4 biosphere experiment. We had a discussion on the difference between ecosystems and biospheres as well as heterotrophs versus autotrophs. Also, she presented to them that Oxygen was isolated from water splitting in Photosystem 2 in the thylakoid membrane of the chloroplast. Last part of the evening was dinner, a lively fun discussion was had and then she completed scoring

her tubes which she finished around 23:30. She definitely needed dH<sub>2</sub>O for tube analysis because she hadn't started the microgravity data.

### *Day fifth*

As every day, I woke up at 8:00 am after a message from the Mission Control Center. We had the briefing which the Communication Officer sent to MCC and we read the daily schedule. We also got familiar with the emergency procedures. Afterwards, I worked on the Random Positioning Machine RPM forces and equations description report, and we tried to get back the monitoring tool with the habitat sensors, which stopped working. I also worked on the FOOD Artificial Intelligence (AI) experiment. I was requested to put more light on the tubes. Today, we received the delivery of the lander.

The Communication Officer woke up very tired. He woke up at 2 UTC, but could not sleep again. All day he was tired. He completed the poem and everyone liked it. He designed a solar photovoltaic (PV) system for the habitat and also finalised the weather report.

The Crew Medical started the day with some logistics like uploading the Vinci protocol and caring for the algae, since they are getting better. He continued with his scientific report and collected more pictures. He helped prepare lunch and continued afterwards with the aquaponics. Simon was having a hard time with it because there was always another problem occurring (leaks, pump is not working, dirty water). After the outreach activity, we did yoga and he again repaired the water tank until the lunar lander arrived. He had to hurry up because the fish needed fresh water so I turned on all air pumps on maximum. After a relaxing dinner, he turned off the water pump because he was afraid another problem would occur during sleep (worst case floating the floor).

The Astrobiologist immediately went to score her microgravity tubes after the procedure to harvest *S. feltiae* from the wax worms was done (took only 5 minutes which she recorded as another educational video). It would take about 3-4 days till the *S. feltiae* escapes from the waxworm. As to her ongoing experiment, unfortunately she found no survivors which is worrisome. When she repeated this experiment in the US with the *C. elegans*, besides the 15 ml falcon tubes, the bait needed to be grown in liquid broth (LB) broth then used to moisten the soil. Also, the lunar and mars soil would need to be rinsed in distilled water before use to make viewing of the nematodes easier. For next week, she will be performing the same experiment but on *S. feltiae*. She cleaned the bathroom and floors before the outreach which was at 18:00 to a US school. Wonderful questions were asked by the children who were the ages of 5-13. I have some of the recording of today's outreach. The evening was eventful with a mysterious knock. We concluded that some tourists were around the habitat and they were curious.

Then a delivery of wonderful goodies and a surprise by the lander (yay). As a team, we put items away then she helped Simon with the fishes. She prepared dinner as everyone was busy with their own task then we sat to enjoy our first “really cooked” food. It was further enhanced with the delicious wine and the dark chocolate. At the end of the evening she showed everyone a trick which they were currently trying to solve: the “cork trick”.

### *Day sixth*

In two days, we will leave the habitat but Aidyl will leave some of his staff in the habitat for her next mission as a Commander. I took the pictures for the FOOD AI experiment and I discussed with Ghahim the

equations that rule the RPM movements. In the morning, I worked on the RPM paper. The remote web for monitoring the sensors does not work yet. Simon and Aidyl showed how to dissect a cockroach, ready to be eaten.

Ghahim woke up more relaxed. In fact, today was the most relaxed day since Day 1. He very much enjoyed the exercise of designing a PV system on the moon. It raised many questions in my head and he reviewed the model to design a Wireless Power Transfer (WPT) system. A great refreshment. Because he was relaxed, he was able to focus more on it. For this reason he spent most of my time working on this report and the PV design.

Simon had to invest almost the whole morning just to fix one problem after the other to repair all leaks in the aquaponic system. I used a lot of tape and patience and was working meanwhile on his report for the experiment. He fed the cockroaches and tried to clean up their “habitat” but they weren't that happy about it. The aquaponics system started to work properly now but started to smell not so good (ammonium). So he tried to clean the water tank without disturbing the fish because they are already experiencing stress due to the new environment. However, they ate almost all of the fish food I gave them. Meanwhile, Aidyl showed him some of the music she's listening to and taught him some music history.

Aidyl was able to quickly make the “danger video” for educational outreach. Her day focused on compiling the images, materials & methods, and results. She concluded that she will need to perform the *C.elegans* experiment next week in parallel with *S.feltiae*. None of the animals survived in 1G or microG. She had control data (i.e. video) of how the  $N_2$  daughters thrash in different soil types. She was concerned that she was gaining weight even though she was sticking to the meal

plan and she ran an hour every day with a cool down walk with weights.

After dinner, we were able to dissect the roach and play the cucaracha song in the background, then yoga and finally dinner. After a lively discussion ranging from the “Me Too” movement to video games, we finally got to the spatial memory test (SMT) test. We couldn’t complete the last two tasks because it was already 23:00 UTC.

### *Day seventh*

Today has been the last day of the mission. An Emergency Surprise was waiting for us this morning. We received a message that a meteorite strike will happen in the next 15 minutes. Therefore, we prepared ourselves according to the instructions from MCC. After waking up, we received an alarm that a meteoroid would hit. We immediately tried to follow emergency procedures (masks, food everywhere, evacuating, torches, etc...). Electricity went down, communication went down, and the bedroom module was hit. Ghahim got stressed because he was so tired and hungry as he was in constant communication with the Mission Control Center, following up and supporting the crew. When the impact happened, we were in the gym in shelter with our oxygen mask while the rest of the habitat was sectioned through the decompression doors. We were informed that there was an impact in the bedroom and we repaired the damage with duct tape. By the end of this drill, we encountered a real problem about electricity, but it was eventually solved.

From my side, I really think that we have covered all the goals of the mission. As a commander, one of my main objectives was to avoid conflicts among the crew. Due to the hard conditions of the mission,

this is pretty difficult to achieve, although we managed to do it. The cost was the rescheduling of the daily tasks. Of course, I needed to carry out all the activities scheduled for each day, but I made the daily schedule.

Our communication officer, Ghahim, was tired all day as he slept only about 4 hours. This experience exposed him to the sleeping problem he was facing. An action should be taken in this regard. In his own words: “I believe the experience was very constructive, and I am glad I was able to make it to Poland with all the travelling complications. I will be watching and following the opening of the new upcoming habitat, and maybe to discuss with the hanger of the AATC further cooperation”.

Simon made a list to document what else had to be done today. He continued with his report and finished it and later on cared for the fish. After sports he took a shower and we had lunch. Together we finished the SMT test and continued our individual tasks. After the outreach we did yoga and also continued cleaning the habitat. For the last time he cared for the fish and tried to clean the water tank. After the last dinner he prepared his stuff to go the next morning. In his own words: “I will really miss this chemistry in this crew”.

Aidyl, after the emergency, continued to take images of tubes which contained living worms until the bulb ble-out. She wasn't able to look at the lunar soil for worm survival. Since she couldn't continue her data collection, we completed the SMT & polarised light perception test. AT 6, we had an outreach with camps from her home town Bronx, NY, USA. In her own words: “I will miss my team Solaris”.



## 19. *The AATC Olympics* *Nadia Mirza-Saadi, Scotland*

*EMMPOL 6*

*22 Aug - 12 Sep 2021*

500m...1km...2km...5km...8km... With each kilometre we ran further into peace. Deeper into the darkness. They say Space feels as though you're surrounded by air or by a fluid. In the habitat we were surrounded by high CO<sub>2</sub> levels and no fresh air. The treadmill I ran on to stop my body from withering away into a sluggish skeleton was nothing compared to the path I was used to. Running with spirit surrounded by rivers, mountains, beaches and lochs (lakes in Scots/Gaelic). I missed my gentle giants covered in heather and moss in the mountains. Instead of the relaxing sound of pitter pattering rain falling on vibrant orange leaves above me, there was the loud slap of my rubbish trainers on the rubber conveyor belt. Granted there was the option to view a forest or beach on the main screen as you ran so it didn't feel that far from home.

Each of us had achieved athletic excellence in our home cities, some had even represented our home countries. Together we hoped to achieve athletic excellence in the habitat. The record at the time was 126.78km. This seemed daunting but we believed in each other and knew we could beat it.

Our heart beats per minute shot up with the beat of the music we ran to. After exercising this stayed high, although surprisingly for one crewmate it would drop (not bradycardia!). Gradually we adjusted to running each day and our running playlists developed too. It was

interesting that whilst we listened to different music, the beat usually had the same tempo. Who would have thought that London Neo Soul RnB could produce the same hype as French Rap! Our time on the treadmill was our only time alone. Our designated hour of exercise was really our designated hour of contemplation. On some nights we barely had more than two hours of sleep, our minds needed a wee (Scots/Gaelic for small) bit more time to process everything that was happening to us.

“Phew”.

“Huh”.

“Argh”.

“Blurgh”

The animals had landed! It is important to express oneself and communicate one's emotions but these groans were alarming! We rushed to the gym, worried about our crewmate. Turns out he was not in pain but putting his all in to break the record. We knew the treadmill was challenging our resilience and persistence. A competition was born between the five of us. Both on the cycle and on the treadmill.

One grew bored of staring at the same forest display and rubber floor and disappointed by the gruelling schedule ahead. As an alternative we switched to the exercise bike. I loved this, I felt strong and powerful. I was able to keep up with my crewmates and almost beat them if it wasn't for the meddling emergencies. Typically my fellow astrophysicists were the stars of the AATC treadmill but this time a Sir Mohamed Farah erupted in the forms of our Medical Officer and Vice-Commander. The final run was upon us, would we cross the finish line?

15.05km done. The Vice-Commander had pushed his limits. He set our new crew record, we were astonished. After that contribution no one

could deny our determination and spirit. The race was not over yet. The Medical Officer stepped up onto the platform.

“Beep... beep-beep... beep-beep-beep-beep-beeeeeep!”

We dropped our pens and Petri dishes to watch the AATC EMMPOL 6 championship finale.

“Wow”

Our Commander was astonished. Who was this red giant and was he still human? The CO<sub>2</sub> was engulfing the habitat, polluting our air and squeezing out any oxygen left. A warning dawned on us, could he keep this pace up?

The Medical Officer slowly walked into the kitchen and announced the final result: “21.06km ran in 97.20 minutes!” We exclaimed with happiness and surrounded our star (no one wanted to hug for obvious sweat oriented reasons). Our total for the week: 178.03km. We did it, we broke the record.

## *20. To Infinity and Beyond*

*Mauro Franqueira, Portugal*

*Exp.52 EMMPOL 12*

*11-17 Oct 2022*

### **Mission Day 1**

Woke up very anxious and with a lot of thoughts and overthinking. Maybe because it was the first day, and I finally started to feel like an astronaut, or because I was thinking I was not able to do this role/task

for so long. Conducted the morning experiments and the Health device wasn't working so I fixed it. Then I started fulfilling the tasks following the brief from MCC, also began with my experiment. Tried to always fill the forms and sheets on time and be organised. Gym time was really good to put my mind in place and start to calm down.

Everything after launch was much smoother. The crew seems very polite and very helpful. Asked for help on the experiment, Sebastian and Evandros gave me some really nice tips and advice. The experiment is already in progress, found all the necessary equipment to work with. Hopefully the equipment will provide great data and the algae will grow on day 3, very happy to start on schedule. When I switch to the CO position was really good to say some jokes and talk, felt a bit playful and cheerful but was able to understand the stress and anxiety of the role. Everyone seems very focused on their own job, and above all very independent on their own experiments and way of working, I like we don't have any leaders for now or alpha males. Is better when we work as an all and with the same importance. *Team work makes the dream work.*

Missed the sun and the fresh air. Would love just to have the possibility to walk around for 5/10 min and watch the night sky and take some air. Starting to feel really tired and sleepy after the launch and dragon experiment, which is very relaxing. Time today passed very slowly. Was possible to conclude how much work is waiting for us, so we need to be prepared, fit and together, and put in a lot of effort and dedication as we should.

1 day gone ... 6 to go. Life as an astronaut is not easy, but is fulfilling and to become one of them requires a lot of effort and skills. Hopefully one day I will be on the ISS, or the moon or mars. Fingers crossed for a continuous good environment/experiment and a lovely experience. Actually I loved writing this report, it was very helpful to relax and “talk”. It's truly a pleasure to be here, and share this experience with EVERYONE.

## **Mission Day 2**

Woke up very mad and frustrated because I just wanted to get my sleep ahead of today and try to rest a little bit. Everything was really fast to fill up today, all the forms and the medical tests were short and smooth. Unfortunately one of our crew mates is sick and I tried to support him as much as I can so that he doesn't feel excluded or alone despite it being a bit hard not having his data recorded. Being with the Medical Officer and the Communication Officer is really nice, sometimes I feel a bit sad for don't speak like a native and being as funny and talkative as they are, plus they are very supportive and friendly, always asking if I need help or if I need something, some really good friends I'm creating here. Hopefully the guys like me and think I'm a good asset to the team. The experiment is done and ready to go, I'm just waiting for the demijohn to collect the CO<sub>2</sub> but actually I start seeing some bubbles on it. Maybe I will proceed to the last stage of the experiment. Following MCC advice I checked the leaking problem and it's ok, no leaks at all, following that I helped the Communication Officer with the vacuum chamber, because it was not working and was smoking. The polarised experiment with MO was really funny. Training with the hipoxia mask was really good, and after taking the Vinci Power Nap was refreshing.

The lunch was very good, but everyone seemed very very tired. I start with the final stage of my experience. The algae is already heating, the air pump is already working, hopefully I can get some good results. Unfortunately the only thing that seems not working is the CO<sub>2</sub> sensor. As the time passed by I started feeling a bit sick and with a cold, and a will to throw up. All the guys except Ophir that slept all day seemed very tired and not in a really good mood. This sleep deprivation was really bad. Hopefully in the next few days we will be able to sleep more. I really want to sleep. Actually I'm writing this while I'm almost sleeping ... and it's just day 2, what does the future hold us? Is really weird the feeling of missing home, I've had that feeling to often and is when I'm feeling more uncomfortable because I start thinking and search for the comfort I then it remembers me everyone back, my bed ... probably the time will pass fast never thought this would be so hard and the thing is I blame the majority of it to the sleep deprivation. But I've got this, at the end of the day this was the dream so I need to keep fighting for it.

Starting to get really cold and feeling the throat a bit inflamed. Symptoms of diarrhoea kicking in, maybe tomorrow it will be worse.

After dinner, still with mild symptoms, I really want to rest and sleep but actually my mind doesn't want to. Possibly I want to be able to fall asleep, maybe because of my biological clock. Helped the CO with his SCOBY experiment and MO as well with the sensors for his experiment. With the permission of MCC I called my grandfather to wish him Happy birthday. Maybe it wasn't a good idea as it reminded me of home, family and friends, affected my happiness and balance, and some anxiety and doubts came to my mind. De-Briefing at night took a bit long.

2 days gone ... 5 to go. Don't want this day to repeat ever again. Writing is therapeutic. It really is. I'm really enjoying writing these daily reports. Off to sleep, if possible for 12 hours.

### **Mission Day 3**

Still not understanding why I'm not dreaming. Woke up just 1 time when I was really in a good sleep because the ventilation fell down and broke. Measurements and fill up sheets are going very well and really fast. Medical Update: Starting to feel better today despite some symptoms of diarrhoea and nausea yesterday. Waking up with some temperature seems normal. Received some advice and feedback from my PI - Personal Investigator, regarding the experiment. Very polite and helpful, I really want to have good results. The Brief went very smoothly. The Barbie song to start the day was amazing and put me really in a cheerful and playful mood (thanks Sarah). The MCC crew today's morning was really funny. Crew seems balanced. I'm feeling good (maybe the best morning until now, letting us sleep a bit more was really good). Pictures time, looking really good. The gym is really one of the best places to go. Today I even sang in a very good mood, some bad thoughts stayed in there today (link of the song: [▶ Nininho Vaz Maia - E Agora](#) ).

Once again the MO did not disappoint on the launch, everything was perfect already told him he is our Gordon Ramsay. Me and the CO after launch danced ( [▶ Nininho Vaz Maia - Quiero Bailar](#) ) a bit of a very joyful and playful moment, memories I will keep. Very good mood and environment today. Took “a shower” with baby wipes, put on my favourite body cream of Kashmir feeling ready to face the world, or the moon. Really happy with the performance of the experiment, finally

having some results and an increase in CO<sub>2</sub>. Tried to put another light there but it was impossible because the LED that I found was too big. Data fullfield on time and in hours in all of the sheets. The day today was the best one so far, really happy. I know day 4 until 5 will be very hard because of fasting but let's do it, life is better with challenges. It's when we feel alive at least in my personal opinion and we are here to stay and fight together until the end. At 9 (mission time) I start feeling a bit tired, a nap would be amazing but I can't, still with some stuff to do. Love smelling this cream is truly amazing and lets me relax. As EO I tried to fix the CO<sub>2</sub> levels but it seems impossible. They are rising a lot in all the rooms, usually I'm able to fix all the stuff and complete the tasks this one is not resulting in. I already tried to spare the crew but nothing works. I substituted the CO because he was taking a power nap and an Emergency happened. I think I handled it quickly and in a proper manner, all the steps and procedures were followed properly and I assigned the DO to write the report and hope everything will be back to normal.

Today I “prepared” the dinner. DO didn't come to eat and said he was tired, it was just the three of us again. Very easy going and chilled dinner. Feeling really really tired. Just want to sleep. Today was maybe the best day so far, the experiment is going well and the crew environment is good. Was really a full day. De-Briefing done. Documents and sheet done. Time to go to bed. Hopefully the fastening will not ruin the crew environment. Days 4 and 5 are the most deciding in my opinion. 3 days gone ... 4 to go.



## **Mission Day 4**

I still don't understand why I'm not dreaming and my sleep is so “light” , very unusual. Measurements done by breakfast, the crew is really efficient and fast. CO<sub>2</sub> levels of the experiment are stable, very happy, now I need to see some algae growing up. Unfortunately we had the emergency procedure today and we didn't perform at all, Sarah gives us a grade of 1 in 10. I was gutted, shattered and really angry, I really don't like to lose. It was a really good experience and volunteering to come out with “radiation” was really cool, it seemed like I was really on a lunar module with my astronaut crew. I really loved it.

After lunch, I was in a really good mood. I start talking with all my friends to see if they are good and what they need. Hopefully they know that they have a friend and whatever they need I'm there for them, and we are in this together. I saw Asit a bit low today so I've got the idea of messing a bit with him and I was able to record some really funny videos of him dancing. It was truly fun. Then me and the MO started the experiment for saliva, hair and nails lovely images on the microscope.

Dinner was very good, finally some french fries. The Briefing with Seb was good and fast. Lets try to have the maximum sleep I can. And overall I think I'm a good connection between everyone, I just like to have a good environment and that everything works in a proper way. I'm always trying to help. 4 days gone ... 3 to go.

## **Mission Day 5**

Today was the longest time of sleeping (despite being just 4 hours), and for me it seemed to be only 2 hours. I think it is hard to rest because of the noise of the ventilation. I like dark and quiet places to sleep. I needed a break from the briefing to calm down, and just take a deep

breath because the worst thing we can do in life is victimise ourselves and don't be grateful, and above all be arrogant, hate that. Good talks with Dra. Agata, Seb and Sarah, very helpful to have someone to talk to and share a bit of my feelings. I will leave this mission with that in my heart. And I will follow all the advice. Working on the experiment I think I can start seeing some algae on the bottom. The CO<sub>2</sub> is stabilised. I'm very happy and it seems the experiment is working. I don't want to disappoint myself and others. The team today seems a bit in a bad mood, I know why, and I will try to change it. Emergency procedure done, good effort from the crew.

Great lunch of our MO aka Gordon Ramsay, the crew seems more happy. I tried to talk with all of them. Unfortunately, next to the lunch crew I have to unclog the toilet, almost throw up. But, job done. I'm desperate to exercise and be active and leave some bad energies in there, but unfortunately I've something to do before that. Experiment with good CO<sub>2</sub> levels looking good all the time between 2800 and 3000. Seems reasonable. Finally some training. "I will be back". Training as usual is vigorating despite being there for 25 Min because of the fasting and dinner. After I took the vinci power nap it was amazing.

Today I've got the idea for the dinner, really good as usual. After dinner I went again to unclog the toilet and it worked again. Hopefully tomorrow is not happening again. Feeling energetic but at the same time sleepy, strange feeling. Today I was very helpful to the crew. Final laps. Feeling excited to see the sun again and breathe fresh air. Feeling grateful for my teammates. The day started a bit bad, but we were able to overcome that and finish it really well. Tomorrow I will take out the algae, and shut down the bioreactor and start analysing and gathering the data for the report, basically the last day in the lab, and then fully on the office writing.

I conclude today and right now that being an astronaut is to ADAPT. Adapt to everything at any moment at any place, and be happy and grateful. 5 days gone ... 2 to go.

## **Mission Day 6**

Today I finally dreamed. I was in space. I was an astronaut. What a dream. And Dra. Agata told me yesterday she had a really good dream. Was this coincidence? Or energy? More ... I fell asleep with the Indian Wood flute Music she sent me. So not only did I dream but I dreamed with my biggest personal dream. Pensive and reflective. The only problem was the shortness of it unfortunately. I woke up in a very easy going mood, I'm not here to have problems with someone or to have specially a bad environment. I'm here to enjoy the moment and live through it with all the mishaps, dancing and playful moments and with all bad sleep nights. This is what I signed for. And it is almost over and we can't go back. Feeling fortunate for all the conquests and steps I'm taking in my life. I will always remember my talk with astronaut Jeffrey Hoffman, he told me to go for my dream of becoming an astronaut. To understand the selection process is hard and with a bit of luck as well, maybe I can do it, and above all to always put the dream on a Plan B in my life, and the plan A is actually an achievable dream, like becoming a great space engineer, taking some PhD. But I told him as Alexander, The Great quote: "Fortune favours the bold", and in this life we need to be bold. Every step I'm taking in my life is with that in mind. And hopefully I'm one step closer to my Plan B. This experience really taught me a lot and I will become a better piece of stardust with this. I'm grateful. Start finishing the experiment, shutting down the bioreactor and collecting the algae. Extremely happy, in 5 days the algae grew and it's quite big. Hopefully good results. I was able to see it on

the microscope. Continue writing the report. Seb says I achieved good results and the report seems promising. Beat the mission all time record for chimp test. I'm literally on the moon today. The guys were taking a nap. I was here working alone. Feeling connected and focused. Finished the presentation, the report is almost completed, I just need to sharpen some stuff. Fasting was a really bad idea, I'm starving and with a massive headache. I think I deserve a nap as well, I have everything done basically. Good feedback from Seb said my experiment could continue more often in future missions to collect more data. This could be the basis for it. Honoured with that. He seems to really love the results, my work and sacrifice. Submitted the presentation and implemented the feedback from the MCC. Let 's keep pushing. Gym training was amazing, feeling very good today. Actually I thought fasting will be worse. Im always have a thought of seeing Dra.Agata opening the door and taking us out with her bright smile and good energy. Don't know why. I'm really starving and would love a Mcdonalds or a Dominos. Crew mood is really amazing and we are a really nice team. I will miss these guys. I will try to cook something with Ed before we go to bed if possible.  $\frac{3}{4}$  of the report is done. Time flies. I will for sure fall asleep with the indian wood flute music again. 6 days gone ... 1 to go.

## **Mission Day 7**

Not even 2 hours of sleep, and after the emergency really bad news that left the crew devastated. ERV is not coming to take us. What bad news. I 'm even speechless. Everyone was talking about running on the grass, seeing the sun and breathing some fresh air again. Hopefully they will find a solution and we can leave on day 8 or early 9. I really want to go to the sauna and eat dinner with everyone and take the flight that I

really need to, to come back to the classes and Uni. Hopefully they will find a way. I really don't want to speak or think more about it. I will exercise on the bike. At least we got an 8,5 out of 10 on the emergency, Evandros was kind. LET'S BREAK THE CYCLING RECORD TODAY AND KEEP GOING. Exercising feels quite good. Cycling record beaten. This team strives in any circumstance. Happy to break some records. And try to enter the hall of fame of AATC missions.

Lunch is done. Nothing more to say now. Actually the days are getting boring, when we had the experiments it was much better and seemed the days passed faster. Don't know how to explain. Was different. Actually I'm feeling really tired. A huge headache. Just want to rest. Presentation time. Was a bit anxious and stressed. I think the video is clear about my emotions and the way I talked. But it's already uploaded. Finally everything is sticking together. Don't have much to do now. Maybe clean the habitat and wait to see when the ERV is picking us. Hopefully tomorrow but we never know. The 3 Musketeers is really the motto for this mission. And what a mission he was. Waiting for Dra.Agata feedback to see if we meet the objectives and if we were one of the best missions. I really dont have much to do or say right now.

## Mission Day 8

I wasn't expecting to write this at all on day 8. Feeling a bit tired and sleepy. The rest of the crew seems a bit overwhelmed with "the situation" but everything is good. Still the three musketeers.

Feeling calm and excited to see the sunlight and breathe some fresh air finally. I never thought it would be possible to miss the sun. But actually it is.

Nothing too much to tell today. I feel the crew is just counting the hours until the ERV arrives and takes us back home to our little blue marble. Actually it was really cool to stay here with the guys and watch some movies. Finally some chill together.

Hopefully tomorrow is the day. The day where we “reborn” again.

## *21. Sustainable Earth, sustainable Universe*

*Olaoluwalotobi Thomas, USA*

*Exp.48 SESU*

*5-11 Aug 2022*

The habitat for me was truly a life influencing event that I will never forget. Travelling to space is my goal but the travel I did to the space inside me was uplifting. I had truly interesting dreams, epiphanies, and self-awareness sessions I had to face and embrace. One phrase stood out to me, “It is not how I fall but how I get up”. This was so encouraging during times of challenge with completing mission objectives and also carrying out personal experiments. Once in the habitat, I was able to explore the worlds of my crew mates, learn from them and share my own being.

My personal experiments revolved around the viability of physical urine analysis as a predictive indicator for performance. The goal is to help in long duration mission success through optimization of crew performance through a resource cost effective method.

During the mission, the initial study quickly evolved and had extensions in the realm of productivity questions which have produced interesting findings and brought crew members together to continue studies back on Earth. During my time in this habitat, one principal that held true and stood above so many things was THE MISSION. No individual success outweighed the crew's success. It truly impacted my approach to how I view what is important in crew dynamics. I even expanded my understanding of the importance of crew dynamic studies for deep space mission selection. I will definitely take what I have learned here back to my colleagues in space science studies.

SESU 48 “Sustainable Earth, Sustainable Universe” was our mission name and “Home Training on Earth will make us good guests to the Universe” was our Ethos. We all carried poor sustainability habits from Earth and learned how to be more than what we were. This was uplifting and encouraging to be ambassadors in our spheres of influence.

## *22. THOR*

*Diego Malpica, Colombia*

*Exp. 50 THOR*

*24-31 Aug 2022*

Day 1

Today is day one in the AATC habitat and after waking up I felt overwhelmed by the several tasks that were required to perform and I could feel that the crew also had the same sensation. This is the feeling I get when I am overworked but I know rationally that this situation can

be handled with time management strategies and teamwork. Two of the crew members reported mild symptoms of discomfort such as headache and runny nose. The headache is tense in my view. The CSE, the only girl in the team, has been under a lot of pressure from her commander due to a previous argument about uniform use. They do not interact, and she has expressed her feelings towards that situation. She feels frustrated and angry. I see this behavior as a normal stress psychosomatic reaction that includes the mild headache which was treated with ibuprofen 200 mg. The other crew member, the BME, reported to me a runny nose, but I have seen a pattern in the last couple of days related to allergic rhinitis which resolved rapidly with fexofenadine 180 mg PO. The experiments were behind schedule because we needed to adjust to a high workload. These consisted of fixing the hydroponics and checking for leaks in the hydraulic system. Now I checked it again after 3 h, nothing abnormal was found. The experiment that made me a little frustrated was the kombucha because the procedure looked very simple but as we were not familiarized with this kind of lab work, it was challenging. The personal experiment was to take neuropsychological tests on the crew, very easy tests, perform physiological measurements such as HRV, SpO<sub>2</sub>, HR, anthropometrics, body temperature and urine tests. Nothing too hard but time consuming. The Data Officer was overwhelmed by the workload, and we had to manage it by providing him with the data instead of chasing us asking for data. We are all having our own data log and performing simple physical metrics such as body weight as per the operational handbook.

We checked the rover and found a damaged battery, so we need to make a new battery to check it further. At this time, I feel a little tired and MCC just told us that we were behind schedule with one experiment. That is just nuts, we need to get to it! Therefore, I will not write this log any longer for today. Good night!



## Day 2

Mission day 2 starts with all the crew waking up late, we managed to get 7 h of sleep because we discussed that this variable is important to maintain performance, mental health and morale among the crew. We already have problems with time perception because we are using mission time as a reference and a work day of 16 hours, no time left to have fun besides eating time. I started the day asking how the night was in general for everyone and started collecting data with the normative surveys we brought including Epworth sleepiness scale, Karolinska scale, and fatigue rating scale Samn-Perelli, physiological variables such as heart rate, blood pressure, pulse oximetry, anthropometrics (fat%, BMI, lean mass, hydration level, visceral fat) and measured RR interval for the whole crew for further analysis. We performed the NASA-PVT+, NASA-Fine Motor Skill test and we took the usual chimp test and subjective time perception. We had to make a schedule to be able to perform the Vinci nap protocol, personally I found the Sudoku challenging because I never did it before in my life. The health of the crew is fine, physically I haven't seen any major concern for the mission. The CSE reported me that the belt for the sensor Movisens is already causing a rash below her breast, I took a look at the skin and suggested we moved it a little bit down and if something shows up, we might need to take the belt off for some time, the concern is sweat related to activity so I must be attentive for any contact dermatitis. PANAS (Positive attitude – Negative attitude test) was taken by everyone. The BME does not have a runny nose anymore so I did not have to give him more fexofenadine. No NSAIDs were used today. I did the Vinci nap protocol before exercise and then I used the treadmill for 60 minutes at hour 8 in the mission, I feel it is very hot in the gym so we moved the fan in there for comfort and after 50 minutes of physical activity with heart rate at the 60-80% Max HR zone, I put on the restrictive breathing mask to grade the effort with the Borg scale and took vital signs, we came up with the idea to lift the legs of the bed and

make a 6 degree Head Down Bed Rest to measure blood pressure, SpO<sub>2</sub>, Heart rate simulating a little time in microgravity. I sense that we need to keep it up, motivate the crew, and have more time to have fun because we are ultra-focused on the job and with time that can cause fatigue. I fixed the EM sensor and I thought that maybe the previous crews had some ideas to fix things but we are going beyond these little repairs and have more innovative ideas to fix them for a longer time. I was pleased to see the hydroponic system working again but there are things that need repairing such as the Geiger-Muller counter. I talked the BME into helping me fix the battery connectors because they are dirty and need replacement. One thing that I have been avoiding is doing the dishes but as I am writing this, I am taking the initiative to wash them because I don't like seeing dirty things in the working area.

### Day 3

Mission day 3 started with the crew walking up after 5:30 to 6 h of sleep. I don't know what time it is and I don't really care anymore because it doesn't matter. Our Time is the mission time, 16 hours of work and no breaks. We had an emergency

Today that made me a little angry because I knew what to do but we were not prepared. First, we had a micrometeorite impact that damaged our hull and pressure started to fall, the temperature was also going down. I felt that we did not have all the necessary equipment, we only found 4 EVA suits and one crew member had to stay in the shelter. The crew was slow to react, as CMO I assumed they knew how to operate the suits, but they did not. Two of them were incapacitated from loss of pressure. After that the instructions were not clear, very ambiguous. As a doctor I know how to do a neurological exam but the data that we were requesting from ground control did not make sense at the beginning. The pictures that showed the twisted eyes were not a

reflection of a complete functional neurological assessment. After that emergency we had a Coronal Mass Ejection and high energy ionizing radiation was headed to the moon. We handled that quite slowly because we had a sensor that did not work well, the display was not working and with low light it was impossible to read the values. After we checked radiation dose with the old Russian sensor in every module of the habitat, we made sure everything was safe to leave the shelter. That included a medical check on the crew and also demonstrating MCC the results of the measures. 3/5 crew members ended up with a tensional headache and I had to prescribe them ibuprofen and acetaminophen. One crew member was really sad because she hasn't been in touch with her family and the crew commander requested all of our families to record a short video for each astronaut. The CSE also had a rash under the sensor belt that I treated with a topical ointment with success. The days had been tough and the experiments were delayed due to emergencies.

With the space engineer, we fixed the hypogravity device to spin the agar in the Petri dish. We also collected tears but with some difficulty because I cannot just cry out of nothing. I feel I am behind schedule, the vital signs readings in all the different experiments take a lot of time. I am a bit frustrated and tired because I can't make free time to do my own experiments. All the crew relies on me for every BP measure and the automatic sensor is unreliable.

I would love to keep on working with my experiments but I just don't have more time and that is frustrating me.

Day 4

Today has been one of the most productive days of the whole mission because several crew members got data with their experiments without

any delays or emergencies in the habitat. Crew health is good overall, no symptoms of any kind. I am a little bit concerned about all the experiments from other crews as I am not finding any significant changes. The VNP seems to work as a power nap when it is used, but I cannot see any changes in the variables that are being measured just yet, that could take time and hundreds of people. Today I had to administer ibuprofen to the CSE because she was having a headache.

My actigraphy showed me that I slept 4 h last night but today I felt even more energetic than previous days. I was happy and also wanted to have fun in the habitat. Exercise felt good even if I hate running on a treadmill, I love to be outside and explore the world. Being inside in confinement is tough because you have to take care of your mental health, that is why I am being supportive and calm.

I had to write a code in C++ to fix one of the Arduinos with sensors that I brought because some mistake didn't allow me to write the data onto the SD card and previous attempts to do this ended up in other people's experiments. I think the habitat is too hot and this may decrease comfort in some people and this demands to be hydrated. The urine dipsticks showed a high specific gravity and it correlates with the hydration status. All crew members are fine despite motivational issues brought up during spontaneous conversation although this analog mission has been a great deal for all of us, maybe a little bit too much. Expectations are high and tiredness is also prevalent. The food is fine, the controlled water supply is challenging but not bad, the area is tiny but not too much! Resting and exercising, eating well and staying occupied is the key to success. I wish I had the chance to go to Antarctica, I would love to be a role model for my son Juan Felipe Malpica. I miss him so much. Thinking about him makes me stronger. I am a tiny bit worried after MCC told us we might be in trouble with the

Polish Military because the Ministry of Defense didn't know about this exercise.

There is no critical health situation here now besides being a bit tired.

## Day 5

Last night at mission time 16h we tried to watch a movie but  $\frac{2}{5}$  of the people just fell asleep. We were very tired and  $\frac{2}{5}$  crew members did not sleep well. The commander says he feels fatigued, and seems a little bit overwhelmed by the several tasks. The BME showed signs of discomfort and no wellbeing, he is also tired because he did not get good quality sleep. We all stayed in our beds for 8 hours but only  $\frac{3}{5}$  slept well. The change in time zone twice from Kraków to New Zealand on mission day 1 and then on day three to Nepal is really confusing for most of the crew so we keep our time of day according to the mission time, we get rest 8 hours, sleep only about 6-7 h in average and with not the best quality. The sleep screening which I do every morning shows that not everyone is honest about it, because I see odd changes, low tolerance frustration from very early in the morning. I tend to give them high spirits, not complaining, continuing with my work even if I feel a little tired, not because I don't sleep because I am really having good nights but because of the workload. We discussed this at briefing time and we had to change schedules to adjust to all activities. Today is Artemis I launch and it's been delayed, so we set up a tv screen to stream it from NASA YouTube channel. We were asked to make a G-profile vs time and altitude which is easy.

I have been doing neuropsychological tests that include SDMT, King Figure, NEO PI-R, WAIS-IV matrices which take on average 2 h per person, so I am doing this all day. BME did the tests and he said they

were very hard, I agree. CSE told me she was having abdominal pain, colicky in the left quadrant, 7/10, did not incapacitate her and I went on to examine her doing first observation, auscultation which was normal, then percussion and lastly palpation and concluded that this condition is not dangerous and can be tolerated. CDO showed some signs of anger when I explained the neuropsychological tests because he didn't understand them at first but that passed quickly. He is rather peaceful and funny. The crew, in my opinion, is showing resilience and because they are in the military, can tolerate it. It came up in a spontaneous conversation about the differences between a regular air force officer and an administrative officer and the differences between their training, this might bring challenges for personnel selection in this business.

In my opinion, the personnel selection process must place an emphasis on highly resilient people that are able to live for long times separated from their loved ones and also be able to tolerate the scarcity of resources. Those who are used to living with high standards may find it difficult to adjust.

As an interesting finding, the military tend to always double check and ask before making a decision which is good in the real world but I find this is not always practical because you need good skills and not to spend too much time asking before making a decision, as I told them in previous briefings, their role is to execute based on what they are told by the MCC and mission commander, take your best shot at it and find solutions for everything without the help of anyone ASAP; not always ask everything because you tend to distract everyone with the questions. This must be a balance because doing whatever the hell you like if you are impulsive and not guided by standardized operational procedures is dangerous.

I just found out that when I come back, I might have a little trouble getting to work because my car died and it has to be taken to the mechanic, well I have to deal with that after this mission, not a big thing though. My mother is sick and that creates an additional layer of burden, she is being taken care of by my dad, I just worry like every normal person.

## *23. EMMPOL 11*

*Kiran Gautam, Belgium*

*Exp. 42 EMMPOL 11*

*21-27 Apr 2022*

Day 157

The entire EMMPOL 11 team safely landed on the Lunar base in Kraków, Poland where we undertook many pre-required survival training to prepare us for any situation in the habitat. The habitat is confined and isolated away from the city (two hours away from the emergency services). I'm very excited to start this journey of becoming an analog astronaut where I will learn and be exposed to interdisciplinary fields.

I started my day at T:00 and received exciting news that we were on the 157<sup>th</sup> lunar day. I caught up on a few hours of sleep with my team and once I woke up I performed my time perception and medical tests. We ate a delicious breakfast cooked by lovely crew mates. I also performed my experiments on stress perception and social dynamics of the crew. Whilst Anet conducted her experiment on bacterial interaction with hydrogel material. Our day was split into different sessions.

In the afternoon, we ate lunch together after the experimental session and performed different tests to keep track of each individual crew mate's health. This day was less tightly packed to allow time for us to adjust and adapt to the habitat.

In the evening, our sessions consisted of workouts and activities which helped us to relax and helped to strengthen the bond between the crew. There were briefings and debriefings reported to MCC by our unit Capcom regarding all issues.

Today was a wonderful and amazing day but at the same time a little stressful. Together as a team we are ready for the coming days and experimental challenges.

\*

Day 158

All of the team started our day by performing a few medical tests, checking vitals. The information was tracked by the Crew Medical Officer and combined by the Data Officer. The day was scheduled according to our experiments. We had enough time to enjoy a relaxing breakfast and answer a few questionnaires to gradually prepare for our experiments. Today we all had a balanced schedule and so had enough time to cook together and enjoy some group time. We tried the kombucha drink, it tasted good to me. Gradually the volume of kombucha intake will increase in the days ahead. Today we found enough time to discuss on experiments and I had also had a great discussion with Jack of how can I use Urine samples to analyse oxidative stress markers influenced by psychological stress using a UV based spectrophotometer and day 159 will be the first day of trial and due to which I had asked all the crew members to collect their urine



samples in their respective labelled tubes in the morning of the next day

Today the time zone was shifted from Kolkata , India IST to Auckland, New Zealand time zone which was quite stressful to all the crew. Me and Anet performed our experiments overnight to finish the culturing of our 10 hour time point 58 samples due to which we had just 4 hours disturbed sleep. We were satisfied after completing our first task.

We had also planned for the next following day.

## Day 159

Today we had entered Day 159, it has been two days , we have been since four nights and three days in the habitat and this feeling of being confined and away from seeing sunlight is different affecting mood patterns of the day and also work. Today we have shifted to a different time zone as part of an experiment due to which we received only a few hours of sleep and which made us feel exhausted. Early this morning, me and my team mate Anet were working on experiments and we successfully managed to work on the incubators to make them functional according to our requirements. This was of a big relief because we had to incubate our bacterial culture for further steps of experiments. After this we took a few hours of nap and started the day with biological vital measurements and followed by having a lovely breakfast cooked by our amazing team members, where we had briefing sessions and debriefings on the table. Later, we started the first part of our days experiment and as we were short of incubators providing optimal temperature and humidity conditions for our bacterial culture , so we gathered few things like heater and insulating sheet and a big container with openings and sealed it properly according to the

requirement and made an incubator supporting our experiment , the optimal conditions was successfully achieved.

We can already see some progress in bacterial colonies which is a great improvement and a positive sign for the next part of our experiments. The team is very helpful and working with an amazing team is fun and it is helping to learn new things from everyone.

Today again we have late night experiments scheduled and our team members also are awake with us to support us and help us.

We are very curious for the results.

Day 160

Today it started with 6 hours of sleep after performing experiments along with my team members and performing all the time perception and tests for a biological check on vitals. Then followed by we all enjoyed the lovely breakfast made by our commander, authentic French toast. Then we parted for our own experiments. Today was very progressive and satisfying as we could observe good results of our previous plating's and we had entered the data in the excel sheet. Then we had good briefings and debriefings sessions for the planning of our daily experiments , problems and discussing the contents for upcoming outreach events. We had also managed to click a few group pictures as required.

For the afternoon we had a good lunch and proceeded with other experiments. In the evening we had a detailed discussion on planning of the schedule and focused on dividing the tasks for the outreach interview and also continued with the regular experimental schedule.

## Day 161

Today, the day has started at a very good note where I had quite enough sleep as compared to previous days and I was very well energised but later I started to get strained and started to feel really tired by evening. I have seen some progress in my experiments and was a bit stressed and irritated as I couldn't find the answer in the literature papers. Me and Jack we both decided to work on the results acquisition part first and then compare our results to see some significant changes.

It is Luke's birthday today , the youngest member of our group, so Philippe and Sarah baked a cake and we celebrated his birthday yesterday after dinner. Today was fun, along with experiments we had a lot of fun together and this motivated and maintained the vibrant atmosphere in our Lunar habitat.

There was an outreach event planned by Philippe representing the entire EMMPOL 11 to the French audience and also introduced us explaining about our experiments during habitat tour making it more engaging.

We are also a bit sad as we will be parting away and leaving the amazing moon base after 2 more days, but this has been such a great opportunity to be part of a cool team and share our knowledge with each other.

## Day 162

Today we started with our routine medical tests and STP test followed by breakfast. Each crew member had time to plan for the experiments or work on data collection. For the bacterial culture, me and Anet, we have worked on taking images of the bacterial sample and cleaning up

trash, simultaneously , Jack and I started to analyse urine samples using a spectrometer and had a good discussion on the elevated peak levels and finding possible parameters. We had a good meal and also started to pack things in order. The main focus of today's discussion was regarding the results for the last day's presentation and also for the live streaming session.

As part of an outreach event for EMMPOL 11 campaign, we had a Zoom and Live session streamed on YouTube which was witnessed by a number of audiences and this session was interesting and we had many questions to address covering different aspects of our day to day life in habitat. The overall session was good and in the late evening we started to pack trash to dispose of it properly.

## Day 163

Today is the last day of the training space simulation in the habitat. We had breakfast together where we discussed the briefings from the day before and the tasks scheduled for the current day. During breakfast we had the emergency simulation where we all quickly started to get in action to perform tasks as instructed by MCC where we had faced Micrometeorite impact. The entire emergency simulation lasted for 1hour 20min . After the termination of the emergency simulation we got back on completing breakfast and the main tasks scheduled for the day's discussion was presentation of the work giving brief details of the work during the entire weekend and cleaning of the habitat and disposing the different trash accordingly required.

We started with filing Brent's questionnaire, Kiran and Kato's questionnaire and submitting different reports followed by preparing for presentations on individual experiments. Anet and I have already completed the experimental work for bacterial interaction and

components on Day 6, we were just left with data collection and discussion of further next steps.

I had taken the morning , afternoon and evening mood barometer and questionnaire as already planned for day 7 but this Day 7 we didn't plan any V.R session as we have triplicates for 10 min time points and 15 min time points and Day 7 due to lack of time, this session could not be planned.

The Urine samples analysis by spectrometer experiment was performed on day 7, the samples for before breakfast and after breakfast were collected and analysed and the data has been acquired , now the next further steps will involve data processing and working on results along with discussion.

After completing all the final experimental work we cleaned the habitat together and the tear labelled samples were placed in the freezer and we analog astronauts EMMOL 11 crew wrote down the word astronaut in our own native languages on the wall of the common room representing international, multicultural and multilingual dynamics of the crew. The space simulation program was terminated at day 7 , 17:30 Central European time, where Agatha had come that day around the mentioned time for the mission egress, where we also pinned our EMMPOL 11 mission badge together on the AATC museum wall as part of tradition. After this we started from the habitat to the Kraków city for the official goodbye kisses and successful mission completion. The one week stay in the habitat was an amazing once in a lifetime experience , our first step towards being an astronaut and contributing towards human exploration missions in space. I sincerely express my gratitude to Agatha, our mission flight director and Matt for their amazing enthusiasm and contribution for making this mission successful and possible. I would like to convey my gratitude to the entire EMMPOL 11 team for being there for each other and supporting each other. I am grateful to have been guided and supported by wonderful professors

Sarah Baatout, Belgian Nuclear Research Center and Bernard Foing. I am extremely grateful to have my parents, family and teachers supporting me in each and every step.

## *24. Rediscovering Earth*

*Sarah Solbiati, Italy*

*Exp. 42 EMMPOL 11*

*21-27 Apr 2022*

*Day 157. Mission day 1.*

The day started full of joy and motivation, spreading through the entire crew a general sense of enthusiasm for the beginning of this awaited experience. After an initial patrol of the habitat, we started to prepare the material for our experiments, and the energy derived from the initial excitement gradually transformed into a dynamic and productive energy. In the morning, the group had to face a first issue: a beeping sound was coming from the UPS box behind the fridge. The crew communicated the problem to MCC, which helped restore normal activity. This emergency happened during my sports session, which consists of approximately 1 hour of sport, measurement of medical parameters, STP test, 10-20 minutes of Vinci Power Nap and again measurement of medical parameters. I initially wanted to interrupt my sports session to help the other members of the crew in solving the problems. However, after having observed that they were doing a perfect team work, I decided that the best thing was to continue the sport session, in order not to lose important measurements for the several ongoing scientific studies. Immediately after this emergency, the

MCC communicated that the habitat's parameters were not nominal, and that we should have worked on the ventilation system in order to restore nominal CO<sub>2</sub> levels. Thanks to the support of the MCC and the group working of the other members of the crew, the issues immediately transformed into positive challenges, contributing in sustaining the mood of the mission. The experimental schedule was really dense, and in the afternoon I started feeling a first sense of tiredness, though hidden by the excitement. In these occasions, I felt the boost given by team working, in tasks division and sharing of points of view. In the evening after dinner, three of Anet, Philippe and I underwent a virtual reality session, which facilitated relaxation, and I immediately felt stress reduction after a dense and intense experimental day in the habitat. Also, the group session of Kombucha mask and cream, which "forced" us to lay and rest for 20 minutes in a convivial situation, restored peacefulness and prepared us for a good rest in the night.

The day passed very quickly, and I did not suffer (nor felt) the condition of isolation. At the same time, the sensation at the end of the day is that we have done a lot of work in these very dense hours.

### *Day 158. Mission day 2.*

Day 2 started with excitement and motivation for the entire crew, although some astronauts felt cold during the night and did not sleep properly. Nevertheless, we immediately started working to stick with the schedule. STP and medical tests were performed with considerable efficiency, which allowed us to have a joyful breakfast and a constructive briefing for the day. After breakfast, each member of the crew started with the experimental session. Also, the tears experiment started, with the collection of control samples from all the members, and sadness and happiness tears from some astronauts. At lunch time we had a joyful meal together, followed by 100 ml of kombucha tea, and in the

afternoon the experiments continued. Also, circadian parameters collection continued regularly during the day, as well as the sport sessions. In the afternoon, we cleaned the habitat, organising and cataloguing material, devices, emergency apparel and other objects present in the habitat. Afterwards, we performed the VR experiment, which let us virtually discover the ISS. We also performed the Kombucha experiment: 3 of us (Anet, Kiran, Luke) used the cream, while the other 3 (Philippe, Jack and I) used the mask. The group using the mask did not monitor skin parameters before the Kombucha session. Therefore, an additional monitoring of skin parameters will be performed tomorrow morning, together with the medical tests.

At 17:00 CET, an outreach event with Euromoonmars was planned, during which the crew presented the experiments, the life in the habitat, also showing a tour of the habitat.

In the evening, the MCC communicated the change of time zone from Chennai, India to Auckland, New Zealand.

### *Day 159. Mission day 3.*

At awakening, the crew was feeling well, though tired after the night. This was possibly due to the change of time zone from Chennai, India to Auckland, New Zealand, requested yesterday in the evening, and the worry of missing the wake up call from MCC. In addition, Anet and Kiran were working until late yesterday night to complete their experiments, sleeping 4 hours only. Nevertheless, we immediately started working to stick with the schedule, completing all morning measurements and questionnaires. In the morning, Anet and Kiran built a new incubator using the material already present in the habitat, as the space in the supplied incubator finished. They used a basket, thermal foils and a heater. Parameters in the incubator were regularly monitored and were proven to be in the correct nominal ranges of temperature, and this was a great accomplishment. Luke managed to fix the rover, which is now working and running, and in the next few days



he will perform friction. The morning was really dense, with personal experiment, tears experiment, polarised light experiment and sport sessions. Also, Philippe organised the habitat starting from the bathroom and the kitchen, categorising all the material available in the habitat and preparing an inventory. This operation is particularly important in order to know and organise all the material available in the habitat, both for experimental matters as well as for emergencies. We also decided to store 6 to 12 bottles of water in each room, in order to be prepared in case of an emergency. During the afternoon I started the analysis of the signals acquired with the Movisens sensors during the first two days of the mission. The quality of the electrocardiographic and ballistocardiographic signals recorded was good for all the acquisitions, and I will continue with the analysis in the next few days. I hope I will be able to evaluate at least one virtual reality session for each of the participating crew members, in order to discuss with Kiran about the results. The group is getting every day closer, and we are more and more getting to know each other, how we work in team, our strength and weaknesses, which is increasing our efficiency and performance, keeping us in the best mood. After dinner we had group activity, Virtual reality experiments and Kombucha masks. Luke and Jack went to sleep after these activities. Anet and Kiran continued their work, as their samples needed to be analysed at specific time points during the day. As they had very few hours of sleep last night, they are going to have one hour of sleep before going back to their experiments. Philippe and I are continuing working on the reports, and we will wake up Kiran and Anet in a few minutes and help them with their experiments tonight. The time zone remains Auckland, New Zealand.

#### *Day 160. Mission day 4.*

A particular day, which actually started the previous night. Starting from where I left in the previous report, Philippe and I woke up Kiran and Anet from their 1-hour sleep and helped them to work with their

samples. This allowed me to halve the work and I really enjoyed having the possibility to learn more about their experiment on bacteria cultures. After this, we all went to sleep, and woke up relaxed and energised for the day. After performing morning medical measurements, we had a French breakfast all together and had a briefing on the activities to be performed during the day. Everyone has continued to experiment, sports sessions and tears experiments. Also, I checked the tables with the acquired data to fill in the missing values. During dinner we prepared a schedule and discussed the topics for the public outreach EuroMoonMars event, which will be held on 26/04 at 6:00 PM CET. During the day I felt excited, then focused and motivated. After dinner, we had a group session, VR experiment and Kombucha mask and cream session, which helped me to relax in the evening. Today I started feeling that my inner circadian clock was challenged.

Time zone remains Auckland, New Zealand.

### *Day 161. Mission day 5.*

Yesterday night, before going to bed, Anet and Kiran finished working on a bacterial culture experiment. Meanwhile, Philippe and I prepared a cake in cups in order to celebrate Luke's birthday, which was today, April 26<sup>th</sup>, using ingredients and tools present in the habitat. This morning, at To 4:00 PM in Auckland, New Zealand, time zone, I woke up happy and excited. We completed medical checks, and immediately we had a constructive breakfast, due to the dense schedule of the day. In the morning I underwent a tears experiment, polarised light, and a sports session. Also, before lunch, we took group pictures and pictures relevant to our experiments. In the afternoon, I started analysing data from my experiment with the EcgMove4 Movisens sensor, with the aim to have results relevant to one session of VR of Anet and one of Philippe. Also, I analysed the signals acquired by Philippe with his sensor, which contains an accelerometer and a gyroscope as the

EcgMove4 Movisens sensor. We noticed that heart beat is detectable on his sensor as well, and thus we are performing synchronised acquisitions with the two sensors. Before dinner we cleaned the habitat, as Philippe had planned an outreach event to show the habitat and the activities we are performing during this mission. Meanwhile, we continued working and we did evening questionnaires. After the meeting finished, we had an exciting and extremely immersive virtual reality session, during which we were walking through the habitat, virtually exploring a moon scenario. I can feel that my circadian rhythms are every day more challenged: in my activities, there is no difference between what is morning and afternoon, or again I don't feel when it's lunch or meal time, and I need to count the hours spent since the beginning of the day, our To, to rhythm the day. Also, my way of communicating has changed, as I noticed also when writing my daily reports or working emails. The sentences became shorter, more direct and concise. During my sports session, while resting between physical exercises, I took a moment to close my eyes and take a deep breath. The habitat felt quiet, for the first moment from the beginning of the mission. At that moment, I heard noises from the outside. It might have been a helicopter. And in that moment, I felt the separation from the outside world on Earth, for the first time during the mission. Time zone remains Auckland, New Zealand.

*Day 162. Mission day 6.*

Everyone had a great night, and in the morning we are all ready for a very dense schedule. As every morning since the beginning of the mission, team working was crucial to stick with the schedule. While some of us were preparing dinner for everybody, the others performed morning medical checks. During breakfast, we had a group meeting to discuss this evening's outreach meeting. Immediately afterwards, a tear experiment started. Then my sports session started. During the last days I maintained the same training. Today, instead, I felt much more

energetic, active and dynamic, and thus I decided to increase the intensity of the training. This was extremely recharging, and I felt focused, motivated and determined. In the afternoon I started to work concretely on the data acquired with the EcgMove4 Movisens devices, focusing on the virtual reality sessions. It was a particularly quiet afternoon. In the evening, before dinner, we had an outreach event with EuroMoonMars. It was great to share our experience and to see MCC, though only through a screen. After the meeting we had a good dinner, full of playful moments, efficiently used to collect numerous samples of happy tears. I am really grateful for being part of this group. After dinner we had group activity: we created the dragon, which consists in creating a drawing around the drawing of a hand.

A message from MCC removed any doubts: I am excited and can't wait for this challenge. I can't believe that tomorrow is already the last day.

Time zone remains Auckland, New Zealand.

### *Day 163. Mission day 7.*

Everyone is thrilled for this last day. It has been an intensive, immersive and extraordinary week. As every night before going to bed, yesterday night Philippe and I were double checking on the driver folder that all the daily tables have been filled. At this moment, Philippe noted the "EMERGENCY PROCEDURE" document, which contained the procedures to be followed during seven different cases of emergencies, ranging from micrometeorite impact, to loss of communication and fire. We immediately started to go through each emergency, sharing the work and linking possible cascade emergencies. We wanted to be more than prepared for any emergency. We worked all week to be prepared: through the entire week, Philippe opened every drawer and looked in every place of the habitat, reorganising all the materials, preparing a detailed inventory and a floor plan of the habitat. Also, during meals we had several briefings with all the crew, in order to discuss the procedures to be as prepared as possible for any emergency. In the

previous days, we stored 6 or more bottles of water in each module of the habitat. We prepared a first aid case containing devices for medical parameters monitoring and some spare batteries, always ready for a possible emergency. We disposed of a drawer in the kitchen with two walkie-talkies, a headlight and spare batteries. In the morning, during the medical checks preceding breakfast, Philippe and I informed the other members of the group of this document, suggesting everyone to read one procedure, in order to prepare for the emergency. Breakfast was ready, and we were about to start eating. Siren on. A glimpse was enough. “Suits on” order from the commander. Crew Medical Officer, Luke, took the emergency first aid box. The two walkies were taken as well. 7:10 CET, MCC to EMMPOL 11, “you are under a meteorite rain. Immediately wear flight suits, masks, glasses and gloves.”. Thanks to great team working and preparation, these steps required a few minutes. 7:13 CET. After switching off phase 1 and phase 2, we all moved to the bunker and switched lights off. 7:14 CET. Collect vital parameters: body temperature, heart rate, pulse oximetry and blood pressure. While we were collecting vitals, a new message from MCC was received: 7:17 CET. Decompression in the gym module. Send two people to check the site above the treadmill left side to the bulb. Tape the destroyed part of the wall. Full body protection. Vitals were sent at 7:21 CET. 7:29 CET, problems in blood pressure measurement due to poor connection of the device. Jack and Kiran are sent to repair the gym wall, while the rest of the team crawled to the bedroom module and started taking photos of the eyes for blood vessel monitoring. 7:33 CET, the rescue team in the gym repaired the wall. Great job, team. 7:38 CET, all the crew was safe in the bedroom. Anet and Luke were sent to check the electromagnetic field in each module, as well as alpha, beta, gamma radiation. This was great team work, with Philippe communicating with Anet and Luke through walkies, Kiran and Jack preparing the tables, and me computing conversions and communicating to MCC. 8:30 CET, MCC confirms that all the parameters are nominal. Emergency was

terminated. We did a great job. The perfect summary of an entire week, spent with other five unknown people, who rapidly turned into friends. We really did a great job.

After the emergency, we gradually returned to the dense schedule of the day. Breakfast, briefing and working. Our mood started to change. The tension was flowing out of our heads, and we were starting to realise that we were each minute closer to the egress. The week passed in a snap of fingers. In this week we have known each other as friends, and we were closer every day, as friends and as a team. Meals, briefings, debriefings, group activities, music playing during the day, circadian mood measurements. All these had an important role for team building. A lovely, productive and energetic mood was clearly perceivable during the day. We continued to work for our final presentations of the work done inside the habitat. We cleaned the habitat and packed our luggage. We were ready, at least organizationally speaking, for the mission egress.

17:30 CET. Capsule opened. Terrestrial daylight flashed through the crew's eyes. The gentle sparkling of the April rain. The embracing freshness of air. The smiling and lovely “welcome back home” of our MCC.

Time zone returns to Kraków, Poland.

*“We came all this way to explore the moon, and the most important thing is that we discovered the Earth” - William A. Anders*

## *25. During the Mission*

*Mateusz Krainiski, Poland*

*Exp.43 Alula*

*7-13 May 2022*

During the mission,

I entered the role of an Engineer tasked to keep the habitat operational and repair any broken equipment that might need repairs. Beside these tasks, each of the crew was tasked with a few experiments described in a later section of this report. We entered the habitat as a group of strangers and we left it somehow closer to each other, a little wiser, and happy for the experience we took part in. The crew performed fine, in my opinion, we didn't have any interpersonal conflicts or bad feelings. We stayed positive, motivated, and friendly until the end of the mission. I think we missed some clarity on the tasks. The crew was often coming to me asking about some habitat and mission related things which should be clearly explained in the manual. But that's just my opinion, I'm a big fan of clear documentation. Definitely having some experience with astronaut activities and analogues was useful. One of my primary tasks during this stay in the habitat was to attempt to revitalise the Chrząszcz rover. I started the work with a review of the current state of the rover, then I identified what components will be needed for repairs, I drafted a list of tasks and a timeline of repairs, and finally carried out the plan step by step. Luckily, all the necessary components to repair Chrząszcz have been present in the habitat and the repairs were successful. During the repairs, I had to disassemble the, already partly disassembled, red rover which was in the habitat. I needed to salvage it for screws and some cables. The Hypergravity simulator is a device originally built for the DM-Robotics Project by An-Mar Grudziądz. Upon turning on, the display which should be

displaying the current setting of speed in the range of 0-100, was showing random numbers and the motor was not turning. It turned out that the potentiometer used for setting the power output and the motor were faulty. Upon opening the device, I found out that it's not very well designed and it's rather difficult to service the components, even though the device is a very simple construction. Some mounting points in the 3d-printed material have taken heat damage. Care should be taken when running this for prolonged durations. After having replaced all elements, I ran a test at full speed for 10 minutes to check how hot the motor would get. It reached 40 degrees C, which is still acceptable. However, under longer operation, it might heat up even more. The device is now fully operational with a few modifications that should make future servicing easier.

This RPM device was originally designed by Paweł Kupsc at ESA. Upon closer inspection, I noticed that one of the cables is broken and that the device needs to be put together. I fixed the wire and correctly placed all components and the device is operational again. Two of the pieces mounting the motors are damaged. They are operational but should ideally be replaced with new prints. Paweł sent me the part, however, he sent it to me already after we left the habitat.

A big clinostat has 6 slots for samples, and can operate with various speeds of turning, however only at a 90° angle, simulating zero gravity on all the samples. The sample holders were detached from the driving rods, one of the rods was misplaced and bent. I glued the sample holders to the rods, straightened the bent rod and assembled the device back. It's operational now, though care should be taken when operating it as when set to a too low rotational speed, the device will sooner or later stop moving. The sample holders are also not very firm, it definitely can't hold up heavier samples.



During the mission,

The AC was making a lot of noise. At times the device was rendered unoperational due to related vibrations. Upon inspection, I got to the conclusion that the rotor of the hot exhaust turbine is hitting the walls of the stator. This is causing noise. I attempted filing off bits of the rotor and it helped for a moment but the issue was recurring. The ultimate solution was that if the AC starts making noise, one needs to hold it, lean it or shake it on different sides. Once the noise stops, the issue usually doesn't return for a longer period of time. Our working theory was that the noise happens when the rotor gets into a non-ideal, yet stable rotational movement. If it becomes aligned properly, it's stable in that movement as well but it needs to be jerked into position. We noticed that the exhaust pipe of the AC is quite long (4.5m) and hot (up to 60°C). This effectively served as a radiator, nullifying any cooling effects the AC could have. After we got permission from MCC, we shortened the exhaust tube to around 1m. We observed a noticeable increase in the efficiency of cooling, confirmed by notes from MCC. As stated by MCC, previous missions reached temperatures of even 30°C in the habitat. During our mission, we had a stable temperature of around 20°C, even though external conditions were not ideal for keeping cool temperature inside. One final thing to mention about the AC is that at some point it started collecting a lot of water from the air. This was right after we shortened the heat exhaust pipe. It was leaking out water for almost a day. When we sealed the drain pipe, the device's water tank got full. After it got full, any tilt of the device caused it to leak water from a lot of different places. So my advice here would be that the drain pipe is kept sealed and if the AC reports that it's full of water, place a deep plate by the lower drain pipe, unseal it, and collect some water. When the plate gets full, seal the pipe again, remove the water and repeat the procedure until there is no water left. I know it's annoying but it's better than the alternative.

During the mission,

We were tracking our water consumption and urine volume. I noticed that I had noticeably more trips to the toilet than my team members. Although, I also had a higher water intake than most of the team. I didn't notice any irregularities in the detailed urine sample analysis.

During the mission,

We were given a controlled gluten-free diet in the form of a menu. We had to prepare the meals on our own, from store-bought ingredients. The food was nutritious and it usually contained food combinations that were not very typical. The food wasn't bad, though it wasn't good either. As we put it on the first day, the person who designed the menu *ain't no Master Chef*. We took turns preparing the meals randomly. We didn't need to introduce any formal schedule for preparing meals, there was usually someone free to start preparing the food and the rest of the team joined after a moment. From interesting observations, I noticed that on this diet my frequency of defecation was lower than what I'd expect normally. It might be due to the reduced gluten or perhaps some other factor, e.g. lower lactose than normal.

During the mission,

We were making detailed notes on the duration and quality of our sleep. We were also instructed to note down any dreams we might have, however I had a dream only one night. I don't usually remember my dreams so I wasn't expecting any results here. I noticed that even though I was not sleeping much, in fact I was sleeping the least of the crew, I was able to stay energised and motivated up until the last moments of the mission. The last day, I slept less than three hours and we were woken up by an alert. That didn't prevent me from staying focused and figuring out how to operate an old, Soviet dosimeter based on a manual, and properly executing all the measurements even though

they were tedious and boring. I think that the mix of isolation from sunlight, having specific tasks to perform, and power naps during the day, worked very well for me. My deep sleep and REM phases were very short, usually less than 1h per night.

During the mission,

We were asked to measure weight, temperature and mood every 2 hours of work time. We tried to keep the timing of the measurements, though it didn't always work out properly. The mood measurements weren't executed great, the Medical Officer wasn't asking us about our mood during the measurements, expecting that we will fill these up later. In retrospect, I think this would work best, if the Medical Officer was given a proper, physical Mood Barometer table to guide us in picking current emotions. In my opinion, the Mood Barometer table we were given was not very good. The emotion names were confusing and, in my opinion, didn't correspond to any scale.

During the mission,

We were asked to exercise 1h per day. These exercises were fine, I was usually combining half hour of treadmill or cycling and half hour of stretching exercises. My only comment here would be to properly warn the crew about the very high concentration of CO<sub>2</sub> that can happen during intensive exercise in the gym. There is no ventilation in that room naturally - it can only be induced by a fan. On one occasion, after I finished my exercises, the CO<sub>2</sub> level was very high and I felt very dizzy after the exercise. The particularly interesting thing is that I felt dizzy only after I stepped off the treadmill. I think warning the crew that they should always put the big fan ON when exercising should be a standard operational procedure for the gym.

During the mission,

We were asked to collect tear samples. This included control samples, artificially induced tears, sad tears, and happy tears. We managed to collect some control samples, though we failed at inducing tears in any other way. The tear collection method was also unspecified, we went through a lot of hardship to gather the control samples. My recommendation here is to prepare a better tear collection procedure and some guidelines on inducing tears. eg. watching a sad movie every evening until we make it, takes up a lot of mission time.

During the mission,

We were tasked with evaluating the impact of kombucha masks on our skin quality. Every evening, we'd put on the kombucha mask for 15 minutes. We were not very eager for this experiment. The masks were disgusting and smelled weird. We doubt that this had any impact better than e.g. washing your face with water with soap or putting on a mask made from a damp towel.

During the mission,

We were asked to drink a small portion of kombucha every day, after lunch. This was quite a humorous aspect of the mission, because we would usually forget about it, and only later during the day someone would mention something about kombucha and we'd groan that we have to drink it. We're not sure if this had any impact on our performance. My recommendation is to notify the crew properly that the drink should be stored in the fridge. We missed the note on the bottles and left it in the cupboard. Every day the drink was becoming more sour. For part of the mission we missed this experiment. I think it lacked a proper introduction and explanation. My recommendation would be to prepare a better mood barometer chart and place it in the habitat.

During the mission,

We were tasked with trying to train ourselves to see Haidinger's Brush, which is an artefact produced by the human visual system when detecting polarised light. Half of the crew was able to spot the brush already after the first day, half the crew failed to see it at all. I wasn't able to see the polarised light. One of the reasons might be my weak sight and the fact that I'm wearing glasses. I tried to spot it both with and without glasses and I didn't notice any difference in the perception of the light.

During the mission,

We were tasked with taking a nap every day on the Vinci Nap hammock. I quite liked these moments, the hammock was quite comfortable for me and I think it's quite a cool way to have a napping bed taking very little space.

First thing that comes to mind when I'm thinking about possible improvements would be to extend the mission manual with experiment procedures of experiments that could be performed during the mission. These can be simple experiments, e.g. keeping cress on the 6x clinostat but with different amounts of water. The intent of these would be to give ideas to the astronauts of what experiments they can perform using the equipment and time they have there. These could also be used to fill in the time in case the crew doesn't have that many of their own experiments. There's a lot of nice equipment there but since e.g. all of us were engineers, we didn't know how to properly use it to do biological or microbiological research. And it would be fun to try and learn something like that.

The second thing that's missing, engineering-wise, is a collection of raw components. An organised workshop would be great and, I think, a

collection of general-purpose building components, such as pipes, screws, is essential.

My final recommendation would be to simply organise the space in the habitat better. There's too many things there (a lot of which are junk, really) and it's hard to keep order. Shelves and boxes could be one way to add some organised storage space, maybe just removing some of the equipment would help as well. Better organisation could mean e.g. leaving things used often in more accessible places. E.g., the medical equipment needed to do the measurements is used at least once a day and most of it multiple times a day. On the other hand, the black RPM is taking up a lot of space next to the monitors and it was not used during our mission. The micro-harvester, in my opinion, is a serious health threat to any non-cautious person who might get to it. There's a lot of chemicals there, some are labelled by hand leaving suspicion whether that's indeed the components inside. Organising the habitat could possibly be a task for one of the teams. In my opinion, speaking openly about order and keeping order is a valid task for an astronaut! In the end, there's no "cleaning crew" that boards the ISS after every mission!

I'd recommend replacing the blood pressure metre with a simpler, small device that doesn't require connection to the phone. These are not expensive and it'd be a lot easier to use. The iHealth one that's in the habitat is wasting a lot of mission time.

Thank you for being a part of this mission. It was a great adventure. We were able to create a great crew and test ourselves in this weird environment. I'm happy to have noticed that I reacted well to the confinement and managed to stay positive and cheerful.

I really liked the interior design of the habitat and the idea of stapling everything to the walls and ceiling is my new favourite idea for PoC

interior design. I appreciate the effort you take in making this time special and I really felt a strong family connection with you guys.

All the experiments were fun, we didn't succeed at everything and that is part of doing research like this. I hope our data is useful to you and will move science forward somehow. And I hope that the things we left in the habitat will also serve future research!

## *26. Not ready to go back to Earth*

*Wojciech Grzelak, Poland*

*Exp. 51 Altair*

*2-9 Sep 2022*

Day 1

Initially I woke up 3h before the actual call from MCC, because after conversation with the crew some of us were expecting to be woken up earlier. After waking earlier, due to the expectation of being ready in any second I didn't fall asleep. Due to that, on actual waking time I didn't feel perfect, although during the first period of my sleep I had a deep sleep period (I hardly ever remember my dreams). During the first part of the day my mood was rather increasing although I didn't make much progress in my experiment at that time. It was really inspiring to see Maciej making fast progress with the 3D printer and Marcelina working diligently in the lab. I felt happy to be around such dedicated

and organised young people. In the second part of the day, along with the loss of daily energy and with the feeling of not accomplishing much, my mood started to decrease. Luckily, there was a pause in that gym, which returned some positive vibes. Afterwards, despite the decreasing mood, I managed to spontaneously do some ordering work in the shelter and then do some to push some progress in the field of my experiment, which in the end made me feel quite accomplished.

I've decided to support the team and increase their sense of comfort by taking over as much as I can on food preparation during breakfast and lunch. I've made a significant order in the shelter, continuing Athena's job there. During the gym, after the hypoxia part I've decided to push myself a little bit and I've run for 10 minutes with speed 12 km/h. Afterwards I finished with quite a heavy load (levels 15-22) on the stationary bicycle. I've managed to discuss the Productivity experiment with Athena and workout the outline for the experiment.

## Day 2

I've woken up very vividly, because tonight, compared to prior, I spent sleeping from the very beginning to the very end non-stop. Starting the day, but this time being better prepared, knowing what to expect and how to use medical tools, was a way better to start a day than without this previous experience. Not to mention no urine testing. The breakfast went also easy, because there was no need for heating any ingredient, therefore it started faster and more efficiently. After breakfast, it was also quite comforting that we could have a dedicated time to recall emergency protocols.



I was happy to finally have a clearer idea (after coffee) about the new approach to my experiment. I shortly presented my new view to Maciej and Marcelina and broadly discussed the new approach with Athena.

Together with Maciej and Marcelina we've managed to quickly prepare a very tasty lunch, which was tortillas with beans, corn and tomatoes.

Then, later on we performed our photoshoot session. It is important to mention that Athena played an important role here, because of her knowledge and experience in setting up the lighting and proper staging. It was a relief that there was a person who had such knowledge because it saved us a lot of time to produce photographs of a certain quality.

Then, after some little harder gym session than last time I attempted the introduction to vinci power nap. Didn't manage to sleep at all, but still it was an interesting, meditation-like experience to lay in the bed with a high, after-training, heart rate.

Not long after, again Maciej and Marcelina did a great job in preparing the dinner. Shortly before consumption, we were informed about the incoming CME emergency situation. With quick and harmonious cooperation of the whole team, we managed to prepare all (almost) required utensils and hide in the shelter. After the event, we've faced several problems concerning the missing battery in the electromagnetic field sensor, which resulted in multiple quick and creative attempts of the entire team to first obtain batteries and then make sure that the environment was safe to get out from shelter. It was a really exciting experience and I think it bonded the crew today quite importantly. After

getting out of the shelter we quickly finished the dinner and debriefed. Unfortunately, I learned today that I'm not able to drink any lactose, because after drinking cocoa with powdered milk I had to visit the toilet today for 3-4 longer times and use a huge part of the crew's technical water on it.

I've outlined a new approach to the experiment, focusing on creating a working prototype during the mission and potentially testing it. More can be found in the outline file. After discussion with Athena, I was asked by her to find time to speak to her about possible AI applications, which we agreed to do during the next few days. In the gym, except for the fixed hypoxia part, I've run 15 minutes at 12 km/h. I mixed it with 45 push-ups and 10~ minutes on a 13 level bicycle.

### Day 3

Woken up having known that I slept all along so far, but at the same time feeling something is wrong. As my Zepp application once again didn't receive my sleep data, only by listening to the crew I got to know that we've slept very shortly. Having difficulty with getting up, was surprised how quickly Athena got out of her bed and jumped toward the computer to fill her sleep report, at the same time complaining that she had barely slept.

Having informed the crew about my just confirmed on this mission lactose intolerance (resulting with frequent toilet visits day before), Marcelina said that according to menu and food planning there is an excess of eggs and I can eat scrambled eggs instead of pudding. As it

later appeared, it was a very good decision, because my stomach was working quite normally during the day. Shortly after the breakfast and due to the large sleep deprivation I suggested Athena to make a coffee just as soon as possible, otherwise it will be very hard to focus today and work intellectually on my experiment/project. Having drunk 2 tablespoons of coffee, after around an hour, when I attempted to start my work for good, I just realised that I'm not only unable to concentrate, but also feeling terribly exhausted, feeling kind of discomfort in the left part of my chest and observed that my mood is increasingly worse. Without further due, I knew that my body was screaming for rest and if I'm about to do anything productive within the next hours, first I need to recover and rest some more. Initially I tried to lay down for 30 minutes, but as soon as the alarm went off, I knew that my body was definitely protesting for more. As I went down this road, I woke up after around 2h of an unscheduled nap, but in a significantly better mood. As it appeared, the crew was slowly preparing for lunch at that moment and I was informed by Athena, that she intends to have a conversation with all of us after the lunch, concerning 'soft skills'. After we finished lunch, we naturally switched to discussion in which we talked about our moods deteriorating today strongly and we discussed factors that could and can cause such situations. After a very mature discussion, I also asked the crew to inform me how they felt about the fact that I've had a long nap, while they were working. The answers were different, but I believe that overall discussion helped us all better understand each others' points of view and improve bonds inside the team. I observed that all of the crew members felt relieved after our talk.

I feel obliged to mark that all of the crew members managed to be productive during such a hard day. Maciej worked out a brilliant new idea about printing flip-flops with kombucha, Marcelina made a lot of progress in the lab, and Athena successfully finished the project of our logo in a very short period of time.

Due to the unplanned sleeping I didn't progress with my project/experiment. In a crucial moment of the final logo work I took over the role of CO so that Athena could push out the logo before the final deadline.

As it appears to be usual, I also tried to maintain moderate order and clean the kitchen ad-hoc during making the meals etc. I've also done all of the dishes twice today.

During gym time, except for fulfilling the fixed hipoxia plan, due to my today's indisposition I decided not to force my body too much this time and protect my heart. Therefore I've run only 2,4km and cycled more, reaching 8,3km. I added 50 push-ups to that.

## Day 4

I Woke up after fully sleeping. It was the first time when my Zepp application actually properly synchronised my night so that I could read REM phase etc. Unfortunately it showed that I spent only 2h sleeping, while the rest of the crew 4h. I've spent much time writing a daily report after the rest of the crew was sleeping and then some time in the

bathroom. Didn't expect it would actually be a half of our entire sleep. Therefore I've decided to improve on that and prepare the daily report today, as it goes, during the day.

After a breakfast together with Athena we've continued our discussion about prototype app, in order to work out what the basic UI screens would require. After some time, as a whole crew we've decided to review the emergency procedures once again. During that we improved and prepared better our EVA suites and all potentially required tools for emergencies in one place. Then I moved on to designing UX/UI wireframes for the mobile web application. After lunch I felt a significant decrease in my energy and decided to go for a 30 minute nap, which brought me back to life. Then I continued my aforementioned work and managed to finish it before going to the gym. After the gym I had my first swinging VPN, which happened to work very well for me for 2 reasons: 1) finally fell asleep and it was hard to wake me up there, 2) I resolved sudoku afterwards almost twice faster. Before the dinner I cleaned most of the dishes used by the crew and finished cleaning them after the dinner.

During day 3 I didn't manage to effectively work on anything related to the experiment. I had so little energy that I focused on helping the crew.

Concerning productivity experiments, we've described: final version vision and mission, prototype basic assumptions, what currently used data could we reuse and brainstormed the elements of potential survey that each astronaut should fill daily. We've also initially decided on how often the marks for productivity would be given.

I've managed to design 11 mobile user interface screens dependently on the use case. I used the *Balsamiq* application to do that. At the gym I did hypoxia run according to the schedule. Afterwards I ran an additional 5km with 10km/h speed, cycled for 10km and did 50 push-ups. I've burned around 490 calories altogether.

Finished first version of UI wireframes have been uploaded to the Experiment Outline file.

## Day 5

Woke up by vent disruption, which I immediately examined. After crew and MCC consultation we switched the vent off and attempted to sleep further, which appeared not to be of such success as before the event. Once again I started the day with frustration that my Zepp Life app couldn't speak properly with my wristband and couldn't provide consistent data about my sleep both to myself and documents. Having tried different combinations (switching the 00:00 hour before or after app sync) and methods (direct readings or 'nap' readings) on previous days with and achieving rather random success, the only constant effect was my initial frustration to start the day like that, especially that all other crew members did not seem to have such problem. After talking with Maciej and Marcelina about how the week schedule expected to finish experiments on Day 5, I decided to abandon the idea of implementing any code during the mission and focus on maximising the quality of the input that could be a precondition to implementation in potential future work. After breakfast I was working on my experiment. After lunch I attempted to work my experiment, but felt a significant decrease in my energy and did a 30 minute nap so that I

could have energy for the most extreme version of the hypoxia test. After waking and before sports I manage to make small progress in experiment. After sports I used VPN, during which I fell asleep. After waking up I realised I'm also too exhausted to work and attempted to do another 30 minute nap and then continue my experiment and/or help with dinner preparation. I was woken up by Marcelina saying that dinner is ready, so apparently I didn't even hear my alarm or just was too tired to set it up properly. Interesting fact is that I usually put stoppers on my ears, but this time I didn't and still didn't wake up, not to mention that I usually have quite a shallow sleep. What I discovered during the last days by the way my bowels are behaving, that leaving my gluten and low carbohydrate diet was a bad idea. I feel much discomfort, gassiness and potentially mood decrease due to gluten, grains (mostly in the bread) and dairy.

In the morning I helped Athena to fix wifi on her laptop. Outlined subchapters to be covered during the day. Elaborated on: New approach (generally), Milestone impact points, Milestone voting, Points assigning, Individual mission impact preview, Impact ranking and started to do so for UX proposition (wireframes). During gym I've successfully done my last hypoxia run (10 minutes with speed 12 km/h). Afterwards I cycled 3,5 km (burning 200 kcal there) and did 50 push-ups altogether.

## Day 6

For this night I had optimised my preparations the night before to the full so that exactly after the last circadian test I could go to sleep. This amount of sleep feels like regenerating in a rather deep manner, because I feel deep calm in the morning, probably for the first time during the mission. Shortly after breakfast together with Athena we performed a photoshoot session which was supposed to show that we didn't actually spend our time here being completely lazy, during which we discovered our hidden acting talents. After photos I moved to continue my paper work for my so called 'productivity experiment'. As Maciej and Marcelina were busy preparing biospheres, I prepared lunch for the crew. After lunch, as it's impossible on this mission to have at least one larger chunk of time to work in peace and silence, some new emergency must have happened. Due to an attempt to plugin additional cosmic gear to the ceiling power line we've managed to create network overload on the powerline supporting cameras etc. After some time, Maciek managed to get to the UPC and reset it which luckily successfully rebooted our Big Brother system ;) Soon later, together with Athena we prepared our biospheres. As she decided to create a bigger one in a 5-litre bottle, I focused on realising the other 3 normal bottles. As I was initially very reluctant towards working with plants, then after a short shift as gardener I must say that it was in many ways fun and satisfying to plant some new habitat inhabitants.

After breakfast together with Athena we performed a small photoshoot of our work and our working environment. I've made 3 bottles of biospheres using gravel, soil and fertiliser. To do that I had to first



divide the mint plant with a knife. First I divided it into two equals. First of which went to the larger 5l bottle prepared by Athena, and the other half was divided by me on 3 smaller plants which were planted in normal bottles. Concerning the experiment, I've created Entity Relation Diagrams and elaborate more on remaining, planned subchapters.

## Day 7

I woke up a bit disoriented, lack of sleep might have had something to do. Feeling of being picked up within a few hours after almost a week of isolation was quite uplifting though, so I quickly did my measurements and helped with breakfast. After breakfast I volunteered to clean a mountain of dishes from the day before and after 'dirty' pudding breakfast. After that I packed myself and prepared for egress. Then I helped to prepare lunch by cutting apples. We had quite a funny time during the lunch, eating awesome pancakes in a great mood. After some time of ERV anticipation, we were informed about the tragic loss of... Queen Elisabeth II. That was utterly saddening. Luckily we were informed about prolonged stay, so that I could focus myself more on grieving in isolation from the outside world. To be honest, I think I was not ready to go back to Earth. At least we don't have climate change here.

## *27. Bad WIFI*

*William Dobney, UK*

*Exp. 41 Emmopol 10*

*9-15 Apr 2022*

Day 1

First day in the habitat was very chaotic. We had a lot of tasks to accomplish with no structure as to how we would perform them and in what sequence. This resulted in us thinking that we did not have enough time to complete all the tasks. We also didn't get all the tasks we wanted to get done before the end of the day.

Regarding my experiment, I did not have the time to start any of it as I was busy with all the other tasks. I hope to start my experiment in the next few days but currently it looks like there is much more to do other than my own experiment and limited time to do it all.

The crew is all healthy, everyone's parameters are ok, and we are excited to continue the mission. However, the days are long, and sleep is limited but the majority of the crew slept well. We are still getting used to the habitat and the lack of fresh air and sun but so far it has not bothered me too much and I have not thought about it.

The food is alright, but there seems to be many inconsistencies between the diet and the shopping list. Therefore, we are having to change the menu for most meals, and we do not know the exact quantities that we need. So, any data gathered from the diet may be faulty as we are not eating what is in the diet. We are still vegetarian and celiac.

The WIFI connection is poor and only two devices can connect to it at once. We are using 4G and hotspots to improve the network but even that solution is not full proof as the 4G network here is not very good.

We encountered several pieces of equipment that are faulty such as the blood pressure machine meaning we do not have any blood pressure readings for any experiment for today. My blood glucose level was not measured as I could not deliver enough blood for the machine to make a reading.

Liliana tested positive for COVID-19 and she does not feel so well but her condition improved throughout the day, and the paracetamol helped.

In conclusion, we are excited to be on this mission. Day 1 was long, full and tiring but definitely worth it. I underestimated how many experiments we would have to perform apart from our own. I hope that crew morale stays this high as well as the motivation to achieve great things.

## Day 2

On the second day in the habitat, there was a clear improvement in the efficiency of the timing of the tasks. The feeling of not being able to finish all tasks in time was not as noticeable. We still had a lot of tasks to perform but we had a structure, and we did not spend as much time trying to understand what we had to do. We got most of our tasks done but there were a few that we moved to the next day.

Regarding my experiment, I did not have the time to start any of it as I was busy with all the other tasks. I hope to start my experiment in the

next few days but currently it looks like there is much more to do other than my own experiment and limited time to do it all.

The crew is healthy, everyone's parameters are ok, except for Liliana's positive COVID case, her conditions fluctuated throughout the day, she was cold and had a sore throat. We are still motivated to continue the mission. However, the days are long, and sleep is limited. Sleep tonight but bad for most of the crew. We are nearly used to the habitat and the lack of fresh air and sun but so far it has not bothered me too much and I have not thought about it. However, time perception skills have gone downhill. I do not feel connected to Polish time, I just wake up and set the clock to 0. I am constantly tired and not knowing what time it is means that if someone were to tell me to go to sleep I could or if they told me it's the morning and you have a full day ahead of you, I would accept that.

The food is alright, but there seems to be many inconsistencies between the diet and the shopping list. Therefore, we are having to change the menu for most meals, and we do not know the exact quantities that we need. So, any data gathered from the diet may be faulty as we are not eating what is in the diet. We are still vegetarian and celiac.

The WIFI connection is poor and only two devices can connect to it at once. We are using 4G and hotspots to improve the network but even that solution is not full proof as the 4G network here is not very good. We devised a solution for the WIFI, and it is more stable. We are using my laptop as a sharing device and now all devices can connect to the internet.

We encountered several pieces of equipment that are faulty such as the blood pressure machine meaning we do not have any blood pressure readings for any experiment for today. We found the other blood

pressure machines and tried to fix them or use them but to no avail. Blood glucose measurements are now all taken.

We started with the kombucha tea and face mask experiment today as well as Francesco's experiment, tears experiment and VR. Not everyone was able to collect happy tear samples today.

In conclusion, we saw a clear contrast between day 1 and 2 whether that be efficiency of performing tasks or the mood and energy. Day 2 was also long, full and tiring but definitely worth it. I am a bit frustrated that I have not begun my experiment yet, but I hope that the crew did not see my frustration. I hope that crew morale stays this high as well as the motivation to achieve great things.

### Day 3

Third day in the habitat started off very well, we completed all tasks for the morning and afternoon very quickly so that meant we could start to work on our own experiments. However, Lilitiana's condition deteriorated drastically during the day, and she revealed that she had pain in her lungs. We immediately contacted MCC, and it was decided by Agata that Lilitiana would abort the mission. After a thorough check of the crew, I decided that everyone else in the crew was healthy enough to continue.

We got most of the tasks done by the end of the day, but it took a while. This day was even better than day 2 regarding completing tasks efficiently. There was no rush to complete everything, and we knew we would be able to complete all the tasks. Regarding my experiment, I finally had the time to start my experiment, but I was not completely satisfied with how I started it.

The remaining crew is healthy, and everyone's parameters are ok. We hope that Liliana will be ok. We are still motivated to continue the mission and we hope that Liliana will still feel part of the team. The days are still long, and the sleep that we got this night was not that good. We are used to living in the habitat and with the lack of fresh air and sun. So far it has not bothered me too much and I have not thought about the outside. However, my time perception skills have gone downhill, I do not feel connected to Polish time, I just wake up and set the clock to 0. I am constantly tired and not knowing what time it is means that if someone were to tell me to go to sleep I could or if they told me, it's the morning and you have a full day ahead of you, I would accept that.

The food is alright, but there seems to be many inconsistencies between the diet and the shopping list. Therefore, we are having to change the menu for most meals, and we do not know the exact quantities that we need. So, any data gathered from the diet may be faulty as we are not eating what is in the diet. We are still vegetarian and celiac.

The WIFI connection has been fixed and we have stable internet and that has also helped the crew to be able to perform the tasks quickly.

We encountered several pieces of equipment that are faulty such as the blood pressure machine meaning we do not have any blood pressure readings for any experiment for today. We found the other blood pressure machines and tried to fix them or use them but to no avail. Blood glucose measurements are now all taken.

With the departure of Liliana, we had a discussion on how we felt, and it has helped morale. We started with the Polarised light experiment today.

In conclusion, the day was very chaotic due to the emergency but we dealt with it and we are still dedicated to finishing the mission. Moreover, I am happy to have finally started my experiment.

#### Day 4

Woke up tired as I went to bed late setting up my experiment. I have settled down into the routine and it is becoming monotonous now. Completed urine analysis but both the samples I collected showed that I was very dehydrated but the day 2 and day 3 urine indicated no dehydration. Had a briefing with the crew about the live event that happened later in the day. We worked on the experiments. I normally had to work on my experiment because the 12 hours were up and I needed to gather the data, but I only got the time to do that later in the day, a full 12 hours later than planned.

When we woke up the mood was a bit tense, I felt that I was snappy and a bit frustrated at how tired I was. The lack of sleep is having an impact on me but only for non-serious tasks where I say the first thing that comes to mind. If it is an experiment, I am concentrated enough to perform it to the letter.

We are having to change or alter the menu for nearly all the meals as we do not have the majority of the ingredients making this diet experiment compromised. However, we are still vegetarian and celiac.

The health of the crew is tolerable. Saikumar has a sore throat, and our temperatures are above 37 degrees. Saikumar did another COVID test which came back negative. The lack of good sleep is catching up with us and we can clearly see it with our energy levels and performance.

More sleep is needed but there are a lot of experiments that must be performed daily.

Time perception skills have decreased tremendously, I do not feel connected to any time zone I just wake up at hour 0 and go to bed at hour 19.

Wi-Fi connection was a bit spotty today and we had to reboot my computer many times to get the Wi-Fi working again. However, the connection during the live show was rather good considering the conditions.

The live event was a success, the crew all enjoyed it and it was a welcome breath of fresh air.

In conclusion, day 4 was the most difficult day of the week so far in terms of sleep, productivity, and crew morale but we are still pushing to achieve all the things we want to.

## Day 5

Woke up at 10 o'clock Houston time and had 5 hours of sleep. Woke up very tired due to the accumulation of bad quality and limited sleep. My phone did not ring when MCC tried to call me, this is the first time this has happened. I suspect it is due to the lack of sleep. For breakfast, we had tasty pancakes with apples. This boosted morale for the day.

Saikumar's condition did not improve enough for him to do his sport session, so it was cancelled. However, he still did his Vinci nap.

Today was not a good day for my experiment. When logging data for my data the day before, I forgot to add parafilm to two of the samples. Earlier this morning, somebody moved a box which tipped my samples



over and compromised them. I believe the lack of sleep might have made me too tired to realise I did not put parafilm on the samples. I will have to redo my experiment with the control samples again once I arrive back in the UK. I did another data logging session at hour 17 and that went smoothly.

The more I stay in the habitat, the more I realise I am frustrated in the morning because the Wi-Fi connection is not strong enough and we lose a lot of time because of that.

Lunch and dinner were also good meals and we only had to do minor alterations to the menu. We are still respecting the criteria of vegetarian and celiac diet.

As we have not changed time zones for a few days, I have gotten used to the sleep cycle and my body is adapting to waking me up after 5 hours of sleep. I have also gotten used to working until 4 AM.

WIFI connection was tolerable at best today. The morning tasks took longer because we had to restart the router. Later in the day, I had to delete the Wi-Fi booster app, making us lose even more time.

In the evening when the crew had finished all their daily tasks, we had a group activity where we watched a film. This was a reward for the crew's extreme dedication and all the work they had done during the last 5 days. 5 days of continuous work with no 1-hour individual break really has a toll on the mind so this group activity helped us to disconnect from the mission and I think we all were relaxed for the first time since entering the habitat. We also had warm milk and biscuits with jam as a snack during the film. All this should allow us to finish the mission with flying colours and make the last three days a piece of cake.

The lack of good sleep is catching up with us and we can clearly see it with our energy levels and performance. More sleep is needed but there are a lot of experiments that must be performed daily. We managed to go to sleep at 17:30 so we got more sleep. Hopefully this will translate into us being more productive tomorrow.

In conclusion, day 5 was a normal day for all the tasks we had to do but it was more stressful in terms of my experiment .

## Day 6

Woke up at 10 o'clock Houston time and had 5 hours of sleep. I did not wake up when MCC called me, this is the second time this has happened. I assume the lack of quality of sleep is catching up to me. Woke up tired and struggled to set up the Wi-Fi which hindered our progress for the morning medical checks. For breakfast, we had toast with hummus, the portions are starting to be very small and do not fill me up sufficiently.

Saikumar's condition improved overnight, and he was able to do his hour-long sport session which is a relief. However, Flavia felt a bit dizzy during the day. The conditions in the habitat are starting to get to the crew. I suspect some of the crew want to go outside again but do not want to admit it for fear of lowering the morale of the rest of the crew.

Today's data collection session for my experiment went smoothly. One of the samples did something I was not expecting but it is fascinating to look at. I should normally have the last data collection session tomorrow evening.

After passing the halfway point in the mission, I feel more and more ready to leave the habitat. It is a great experience and I love it here.

However, the awful sleep schedule I have put myself through has made me less than ideally active. If I were to do this mission again or any other analog mission, I would make sure I get a good and decent amount of sleep. The noise and the lack of sun and fresh air are getting to the crew as they all have sore throats.

Food today was ok, but I am starting to feel less and less full with each portion I eat. We are still respecting the criteria of vegetarian and celiac diet.

I am getting used to the Houston time zone and the routine that ensues. I am ok with waking up at 5 and my body is used to working productively from midnight until 4 AM.

WIFI will be an aspect I will continue to complain about during the mission however it is normal, and we should just adapt to it and not let us get frustrated by it. However, I think it is good for our crew to throw our frustration at something inanimate which we have no control over.

In conclusion, day 6 was a normal day for all the tasks we had to do. We have sunk into the routine and if you were to remove the medical emergencies we have had, we could probably stay in the habitat longer.

## Day 7

Woke up at 10 o'clock Houston time and had 6 hours of sleep. Woke up a couple of minutes before MCC woke us up meaning my body has gotten used to waking up at that hour. I was awake and sharp until after breakfast where I became tired, and I had difficulties keeping my eyes open. Nevertheless, I completed all the tasks for the morning, and we were getting ready to eat lunch when we got a warning of a solar flare. This emergency lasted four and half hours, so we lost a lot of time for

the rest of the day to complete all the tasks. This emergency took longer than it should have but I believe we learnt a lot as a crew and would react much more efficiently to another emergency. I think the lessons learnt not only apply to the emergency, but also normal leadership scenarios and I will make sure to take the feedback into account and I change the way I view leadership. I feel ready to leave the habitat but there is a lot of work to be done before we can leave which we have to squeeze in before the end of the day.

Saikumar's condition stabilised during the night, and he just had a sore throat but when ozonating the bedroom during the emergency, he got a headache and became dizzy. The rest of the crew have varied degrees of a sore throat and runny nose.

Regarding my experiment, today is the last day of data collection. Hopefully, I will not spill anymore of the samples, and I will get the correct data after performing the experiment that I can analyse. Yesterday's data collection was successful and I managed to go to bed half an hour earlier thanks to that.

Wi-Fi connection was a pain to set up in the morning but once we got it up and running everything went smoothly. I will be happy to be back home with stable Wi-Fi.

Our breakfast and lunch were not exactly what was planned but we did not have all the ingredients for them. We had lunch 4 hours later than usual and we were very hungry.

As we have not changed time zones for a few days, I have gotten used to the sleep cycle and my body is adapting to waking me up after 5 hours of sleep. I have also gotten used to working until 3 AM.

Today, we had an emergency.

In conclusion, the final day of the mission was hectic and full of setbacks which we had to catch up on. This made the final day a strenuous one, but space missions are never predictable.

## *28. Lost on the trail*

*"The most important step a man can take. It's not the first one, is it?  
It's the next one"*

*Mikołaj Gąbka, Poland*

*Exp.54 Universeh*

*19-28 Oct 2022*

### **Beginning**

Like all good stories, this one has a beginning. When I got out of bed on October 3, 2022, it was quite warm. After seeing 14 degrees Celsius measured on the thermometer, I expected a sunny and beautiful day, but I did not expect the decision I would face several hours later. For a 3rd year student of biomedical engineering at The AGH University of Science and Technology, Monday is a day of fear, fatigue and crying. After a full day of classes and returning to the dormitory, all I dreamed of was sleep, but life had other plans for me. As I was heading towards the bed, I heard the faint buzzing of my phone, the world stopped, eyes closed, and one simple question appeared in my head; What do they want?, there is an internal battle between my sanity and fatigue; maybe

check it in the morning, after all, nothing will happen overnight, on the other hand, what if it's something important?. Reason won this unequal skirmish and with difficulty I went to the phone to check who and for what purpose they had to destroy my ambitious sleeping plans. After entering the password, I saw an email from Dr. Agata Kołodziejczyk, concerning the trip to the habitat.

A few months earlier, I attended a lecture about the missions of analog astronauts. The subject seemed interesting to me then, but I doubted that I would ever have the opportunity to participate in such a project. As I read this message, I felt a whole range of emotions - from fear and anxiety about being absent from the university for a week, to the motivation to get through it all. All my life I've been wondering how people who are at the top started, were they ready for it, did they know what to do, how did they start?, or maybe just like that? While considering the pros and cons of a possible decision, I was reminded of a quote from a book I used to read when I was a child, this quote reads; " All we have to decide is what to do with the time that is given us". In the mail window, I selected the "Reply to message" icon and wrote two words; "I am willing."

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### Strangers

A few days later I met with Agata to discuss the details of the mission. I found out that this expedition has an international status, so apart from me and my friend from the year who also decided to participate, people from abroad will participate in the mission; From Finland and France. The whole isolation was to last 7 full days, during which we were to experience sleep deprivation, the effects of lack of sunlight, and many other factors related to isolation. Our task was to conduct a series of

experiments related to our psyche, health and the development of new technologies. As part of the preparation, we took part in several lectures during which we were familiarised with the plan of our base, the equipment of the habitat, and we were taught how to collect data. Two days before the start of the mission, we went to Agata's house to get to know each other and to perform training sessions aimed at verifying our abilities related to, among others, adapting to the conditions of isolation and working in a group.

I remember that day - it was around 8 pm, together with Wojtek (my friend who also decided to participate in the mission) we were going by taxi to start the training. I was wondering what kind of people I will have the pleasure of working with over the next week, what is their level of knowledge, why they also decided to take part in the mission, what motivates them. After a few minutes we arrived at the place and the door was opened for us by smiling Agata, after putting things away I went down to the living room where I found two men. The first, slightly shorter, looked young, not much older than us, while the second was older with a tattered beard and watchful eyes. The younger turned out to be a Frenchman named Arnaud, he was fascinated by aero engines and drones, he seemed to have all the protocols related to the course of the mission in his head. An older Finn named Antti was an artist who was not limited to 2D graphics, but he was also familiar with tools for creating animations in space. After a short conversation, it was time for the first test. This test was psychological and was designed to select a communication officer from among the four of us, a person who would be responsible for contact with the MCC during the mission, but the results turned out to be inconclusive, two people were suitable for this role; Arnaud and me, but in the end this function fell to me. On the same day, we had fitness training. Our task was to run up

the Józef Piłsudski Mound, it was the first time when together as a team we managed to break a record, our time was 5 minutes better than the previous record.

The next day we went to the cryo chamber to check our body's reaction to extremely low temperatures. When I heard that we will spend 2 minutes in a temperature of 120 degrees below zero, I didn't quite understand what it meant - 2 minutes is nothing. In the first second in the chamber, I realised how wrong I was, each second seemed like an eternity, and when I heard the signal announcing the end, with all my willpower I forced myself to slowly leave, not run. After this extreme experience, we went to the gym located in the same building to warm up a bit.

The last test was to spend 5 minutes in a lake in water with a temperature of 12 degrees Celsius, submerged above the waist. The first minutes turned out to be dramatic, the overwhelming cold and the gentle whipping of the wind strongly tested our psyche. After 5 minutes Agata asked us if we wanted to leave, I looked at the other three crew members and asked a question that could be considered as one of the keynotes of these missions; What's the record? The answer was terrifying; over 30 minutes. We decided that for now we will focus on surviving the next 10 minutes, after that time we again decided to stay a little longer. 40 minutes passed in this way. When I got to the shore, my legs gave out, but I still felt satisfied. This task integrated us very much, we felt that together we can do anything, everyone supported each other to achieve the best results together.

After the lake we went shopping to make supplies for the mission, then we set off and after less than an hour we saw the habitat. After moving all the things - including food, we divided roles, each of us apart from



individual experiments, had a specific function - Antti became the Captain, Arnaud took the position of data officer, Wojtek - medicine officer, and I became the communication officer. After reminding the rules of life in the habitat and getting acquainted with the plan of the day, we said goodbye to Agata and closed the only door separating us from the outside world.

### *On the other side*

As I mentioned earlier, each person in the habitat had different tasks. Together with Wojtek, I was to carry out an experiment related to the cultivation of cress on Regolith, this experiment was aimed at verifying whether Regolith could be a substitute for soil. Daily tasks included regular checking of vital signs, physical training and extensive data collection. Because I was a scout for 8 years and often went to the forest for long weeks, I was not afraid of insulation, my fears concerned the limited amount of technical water used to keep the bathroom clean and flush. Despite the lack of light, noise caused by pipes responsible for the closed air circulation, sleep deprivation and isolation, I felt good and was calm and focused, I did not know that the worst days were yet to come. On the second day, during the official start of the day, I received a message that we had to start 2 experiments, one related to the measurement of temperature and muscle conductivity during training in the gym, the other related to the study of changes in parameters related to the eyes in isolation conditions. Wojtek got a muscle experiment and I got an eye experiment. He asked me if I could switch because he has no idea how to run an experiment related to the gym but knows the basics of the experiment related to the eyes, I agreed and without knowing it, I've sentenced myself.

## *Abyss*

I planned to measure the temperature and conductivity of five different muscles at specific points in a training session that I had designed myself. Each training was 8 measurements, after simple maths you can see that it is 40 temperature measurements and 40 conductivity measurements for one person in one day, so a total of 160 measurements of each of the two parameters in one day. The temperature was quite easy to verify, I measured using a thermal camera, but conductivity had to be measured using special software connected wirelessly with electrodes connected to sensors. The first problem related to this experiment appeared quite quickly - the software installed on the computer placed inside the habitat did not work. I dealt with the problem quite quickly by installing them on my computer, finally I could proceed to conductivity measurements.

In the evening, after finishing the measurements, I opened my laptop again and wanted to start processing the results, but ... there were no results!. I searched all the folders inside the program but still couldn't find it, I asked myself how is it possible? After all, after each measurement I saved the result. I quickly dealt with the frustration and came up with the idea that perhaps the program is overwriting files and by changing the way of saving data I will deal with the problem. However, as the next day showed, it was not supposed to be better.

After a quick breakfast, I prepared for the experiment, set up the station, checked the sensors and invited the first person. I carefully recorded the results and was optimistic. In the meantime, I looked after and watered the cress. It was nice to see that at least one of the experiments did not cause any problems. In the evening I sat down to organise the data again, first I made a few temperature graphs and then I

opened the conductivity files, I started to process the data, but something didn't like it, all the files looked very similar, after comparing the text files it turned out that all the files contain identical data. Frustration grew, after talking to the crew we came to the conclusion that perhaps the program misunderstands the way of naming the data and reads it as an extension, so the solution should simply be to rename the file appropriately.

The fourth day of the mission was also the third day of the experiment. I got up with only one thought - today I can do it, I will succeed. I started the measurements, was as careful as possible, immediately made some graphs and together with the rest we found that they were different, which means that finally the data was recorded correctly! Evening came, I opened my laptop to finish my work, again created the same two graphs from the same data, but this time they seemed more similar. Fear gripped my throat, the crew was asleep, the terrifying truth dawned on me; as a result of force fatigue, we found differences in the graphs that were identical. At first I didn't want to admit the truth to myself, I copied the text files from the first and second training to the text comparison engine and clicked compare. After a while, a large inscription appeared on the screen; "No differences found." In a frenzy, I closed the lid of the laptop and headed for the bedroom. Antti's voice came to me from one of the beds. "And how did it go?" All I could manage through my clenched throat was - we don't have data.

*The art of war*

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# POST-MISSION

Do you think it is the end ? 7 days in isolation and it is over? Do you think you are now free and can come back home ? What a surprise! What a shock! Analog simulation opened space to new dimensions of perception... not only time perception, but perception of reality. One week of experiments, surgery on the opened brain and we are here and now, where the end transforms into the beginning. Time is relative, reality is shaking. How easy is it to manipulate our senses, our information, our feelings, our reactions...

# AFTERWORD

We would like to thank the authors for their contributions presented on pages of this book. Each of you is dear to us and close to our hearts. You shared good energies so good memories will stay forever... assuming that “forever” exists.

