

Chapter 2

The Arctic During—Flashline Mars Arctic Research Station Diary

Note

This is the daily diary that I kept during my travels and during my stay on Devon Island. Large excerpts were published on the ESA website and in the Belgian newspaper '*Le Soir*'. Here it is in its entirety. Dates are indicated and day 0 corresponds to the planned day of entrance in the Mars Habitat.

Tuesday 3 July 2001, day-5

First day of the trip. A very long day. From Amsterdam to London, and then to Edmonton by AirCanada. Excellent flight. I had some salmon with a Canadian beer. Superb taste, the beer reminded me of the purity and freshness of the Colorado Coors that I tasted for the first time some years ago, while on a Rugby tour with a club from Brussels. But the taste still has nothing to do with our Belgian beers.

I am writing these lines from my hotel room in Edmonton. I have just read the chapter of the "Rough Guide to Canada" about the Northern Territories and the Nunavut, and other chapters on the history and geography of Canada. Quite impressive and interesting. The funny part is that the only place that they describe as being the most accessible up North to trained people with special gear and a purpose is still nowhere close to where we go, as it stops at Baffin and Victoria Islands. We are going to an island even more to the North to a place called Resolute to catch the last plane that will eventually drop us at Devon Island. Resolute, if you look at a map of Canada, is the last Northern civilized dot on the map.

So, I should arrive in Resolute at 2 a.m., two in the morning the next day, local time, that is 7 p.m., seven in the evening, body time or European time. Not that I mind, I always enjoyed travelling long days chasing the sun and the light when flying westward. Actually, time will not be the essence during this trip and this simulation campaign, as first, up North, it will be midnight sun all the time, and second, with jet lags and no difference between days and nights, what is the point of counting the hours as we do in a normal environment? I believe that several of these

taken-for-granted references in our common lives under our latitudes will disappear during the next three weeks, to be replaced by new feelings and constraints.

For example, the next plane that I will take leaves tomorrow, Wednesday 4th of July, from Edmonton to Yellowknife to Resolute. Departure time is 21 h 05, arrival at 22 h 50 in Yellowknife and then departure at 00 h 15 to arrive at 03 h 36 in Resolute, flying by First Air, the AirCanada subsidiary for internal flights. Can you imagine under normal skies, take-offs and landings at times like these? Well, it seems that under polar skies, it is normal routine. As they say, when in Rome, do like the Romans do.

Well, I am nevertheless relatively tired today after all the stress and running of the last few weeks to finish the normal work at ESTEC, plus the additional work for the preparation of this expedition, and yesterday running around in Brussels to meet with some friends, among which journalists to talk about this trip. This morning I went back to ESTEC, to catch up on some e-mail and to get my specially coded calculator to access my lotus notes e-mail system inside the bastion of the ESTEC firewall. But OK, it was an interesting and long day as every time you embark for a transatlantic trip.

Right. Stop here, I want to read a little before sleeping. Bye for now.

Vladimir

Wednesday 4 July 2001, day-4

Second day of travelling. Well, here I am in the Great North. We have just landed in Yellowknife, capital of the province of the Northern Western Territories. I am sitting in this small airport, muffled up in my winter coat, in front of a big white polar bear, the artwork of a taxidermist.

The approach to Yellowknife by plane was really strange and beautiful. Lots of open spaces, lots of water, a huge bay filled with small and large rock islands, and with forests of pines and rocks on the main land. The time is 23 h and temperature is about 15 °C (about 60 °F). We had some rough turbulence on the way, which felt quite funny in this small old Boeing 727, but nobody was really bothered. Other passengers all looked like lumberjacks or Inuit Indians coming home. The first thing that strikes you when entering the airport is the number of people with Asian-looking faces, all of them Inuit. The signs are all in two languages, English and Inuit. Inuit sounds and reads strangely and exotically but very nicely in a certain way. The writing is somewhat similar to the old Runic of Lapps in Scandinavia. I suppose that there are some common roots.

Our flight to continue to Resolute is planned at 15 past midnight, but we were already told before leaving Edmonton that, due to bad weather in Resolute (fog apparently) and although the flight is still scheduled to go ahead and will attempt to land in Resolute, if it does not make it, it will return and come back to Yellowknife. Considering that, if the flight leaves at 00 h 15 and is scheduled to land at 03 h 35, if the pilots decide to turn back, we should be landing back at 05 h 30 in Yellowknife. Sounds nice to spend the night going back and forth to the Arctic Circle to eventually come back to the starting point...I don't think that a lot of people are

looking forward to that. Especially, after being told that we will be on our own, as the company Air First will not assume liability or responsibility because of bad weather. Well, we'll see.

Otherwise, I had quite an interesting and relaxing day. This morning, after a big breakfast, I managed to get the computer connected and I could check my e-mails in Estec and send a few e-mails. In the afternoon, I went visiting the West Edmonton Mall. Many superlatives are needed to describe it: the biggest mall in the world, the biggest car park in the world, a scale one replica of the Santa-Maria ship of Christopher Columbus in a huge pool next to a dolphinarium, an ice ring where an ice hockey competition was being held, a swimming pool with wave machines and toboggans, a huge fair with roller-coasters (I went twice of course; it was great, fast but too short), three cinema complexes, a countless number of restaurants, bars, shops, and so on. I went to see 'Crocodile Dundee 3' (not as good as versions 1 and 2, but still good fun, with a new version of the 20-year-old hit by *Men at Work*).

Although I slept well last night, I still have moments when I feel tired and my eyes are closing. Well, I suppose it is normal as it is nearly twenty to midnight on Wednesday night, which corresponds to twenty to seven in the morning Thursday body time, and I still have a few hours of travelling to do. And still, light shines outside like it was the end of the afternoon or an early evening at home, not yet the midnight sun, but close.

I am attacked by swarms of mosquitoes even here in the airport and despite the air conditioning. That's something I forgot to take: mosquito repellent cream. I was told that they can be quite voracious at this latitude during the short summer. It is apparently one of the reasons why mooses and caribous migrate north when the weather gets warm.

They are calling for the flight. I'd better get going. See you later.

Vladimir

Thursday 5 July 2001, day-3

At last, Resolute! We flew in last night partly in the clouds (and it was rather bumpy), partly in blue sky. The scenery below was quite fantastic: frozen seas and lakes, dry ground and rocks, no trees, nor grass, little ponds like scars tearing up the terrain, all laying in the same direction. And eventually, coming over the southern frozen bay, we arrived in Resolute, home of 230 inhabitants and a few dogs, the second northernmost community. It is mentioned on the map as a relatively large dot, but when you see it from inside, well, it is different. We landed on a strip of rocks and pebbles, no real concrete or bitumen tarmac. The airport is basically one big room, where everybody meets and hugs. I met with several people, some of whom were flying on the same plane. Like often in small communities in remote places, everybody knows each other and everybody greets each other, talks to each other and wishes each other a good day. Which makes these people truly friendly because the polar day can last up to six months....



Resolute in the summer. *Credit VP*

I met Colleen Lenahan from NASA who provides logistic support to the NASA-HMP project. HMP stands for *Haughton Mars Project*, named after the Haughton crater where we will stay on the Island of Devon. It runs in parallel with the project of *The Mars Society*. I met Aziz Kheraj, a friendly “young” man of multiple origins. Coming from Tanzania, but of Indian origin, Aziz lived in Resolute for the past 20 or 25 years. Aziz, married to a charming Inuit Indian lady, the father of many and grandfather of even more, is an astonishing man. He runs the only acceptable hotel in Resolute and several other businesses in town. He is the man to talk to if you have any problem in Resolute: he knows everybody in the village and in the other surrounding villages (which means within a radius of several hundreds of kilometres...) and he always manages to solve the problems. Among the people on the same flight were Andy, a welder by trade coming from Newfoundland who fell in love with the Arctic 15 years ago (I rapidly understood why); Joe, an engineer who will work on a new power plant somewhere up North for an advanced weather station (no more details on this. He is usually quite talkative, but not on this subject; it is true that there are a few military men around and that this kind of station is not on any civilian maps...).

The weather is superb, blue sky and shining sun, and of course this is in the middle of the night as it is half past three in the morning, Canadian Central Time, one hour later than in Edmonton. We put the luggage in Aziz’s van and off we go on a bumpy trail toward the village. No bitumen roads as well, only pebbles and stones. After a cup of soup at Aziz’s hotel and some small talk, it is time to go to bed. I fell asleep several times in the plane but, although I feel tired, I do not feel like going to bed, as if a new energy was inside me, due most likely to the shining

sun outside. I went for a walkabout around the village down to the bay, to touch the frozen sea ice. Paradoxically, the place is very dry: the air and the ground give an impression of dryness, contradicted by the sea ice a little farther. There is no vegetation in sight. Nothing, no grass, not a single bush, no birds, a bare desert of rocks, of pebbles. Oh yes! At last, I stumbled on two small little yellow flowers on the path. The few wooden houses are all built on small poles and you can see ice patches underneath them. It reminds me a little bit of the Svalbard community on the Spitsbergen Island, where I went a few years ago. Children play on their bikes with a dog. Astonishing, it is nearly four o'clock in the morning and the sun is high, nearly at the zenith. I arrived at the edge of the bay and the sea is not completely frozen, there is well over a meter from the edge to the ice besides a few floating ice blocks. I take a run up and hop! I land on the ice, of a strange blue-green colour. The people around here say that until a few years ago, the sea was completely frozen and that the ice was coming to the edge of the bay. Now the ice melts on the edge and the frozen sea recedes every year a little bit farther. Should we see this as a sign of global warming? Maybe...



In front of Resolute Bay. *Credit VP*

Eventually I came back to Aziz's place and went to bed. I slept a solid 6 h in a row. What a pleasure! A warm bed and uninterrupted sleep.

As I wake up, the weather has changed completely. The sky is grey and it is raining, it was even snowing while I was sleeping, but the snow disappeared under the rain. I missed the breakfast of course, but this is of no importance, as the lunch will be served in a few minutes. In these places where passing time is not given by

the rhythm of the sun rising and setting, the only key moments allowing points of references in a period of 24 h (I hesitate to use the word “day”) constantly sunlit are the meals, prepared and served at fixed times. If you are hungry outside these hours, there is always a pot full of warm chicken soup and a mountain of sandwiches renewed every day. The cook’s name is Nick, an Englishman who spends six months per year in Resolute and the other six months in the Canadian West. I also met the other people staying in the hotel, waiting to leave for other polar destinations. There are some five or six persons from the *Discovery Channel*. Apparently, the entire *Discovery Channel* crew arrived twelve days ago and they got stuck in Resolute because of the bad weather, either here in Resolute or in Devon Island. The weather these last few weeks apparently was too rainy and it is very muddy on Devon Island, which renders the landing strip difficult to use. Part of the *Discovery* crew was transferred by plane to Devon Island two days ago, but the weather changed so quickly that the rest of the crew had to stay in Resolute. There is also another group of military personnel waiting to be transferred to this advanced weather station. There is not much to do in Resolute, except walking around and playing pool or watch TV and videotapes.

As mentioned earlier, Resolute is a dry place, i.e. without alcohol and beer. Which means that, after a few days, these people start to go in circles.

I got acquainted with Kathy Quinn, a young geologist from MIT (*Massachusetts Institute of Technology*) of Boston and also a Rugby player. We will be in the same rotation in the Mars Habitat. She arrived also yesterday but in the afternoon from Ottawa. We discussed the seismic experiment that we will be doing and she agreed to give me a hand, which is a relief for me, as I would need her expertise in geology and geophysics. Speaking about our experiment, Robert Zubrin called me this afternoon to say that the equipment was still stuck in customs in Ottawa and that some signature was still missing. So, I called Dr. Philippe Lognonné, the co-investigator of this experiment and who lent the equipment from the French ‘*Laboratoire de physique du Globe de Paris*’, to ask him to send immediately his signature to whoever needs it. So hopefully the equipment should be here in Resolute on Saturday. Later on in the afternoon, Colleen Lenahan announced that we will not be flown to Devon Island before Saturday or even Sunday morning, two or three days later than anticipated, due to the bad weather and to the fact that only one plane is operating, the other broke down some days ago. This island is definitely quite difficult to reach...

It is still raining, drizzling actually, and some patches of fog are coming and going with the wind. So, to fly this plane to Devon Island, you need to have sufficiently good weather both here and there; it is not enough to have a good visibility here if it is foggy over there and vice versa, since all polar flights are flying by sight only. Although we are still scheduled to enter the Mars Habitat on Sunday, we will have to adapt to a new schedule whenever we will be flown up there.

Luckily, Aziz's place is rather large and comfortable. Aziz has an Internet connection, and there are still a few videos that I haven't seen. In short, everything needed for people in transit who are blocked by the bad arctic weather. We spent the time with Joe taking pictures of a wolf and a musk ox (again taxidermist artworks) and of the bay. It is nearly suppertime and I start to feel really hungry, most likely due to the cold and rainy arctic weather.

So, signing off for today from Resolute, the last civilized place before Mars.

Vladimir

Friday 6 July 2001, day-2

Another strange day in the arctic. The 24-h light outside is totally disturbing. I woke up at seven this morning and was up the entire day, somehow expecting the evening but of course the evening never comes in the arctic summer. So although it is close to midnight on my watch and I feel tired, I don't feel like going to sleep, as it is bright outside like in the middle of the afternoon. So I adopt the local way of doing things, a little nap in the afternoon and in the evening and up and about the rest of the day or "night".

Talking with Aziz, he tells me that people around here live with the sun, that is that they spend long hours outside in the summer taking naps of a few minutes or hours here and there, while in the winter, during the polar night, they feel constantly tired and sleep most of the time 18 h per "day". I can easily imagine waking up in the "morning" in the middle of the night and thinking that, anyway, the sun hasn't risen yet and one may as well continue to sleep.

The weather today is still the same as yesterday, that is a "warm" 0 °C (32 °F) with cloudy skies and lots of wind from the North-North-West. Still not good enough to take off to Devon Island during the day. There was an attempt last night at 10 h 30 p.m. Sometimes, the decision is made within minutes when there is a break in the clouds. The pilot managed to land with some supplies for those who are already there, but apparently it was very close, so close that he decided not to fly back as originally scheduled at two a.m. So the *Discovery* half-crew had to spend another day here in Resolute going in circles in front of the TV and surfing on the web. Until finally this evening when on a short call, the weather cleared sufficiently on both sides for them to go practically without notice. One of the guys left apparently with only his socks on and his boots in his hands to be laced in the jeep on its way to the airport. So would we be able to leave tomorrow, Kathy and I? We'll see. Robert Zubrin arrives tomorrow and I am sure that this will help to move things up.

So what did I do today? Well, quite a few things. I went to do some shopping and I went for a ride with Joe to drive the Royal Canadian Army personnel to the airport as their plane was leaving as planned at noon.



With three Royal Canadian Army personnel. *Credit VP*

It is funny how you get quickly acquainted in circumstances like these, stuck in the same place for several days. People are also quite confident around here. No doors are locked and Aziz leaves his keys of the van telling us that we can use it whenever we want. It is true that thieves would have nowhere to go.

We went for a 2h walk along Resolute bay. It was rather warm at 0 °C (we are still in the middle of July after all), but the strong wind made it so cold. I had the feeling that my ears were going to freeze. But no, not yet. The stories of frozen limbs to be amputated would be for another time.

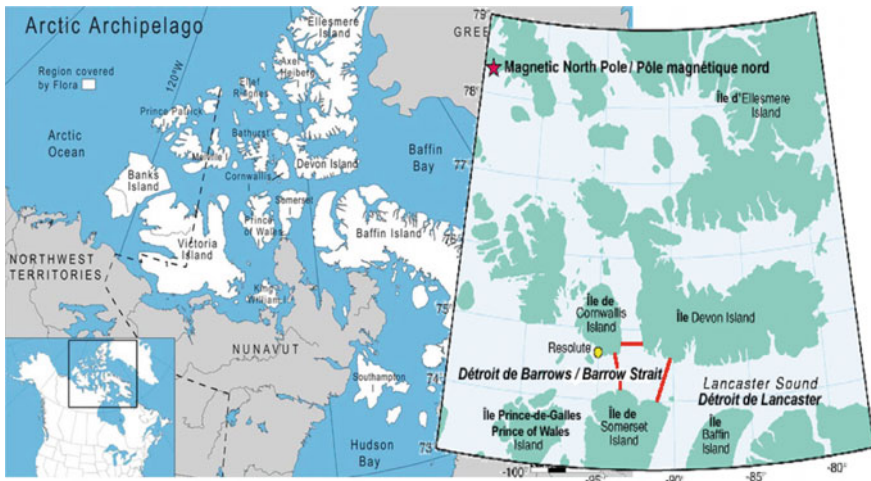
We worked also with Kathy. We studied the procedures of our seismic experiment and we talked about the importance of this experiment for the exploration of Mars: how we would find water of Mars.



Working on the seismic experiment procedures with Kathy Quinn. *Credit VP*

I will come back to that another time, but let's just say that finding liquid water on Mars is absolutely crucial if humans are to settle and live on this new planet.

I also read about the history of the place. So let's do a bit of history and geography. The Polar Circle is at a latitude of approximately 67° North. Resolute is located just below 75° latitude North, i.e. about 15 degrees of latitude or something like 1700 km from the geographical North Pole.



Relative positions of Resolute on Cornwallis Island and Devon Island. *Credit Left: Canadian Museum of Nature/Musée canadien de la nature, Right: Bedford Institute of Oceanography/Institut océanographique de Bedford*

If by any chance, you are lost on the surface of the planet and you do not know under which latitude you are, you can always rely on the old tricks of boy scouts: watch the stars, or look where the sun sets (if it sets...), or simply look at your compass. Well, technology being a wonderful thing, the comfort of modern life allows you to find an even easier way to find your latitude: just look at the parabolic antennas. As most of them are pointing towards TV or telecommunication satellites on the geostationary orbit in Earth's equatorial plane, they will be pointed nearly horizontally, which means that you are not far from the pole.



Joe in front of nearly horizontal parabolic antennas. *Credit VP*

Resolute is on Cornwallis Island in Nunavut territory. The name of the settlement in *Inuktitut*, the Inuit language, is *Qausuittuq*, which could be translated as “the place with no dawn”. The English name of Resolute was given to the place after the HMS Resolute vessel sent by the British to search for the lost British expedition of Sir John Franklin that was looking for the Northwest passage to Asia in the 19th century. Nunavut, meaning “Our land” in *Inuktitut*, is also a new territory that was created in 1999 to recognize the importance of what is called here the “First Nations”, that is mainly Indians and Inuits. Never say to an Inuit that he is an Eskimo, as this term is perceived as offending. It comes from the Algonquian language from South Canada and means “Eaters of raw meat”. So voila, you know as much as I do about this place and its friendly people.

The only bond that links us to “home” is broken today, as the ESTEC web server is down. I could not therefore check my e-mails today and I do not know when and how I will be able to send this report. But hang on tight because it will come to you any way in the coming days. Joe showed me a website from which I could send my e-mails, but I would not be able to read my mails.

All in all, the morale is good, the soup is warm, and the bags are packed, ready to go at first call from the airport. But as much as I would like to be already on Devon Island, I don't mind sleeping another night in a comfortable bed in Aziz's hotel. Hopefully, the next report will be from Mars on Devon Island. So good luck to all of you and to Justin Hennin who's playing tomorrow Wimbledon's tennis final against Venus Williams (well, yes! Even in the arctic, we watch the news on TV). "*Allez Belgique*".

Vladimir

Saturday 7th July 2001, day-1

Well, finally things are shaping up and today it looks like we may be going. After having hung around for the n-th time in this beautiful place (Resolute), we received the word that the plane is up and running and that our turn will come sooner than we may think. The weather is absolute gorgeous and beautiful. The sun is shining and the temperature is still around 0 °C but facing the sun, you would think that it is actually hotter than July (like Stevie Wonder used to say). I went for a stroll again along the beach to admire the iced sea and I even walked on the water, which is easy when it is frozen. Then we made a few jokes with Kathy and Joe, like feeding the stuffed animals of Aziz.



In front of a stuffed polar bear in the hall of Aziz's hotel. Notice the size of the paws with respect to my head and I am standing! *Credit VP*

We did also some work on the computer. Always searching for one thing or another to do, these scientists... Scientists are like that, you have to forgive them.

In the meantime, Robert Zubrin, President of *The Mars Society* and our future Sim Team Lead (the commander of our crew rotation), arrived at last in the middle

of the afternoon, still cheerful and full of energy as usual. As soon as he arrived, he started asking about shipment and flights and bookings and so on. Bill Clancey, a computer scientist involved in cognitive science research, who will also be on our shift, accompanied him. Bill is a big man, big in size, as he is tall and big by his writings as he is quite famous in his field.

We had our first team meeting to talk about the coming simulation. The situation has actually quite changed since our last contacts by e-mails before everybody left home. As the weather was so bad in the last days and weeks, the final preparation of the Hab, the Martian habitat, could not be completed in time. The first rotation crew, arrived more than two weeks ago, got stuck in the tent village of the base camp located a few kilometres from the Hab. This first crew under the leadership of Pascal Lee, a French Scientist working at NASA and whose family's origin is from Hong-Kong, could enter only yesterday in the Hab and their simulation period, initially foreseen for ten days like ours, was delayed by one week. Pascal was asking us to delay the beginning of our simulation by two days to allow them to conduct a minimum of their science program. Robert already granted them these two days and we were discussing the possibility of giving away an additional day. After some discussion about the impact on our experiments, we finally find a compromise for a half period of 24 h, meaning that we will be entering the habitat on Tuesday 10th July at 9 p.m. instead of Sunday 8th July in the morning.



Kathy and Robert walking toward Resolute's church. *Credit VP*

After dinner, we went to visit the office of the First Air Company to check for the geophysical equipment that was supposed to arrive from Paris via Ottawa. Aziz told us as well that his 16-year-old son, who was on Devon Island as a guide, was returning on the next flight as he had an accident. Nothing too serious, just the ankle

superficially bruised by an ATV, one of these All Terrain Vehicles that are in such popular use here (nothing to do with the other ATV, the Automated Transfer Vehicle that delivered cargo and supplies to the International Space Station). So he was shuttled back by plane, accompanied by Dr. Rainer Efenhauser, of German origin and a Flight Surgeon at the NASA Johnson Space Centre, who was participating in the first simulation crew. He actually talked to me in German when I told him I was with ESA, while walking our way back through the village.

We were told as well that we might well be flying tonight at one a.m. or if not, on the next flight rotation at 4 a.m., but again these time indications lost their original meaning as the sun is up 24 h a day. It is a mere reference to your wristwatch, not to a particular moment in your day, as you do not have a “day” in the arctic. You sleep when you feel the need to sleep not because you are constrained by night hours.

Anyway, I thought that after all these days, and if we have to leave later on in the very early morning, I would be better off having a couple of hours of sleep. So off to bed I went and as soon as I fell asleep, Colleen, Robert, and Joe woke me up thumping on the door, to say that we were to go in 30 min, at 1 h 30 a.m. Just time enough to pack up the bags and to throw them in the van. Isn’t it ironic? You spent three days lazing around with so much spare time on your hands that you do not know what to do with it, and the last second, you are told to rush off. But I don’t mind as we are finally going to Devon Island, the location of our Martian environment on Earth.

Vladimir



Ready to board the Twin Otter aircraft to Devon Island. *Credit VP*

Sunday 8th July 2001, day-1 bis

The word of the day is “UNBELIEVABLE”.

We jumped in the plane at 1 h 30 a.m. this morning after a few minutes of sleep and after having loaded ourselves, the luggage, boxes, crates, and so on in the plane. And off we went at two a.m. in bright sunshine. At last! What a liberation! We are going to Devon, Kathy, Robert, Bill, and I. The airplane is an old Twin Otter, which has ten seats and cargo space at the back of the cabin.



In the Twin Otter plane with Robert Zubrin. *Credit VP*

The flight itself is only 45 min, but it is like entering another world, as we leave one island for another, but different in its appearance, wilder, more tortured, chaotic, even more deserted. All water expanses are frozen up, except for some liquid water flowing between cracks. Not a patch of green, only rocks, snow, and ice. Nobody talks, everybody is mesmerized by this view of another world and anxious to arrive. The plane is losing speed and altitude in view of the landing. The light indication in the cabin reads “arrival on Mars in 10 min”. Nice of the two pilots to put us immediately in the right ambiance. The pilots turn their face towards us through the open cockpit door and smile at us pointing at something on the ground.

And there it is! The Hab. Like a spacecraft landed on a pebble beach on the edge of a large circular structure: the ancient Haughton crater. Nothing is visible on the horizon in this barren world. The plane turns above the Hab to come in front of a bare strip of land and stones and slightly inclined. Yes, eventually, we can see some coloured points far away: it is the base camp made of a few dozens of tents.



The bare view on Devon Island, from left to right the mess tents, a rock formation, the Hab in the background and two more tents. *Credit VP*

The plane lands and continues to run on the up-hill strip, makes a half-turn and finally stops. We are welcomed by a dozen of persons, including John Schutt, the manager of the base camp, and Joe Amaralik, the head of the guides, who came from the base camp on their ATVs, the only mechanized moving vehicles on this island. We congratulate each other, we introduce each other, we get acquainted, we are here, we have arrived at last. It is three a.m. and it is warm, well it is the impression facing the sun, still high and bright. But the plane cannot wait and has to fly back. We unload the plane of all the luggage, boxes, crates, containers, and load in the plane the boxes, crates, and containers that need to go back to Resolute. Everybody helps and in a few minutes, everything is unloaded and reloaded. Before leaving for the base camp, I take a quick look around. Unbelievable, this Martian environment! Like if we were on Mars, only rough-hewn rocks all over with tormented bizarre shapes formed by the explosion of this huge meteorite 23 million years ago, and this futuristic Habitat only a few hundred metres away!



On Devon Island, from left to right, the Twin Otter plane, a rock formation and the Hab. *Credit VP*

But it is time to move. The luggage are quickly transported to the base camp on ATVs and trailers. We are walking to base camp by treading down a snow-covered rocky slope to a small river formed by the melting snow. We cross it with dry feet (thanks to Gore-Tex boots) and we climb up on the other side. John Schutt is waiting for us and shows us where we can set up our tents for the rest of the “night”. I am so impressed by the scenery that I cannot take my eyes off the horizon and I keep looking around, comparing this rock with that one, and this snow patch with the next. From here, we cannot see the Hab, hidden behind a big rock. I was reading so much about this place on the website of *The Mars Society*, and here I am, in the middle of it. I know that it will go very fast, these ten days here and I want to take advantage of it as much as possible. I still cannot believe it.

The base camp is composed of three large tents, respectively the mess, a working tent, and the studio-tent of the *Discovery Channel* personnel. Two additional tents are a little bit further. These are for personnel usage to do..., well, let’s say that the only furniture inside is a chair with a hole. A plastic bag is attached at the bottom of the chair, and once filled up, is removed, closed, and placed in another larger plastic bag. A simple code indicates that the place is momentarily busy: a red jerry can is placed in front of the tent door. Outside, two emptied fuel tanks with a funnel and a step allow gentlemen to..., well you see what I mean. During the first years, people used to do their businesses outside, in the wild. Later on, when the NASA-HMP people came back the following years, they noticed that vegetation was growing in places previously used, thanks to nitrates contained in human waste. It was then wisely decided to ship back everything to Resolute to preserve the pristine and wild state of this fantastic island. So, this is a part of the shipment that the plane brings back to Resolute at every rotation.

Further on, the tent village itself, where individual or two-person tents are mounted, strategically placed to avoid water streams. So, here am I, at 4 a.m. trying to set up in the Arctic a tent that someone lent me. Luckily, the spirit of mutual aid is still functioning, and after having helped my colleagues, they come in turn to give me a hand.



The tent village. Arctic camping at its best! *Credit VP*

Again, I could not sleep and I decided to wander off alone around camp. Wrong decision, as the next day we were told to avoid wandering alone outside the limits of the base camp because of possible encounters with polar bears. Well, luckily enough, nothing happened to me that morning, besides being once again totally mesmerized by the wild and majestic beauty of this place. What an unbelievable feeling to be in this out-of-this-world environment!

Well, eventually, I go back home (that is my freshly mounted tent), to download photos from the digital camera to the laptop. Then, it struck me: if someone would have told me twenty or even ten years ago that in 2001, I would be sitting in a tent in the middle of a Martian-like environment on an uninhabited Arctic island at 4 a.m. under a bright sunshine downloading digital images on to a portable connectionless laptop, I would have asked in which Sci-Fi movie he would have seen that. Yes, reality can quickly overtake fiction.

Anyway, after feeling tired of thinking so hard, I unroll my guaranteed -20°C sleeping bag on a thin soil mattress. A little hard, but one has seen worse. Thus, everything is going extremely well. It is not even too cold. I fall asleep thinking that a manned expedition to Mars could happen also faster than one may think.

Remembering unconsciously that someone said something about breakfast at 7 h 30, I managed to wake up a few minutes before. Fortunately, we still have our watches; without them, we wouldn't know what time it is. The sun practically hasn't

moved in the sky. I walk to the mess-tent, thinking that washing and tooth brushing could wait until I would be more awake and a little bit warmer. It is already crowded in the mess tent, the only heated place on the island. I find familiar faces of the *Discovery Channel* team to whom I didn't have time to say goodbye before they left a few days ago. Other people, scientists, engineers, and journalists are also there, trying to warm up. Somebody puts a plate in my hands with three freshly made and warm pancakes and a cup of tea. Mmmh! The simple pleasure of a warm breakfast. I introduce myself to the other members of the expedition. There is a group of engineers and scientists from the Carnegie Mellon University here to conduct a technology test of a sun powered robotic rover; several groups of journalists from *Discovery Channel* of USA and of Canada, from the *Popular Science* magazine, a group of biologists of the NASA Kennedy Space Centre, geologists and geophysicists from the group of the NASA-HMP, etc. In total, about 40 persons, three dogs, and a lot of portable laptop computers, cameras, radios, and ... shotguns, these short guns popularised by the cowboy Jos Randall in the sixties. We discuss a few things, that is mainly the various experiments in progress, the exploration outings of the day in the crater and the expeditions of the geologists of the NASA-HMP group. All this at breakfast. No waste of time. Very well, I like that.

John Schutt takes us aside, the newly arrived group, and explains to us the base rules of the camp: don't wander off alone (hum!), always stay in group, how to use the toilets, that the shower is not yet installed but that it would be very soon, etc. We are instructed on how to use hand held radio transmitter-receivers ("remember the call sign is HMP7SFU"), on how to ride the ATVs (basically like a motorbike, except that it has four wheels instead of two; as I had a motorbike while living in Africa, it is not too much of a problem for me).



All-Terrain Vehicles are fun and easy to ride. They are also essential in this desert environment.
Credit VP

And finally, on how and why to use shotguns. Well, yes, I know, this one is hard to swallow, I do not like firearms, but after having heard the reasons, well, I have to admit that I prefer to know that there is always one at hand. Polar bears are running along freely from island to island on the frozen sea and, in fact, we invited ourselves to their place without having asked for permission. If a bear is hungry, he may well be hunting and basically, for him, you are meat on feet. If he starts to charge you, he rushes at you at an average speed of 20 m/s, or 70 km/h (to recall, the world record of the 100 m is slightly less than 10 s, a mere 36 km/h). So, do not even contemplate running away! But, in addition, a bear is clever and he has a very developed sense of smell. If he smells you from afar, he will not come directly at you. He will prefer to follow you at a distance and turn around you far away to be against the wind, so that you cannot smell him (just as if we would have a sense of smell as developed as his...), waiting for the right moment to jump on you from behind a rock. Even more worrisome: a polar bear is big. Standing, he can measure more than two and half metres and weigh more than 500 kg. His paws are fit with rather impressive claws. A little blow with his paw, and there you are without a hand, or an arm, or even a leg. If by any (bad) luck, you are surprised by a bear, the best thing to do is to take off a piece of clothing and to throw it at him. Not that he is cold, but that would occupy him for enough time for you to grab the shotgun. So, if we are to go on an expedition or simply out of camp, we are supposed to have at least one shotgun within the group. Furthermore, no perfumes, or smelly aftershave and do not leave any food or anything that could have a smell whiffing far away. John shows us how to load, to aim, and to fire the shotgun (luckily) on a cardboard box. Well, I must say that I did not enjoy it too much. I am glad to have done it so I know how to use it, but I still think that the world would be a safer place without them, except for wild places like here where you are at the other end of the food chain.



John Schutt instructions on how to use a shotgun. *Credit VP*

Anyway, it is better to avoid at all cost to shoot at a wild bear. Even in case of self-defence, the killing of a bear is punishable of a hefty fine by the laws of Nunavut. So, caution and suspicion. I would not go again wandering alone as I did before going to bed last night.

All this took us the entire morning. The lunch is served at noon sharp, and is more than welcome, as despite being sunny, it is rather chilly and calories are flying away quite fast. The choice is rice or rice with either chicken white sauce or chilli con carne, all of it coming from tin cans. These cans would be our lot for the days to come, but it is tasty, it is warm, and it is necessary.



The mess tent at lunch. The only heated place on Devon Island. *Credit VP*

The weather started to deteriorate in the afternoon, with a cloudy sky and some wind. As we live primarily outside and under tents, an additional layer of jumper is necessary, which brings the total of layers to six to be able to continue to function normally. In fact, it all boils down to: a tee-shirt, a rolled collar jumper, another jumper, again another jumper, a sleeveless jacket, the heavy duty jacket, and a bonnet for the head; for the bottom, a long-john, a jogging trouser, and a heavy trouser above everything; a pair of thin socks, another pair of heavy socks, and the Gore-Tex boots. This is how we live practically 24 h a day.

Later on this afternoon, we have planned with Kathy to open the boxes of equipment for our geophysics experiment and to go through the instrumentation. We will try to do a dry run maybe tomorrow before we actually enter the Hab on Tuesday night.



Checking the geophysics experiment equipment. *Credit VP*

So, signing off for today. A day full of learning and productive in emotions. Yours, a-little-bit-more-Martian-today-than-yesterday.

Vladimir

Monday 9th July 2001, day-1 ter

Second day of work on Devon Island. The weather turned to warm this morning, up to 2 °C above zero, rather warm indeed, but it is bearable thanks to the falling rain. I woke up early this morning after sleeping more than 6 h in slices of one or two hours. First, a sleeping bag on a mat in a single tent set up on rocks is not the most comfortable place you could dream of, and second, with the ambient cold, I found out that one has to go to the loo more often. So it was always the dilemma of either staying in the warmth and hold on or dressing up quickly and walking the 200 m in the windy rain to the outside pee station to get some relief. Luckily, we were told to take a plastic bottle for this kind of need. Unfortunately, it is filling up quite rapidly. Another reason for waking up early was to clean up today. That is right. It is Monday morning and time to use towelettes to “wash up”. What a pleasure to contort in this small tent, to take off layers of clothing (we sleep of course half dressed), to wipe up inaccessible parts of the body with these humid towelettes (some are still frozen), and then quickly put back on the still warm clothes. The last shower was nearly two days ago, and although it is cold, you sweat from time to time when working or getting in the tent. But eventually, one gets used to it and I start to understand why the inhabitants of the Far North prefer to keep the layer of sebum or perspiration as natural protection against the cold. I decide also to go to the river to brush my teeth. Brrrr! It was cold and one must really want to do

it. Try it at home. Take some ice, let it melt, and as soon as it melts, use it to brush your teeth. Good morning!

Well, we are not en route to Mars to discuss trivial matters but these are aspects the Mars crews would have to face as well, even if, for the moment, we are still doing arctic camping.

Talking about camping, no bears in view so far and luckily I am protected by this special sign saying that I don't taste good and that all of my bones have been replaced with Titanium, that my ESTEC colleague, Tammy Erickson, made for me. I am sure that any intelligent bear that can read will understand and go away.



With the “No bear allowed” sign made by my colleague Tammy Erickson. *Credit VP*

The first crew is still in the Hab and yesterday afternoon they had their first extra-vehicular activity, or EVA (pronounce “ee-vee-ay”) in space jargon. The rain was so heavy this morning that their morning EVA was postponed till the afternoon. While their simulation (or sim for short) was going on, construction work around the Hab was continuing. We were asked to give a hand to lay a pipe from the Hab to the small river running a few hundred metres down. It took us 2 h, Kathy Quinn, Bill Clancey, John Schutt, and I to install 600 m of plastic piping in the Martian Hab environment. We finished in time for the noon lunch, a pleasant Inuit stew, called “Anaq”, made of beef, vegetable, and a few other things that I prefer not to identify.



In the mess tent with the ESA flag. *Credit VP*

The weather turned better in the middle of the afternoon, with the sun coming up and clouds leaving most of the sky. It sounds silly to talk always about the weather like there was nothing else to report. In fact, in the arctic, the weather is one of the most important elements that would condition your behaviour and your decisions. For example, we planned last night, after having verified the equipment for our experiment, that we would do a dry run today in the *Von Braun planitia*, the flat plain in front of the base camp. However, this morning there was no point in trying to detect water under the surface while it was raining and this dry run would not have been dry anyway. Furthermore, the ATVs were needed to support the EVA of the first sim team and we would have needed them as well to carry around our 130 kg of equipment. So we will try this dry run again tomorrow. Another example is the weather report that Bill gets from a Canadian Station that allows him to download the satellite picture of the area. A cold front coming from the North Pole, not far from here, is forecast for tomorrow morning with negative temperatures. So it will be additional layers to put on to sleep tonight and to work tomorrow.

Some words about science. We had a very interesting seminar yesterday evening given in the mess tent by Dr. Gordon Osinski (Oz for close friends), from the University of New Brunswick, Canada, talking about “Impact Craters”. As we are staying on the rim of the Haughton crater formed by a crashing meteorite 23 million years ago, it was most appropriate. This evening, Kathy Quinn will give a talk on “Icesat, observing ice sheet topography change from space”, her thesis subject. This arctic research camp we are in is the most interesting place to have talks like these.

About forty persons, most of them scientists involved in life in space and Mars research, are actually staying in the camp. Another US scientist asked us this morning not to clean or sweep up the floors of the three main tents as he intended tomorrow to collect samples of dust accumulated over the last week to compare to samples collected a week ago, to assess the microbial contamination of human crews in new environments. He specified that he would not sweep up individual tents for control. It is true that the environment is very dusty, even if it is raining regularly. As soon as it dries, the dust accumulates on clothes, instrumentation, computers, and in tents.

A few words on the crew of the second sim rotation. We will be six entering the Hab tomorrow. The Sim Team Leader will be Robert Zubrin, engineer, founder of *The Mars Society*, and fervent advocate of manned Mars missions. Dr. Charles Cockell, a biologist from the *British Antarctic Survey*, is part of the first sim team and will stay on the second rotation as well. Steve Braham, a physicist from the Simon Fraser University of Vancouver, and specialist in communications will also stay on from the first to the second sim team. You already know Bill Clancey, a computer scientist from the NASA Ames Centre, and Kathy Quinn, a geologist from MIT, Boston, USA. We should be entering the Hab tomorrow evening at 21:00 and I am looking forward to that. We were already contacted by e-mail by a group of American psychologists who proposed us to fill out during the sim a questionnaire to assess some human factor in living and working at the base camp and later on in the Hab. So science work as a guinea pig and test subject is already *en route* and I look forward to start the science work as an experimenter as well. It will begin full speed tomorrow once in the Mars Habitat.

Vladimir

Tuesday 10th July 2001, day 0

Busy day today. Cold as well, as announced yesterday by the weather report, but we were fortunate to avoid the snow that fell further down South. The sun shines now in a nearly perfect blue sky with a temperature of +3 °C. This morning, I mustered up my courage and I decided to go for a wash in the little river downstream. Mmmh! It makes you feel alive and kicking, some fresh icy cold water on your face in the early morning arctic wind. After breakfast, we held a meeting with the members of the second rotation to discuss the meals and the food that we need to take in the Hab for the coming weeks. It is mainly non-perishable dried and canned food, not so much the salad, fruit, and fresh vegetable type. But I suppose that a Mars expedition would go for that as well and for longer.

I tried with the help of Patricia Garner, a young English lady engineer from the Simon Fraser University in Vancouver and an ice-hockey player, to set up again contact with the ESTEC host website, but unfortunately all contacts this morning were made apparently impossible by a very slow and jammed satellite connection. To aggravate the matter, my PC laptop crashed down in the attempt. Why? Mystery. We were warned that the environment was very dusty and very cold for computers. Now I am reduced to work with *Windows* in a reduced safe mode, I who a few years

ago were only swearing by *McIntosh*, but, OK, it still works. Kathy proposes very kindly to use her laptop to transfer my files and to send them by e-mail through the satellite connection from the base camp.

Later on, as the weather looked like it would stay stable for the rest of the day, we decided to have a dress rehearsal of the geophysics experiment and to have at last the dry run. With Kathy Quinn and Robert Zubrin, we packed the three boxes of 130 kg in total on a trailer of an ATV and we left base camp the three of us to go to the Haynes Ridge, the plain in front of the Hab. The Hab is actually located on the rim of the Haughton crater and from it, you have a breath-taking view of the crater and the pale grey breccia that filled the crater after the meteorite impact 23 million years ago. The crater itself is a complicated circular structure with several circles, the largest having a diameter of about 20 km. The central circle visible from the Hab is about 2 km and the view is really magnificent and out of this world, with lots of sharp rocks with colours ranging from brownish to dark grey, and patches of white snow.



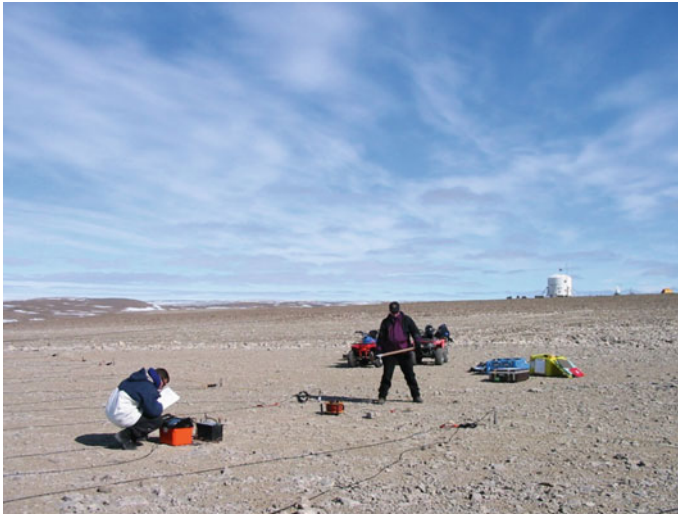
Two views of the Haughton crater from the ridge close to the Hab. *Credit VP*

Riding the ATV is quite an adventure itself. In order to preserve as much as possible the original and dramatic aspect of the landscape, several trails are already marked and we are requested to avoid leaving these trails. As the trail that we followed winds among the rocks, crosses small rivers, and patches of permanent snow, the second ATV got stuck in snow and nearly flipped over in the river on the way back.

We could perform our dry run of the geophysics experiment. It took us actually longer than anticipated, about two and a half hours for one run instead of the one and a half hour expected. Although we were not yet wearing EVA suits, the cold wind on this bare plain made it so chilly that we had to keep our gloves on and protect our ears and head. We managed eventually to set the line of 24 sensors perpendicular to the rim of the crater and to conduct the seismic tests using the sledgehammer. The idea of this test was to assess that everything was functioning properly. The instrumentation lent by the “*Institut de Physique du Globe de Paris*” (IPGP, Institute of Geophysics of Paris) did function flawlessly and some first measurements could be obtained on the underground structure of the crater rim.



Loading the geophysics equipment on ATV with Kathy Quinn. *Credit VP*



Performing the geophysics experiment in a dry run mode. Notice the Hab in the background. *Credit VP*

I feel much more relaxed now and I realize the importance of meticulously preparing an experiment like this. I owe a lot to Philippe Lognonné and Michel Diamant of the IPGP who gave me an accelerated field training at the Geophysical Research Centre of Garchy a month before leaving. A first glance analysis could show already some asymmetry in the ground structure between the closest and farthest points from the crater rim, most likely due to larger compression of material

close to the crater. This was an excellent first run that bodes well for the future experiments that we will be conducting during EVAs (Extra-Vehicular Activities) from the Hab in the coming week. As this test took us most of the day, the rest of the afternoon was spent preparing for entering the Hab and the hand-over between the two crews.

The sim team changeover is still foreseen at 21 h this evening. We already packed our bags from the individual tents and we are looking forward to sleeping this evening in the space ship.

The weather this evening is turning back to cold and cloudy with some fog. It makes it very humid and everybody is getting back to double layers of fleece and jacket.

So, my next report would be from the Martian Hab. While preparing mentally to be cut off from the rest of the world (except by e-mail) for a week, I'll sign off with a bold "On to Mars".

Vladimir

Wednesday 11th July 2001, day 1

First day spent in the Martian Hab. Great! We were able to sleep in the homey warmth of a space house. What a change after the arctic tents!

But before anything else, let me take you for a tour of our new home. The Hab is a cylindrical structure of 8 m in diameter and 6 m high, with two floors.



The Hab with the Martian flag on top and two ATV to the left. *Credit VP*

The ground floor has two entrances with airlocks used to simulate depressurisations and repressurisations of Extra-Vehicular Activities; a large room used as laboratory for experiment preparation and instrument storage; a small bathroom with a sink and a shower, and an incinerator toilet.



In the Hab, ground floor, left: the EVA preparation room with all suits hanging neatly; right: the lab area with the geophysics experiment equipment unpacked. *Credit FMARS-2 crew*

On the upper floor, accessible by a ladder against the wall, one finds the electronic working area along the circular wall with all computers, radios, and other electronic gadgets, the dining/working/meeting table in the middle, a small kitchen in the corner and six small bedrooms with a door: each has a small narrow stand-up space and a recess in a lateral wall that separates two rooms, one room having the recess on top, the other on the bottom.



In the Hab, second floor, left: top view of the living room with the central table and the circular table along the wall with all the computers and electronic gadgets; right: one of the bedrooms with the recess on top for the sleeping bag. *Credit FMARS-2 crew*

There is just enough room to unroll your sleeping bag on a small bench. In the working area, three circular windows allow you to contemplate the Haughton crater on one side, the Haynes Ridge in the middle, and the lower canal, the small river running downstream.



View of the Haughton crater from the circular window of the Hab. *Credit* FMARS-2 crew

Everything is still freshly built and the previous crew had to finish up on some DIY work of painting, plumbing, and other chores. Well, we did our bit as well as this morning, the entire crew spent 2 h cleaning up the place to make it look like our home for the next week or so.

In this morning briefing, we decided on several rules on how our community will live for the next week. We agreed that one person per day would be in charge of preparing the food and cleaning up. We discussed the need to reduce the number of external visitors in the Hab to two persons at any one time, to make this simulation credible. *Discovery Channel* being one of the main sponsors of this campaign, they have a contractual right to have a cameraman inside at all times, night and day, and to film everything (well, within decency limits, of course). Bob, the cameraman, spent a few nights with us, sleeping in the attic, a small place above the six rooms, ready to film everything and anything, from the breakfast to how we brush our teeth. A little strange at the beginning, we got used to it rapidly and we do not see him anymore after a while. That is what he is asking for anyway.



The first briefing: from left to right, Bill Clancey, Charles Cockell, Vladimir Pletser, Robert Zubrin. *Credit FMARS-2 crew*



The first briefing in the Hab with the Discovery Channel team filming. *Credit FMARS-2 crew*

A first EVA will take place this afternoon, conducted by Robert Zubrin as EVA Commander, Kathy Quinn, and myself. It would be a walking EVA of 2 h in front of the Hab to search for fossils and other samples with biological implications. The EVA would be supported by the rest of the crew: Bill Clancey to document the technical aspect of donning and doffing the suits and of monitoring the communication exchanges; Steve Braham to follow the radio communications; and Charles

Cockell as the microbiologist expert to guide in the choice of rocks and samples to be picked up.

So, after a quick lunch that I have prepared (I took the first duty turn), we started at 13 h 30 to prepare for donning the suits. Although not pressurized, these are actually quite similar to real space suits. The suit is made of a heavy-duty material with a breast pocket and two other pockets on the legs. The suit goes over heavy warm clothes (after all, we are still in the Arctic) and is zipped at the back. A backpack, of about 15 kg, contains the simulated life-support systems, that is a water reserve to drink through a tube and a mouthpiece connected to the helmet, and a battery powered fan for air circulation through two tubes blowing in the helmet. The helmet allows you a nearly 180-degree visibility. You have to don a head set before fixing the helmet to the rest of the suit and to the backpack. Boots and gloves enclose the rest of the body. Two badges on each shoulder: one is the Martian flag designed by *The Mars Society*: blue, green, and red (I let you figure out why by yourself); the other is *The Mars Society* logo. Finally, a badge with our name is fixed by Velcro to the suit breast pocket.



Following the procedures to don the extra-vehicular activity suit. *Credit FMARS-2 crew*

It took the three of us nearly one and a half hours to don these suits. Not bad for a first time. Beating the previous crew who took 3 h for four persons to don the suits. It is true that once outside, we are not supposed to return because we forgot something. The simulation must be as close to reality as possible. Oh yes! I nearly forgot something important: there is no toilet on EVA, you have to take your precautions before.

The three of us enter the airlock, it is a bit tight but it just fits, and we wait the 5 min, simulating a 5-min decompression to equalize the inside and outside pressures. The outside door is opened at three o'clock sharp to find ourselves in front of our friend Bob and his camera. As soon as we are out, we realize that the radio communication does not function properly. Something is wrong with the Vox system that enables one-way communications as soon as you speak loud enough. However, this mode consumes more battery power and apparently, batteries do not recharge well in the cold and humidity of the Arctic. Nevertheless, continuing with hand signals, we decide to proceed as planned, as anyway we are staying close to and in view of the Hab. We start our rock and fossil collection. All of the rocks encountered date from Palaeozoic times, between 300 and 400 million years ago. Some are fossilized corals or shells, remains of intertidal seabed of a few hundred million years old. Others were thrown about by the impact that formed the crater, and are partially covered by a greenish grey foamy layer. We were later on told by Charles, our team biologist, that these are blue green algae, or more scientifically *Gloeocapsa sp.*

Our EVA lasted a little bit less than 2 h under the rain, and was relatively exhausting, as the bulky suit made each natural movement difficult to realize. We collected the sampled rocks with a long scooper and a metallic grabber so as not to oblige the Martionauts to bend too much forward. Because of the rain and the cold, condensation appeared inside the helmet, which made it even more difficult to see clearly, as the rain droplets were already covering the helmet external surface. To make matters even worse, I found that each time I leaned forward, water was escaping from the drinking tube in the helmet and flowed down inside my suit, making this EVA even more humid.



The extra-vehicular activity (EVA) with Kathy Quinn to collect fossilized samples. *Credit FMARS-2 crew*

Upon return, we went through the reverse procedure in the airlock and delivered the samples to the team biologist who started immediately to analyse them. The EVA was most interesting and instructive, but it was with pleasure that we removed our helmets and suits. During the EVA debriefing, it became clear that any field activity under EVA conditions would require more than double the normal time.



Pointing at the fossils. No, Robert Zubrin is in the background. *Credit FMARS-2 crew*

I then prepared the dinner, which consisted of cold tuna fish with olive oil, (warm) rice, and (warm) green beans, with syrup pears and apricots for dessert. Not too bad for a tin can meal!

Tomorrow would be another busy day, as two other EVAs are planned. The morning one would be a motorized EVA to check out the terrain a little farther away from the Hab, the afternoon one would be to conduct our geophysics experiment in Haynes Ridge, in front of the Hab.

As I still have to send my reports and as Kathy is still lending me very kindly her PC (my laptop is still working in a reduced mode), I'll finish here after a very exciting first day in our Martian Hab and I look forward to another field science day on Martian ground.

Vladimir

Thursday 12th July 2001, day 2

Second day in the Martian Hab. It was an excellent and very busy day. The journalist Frank Vizard, from the *Popular Science* magazine, was invited to spend the night in the Hab with us to follow a typical day of work in the Hab. We conducted a three-person EVA lasting 4 h to conduct the Franco-Belgian geophysics experiment. The goal of this experiment was to assess the feasibility of a seismic method by human operators to detect subsurface water on the planet Mars.

The presence of water on Mars is a subject of debate since long among scientists and the issue is far from being solved.¹ Water cannot exist in a liquid state on the surface of the planet due to the low atmospheric pressure (about 7–8 millibars, 125 times less than atmospheric pressure on Earth). Indeed, when the ambient pressure diminishes, water starts to boil and to evaporate at relatively low temperatures. Water can exist on the surface of Mars in the form of ice, as in the polar caps. Water in liquid form is hypothesized to be found underground, maybe trapped in water pockets in rocks. If this is the case (and most likely it should be), it is important to be able to locate these pockets, for two reasons. First, a human crew on Mars could try to tap the water in these pockets and use it for either their own consumption (drinking, washing, cooking...) or by dissociating it (a water molecule H₂O is made of an atom of Oxygen (O) to which two atoms of Hydrogen (H) are attached), to produce Hydrogen (to be used as fuel) and Oxygen (to be used as combustive to burn the fuel or to breathe). Second, if life is ever to be found on Mars, it is more than likely that it would be in the form of bacteria and not little green men like it is sometime believed. Bacteria were found on Earth in the most unthinkable environments, like at the bottom of the oceans, at several thousands of meters deep, under pressures several hundred times the atmospheric pressure, or in volcanoes at

¹Since then, the Mars Odyssey spacecraft seems to have discovered in Spring 2002 indirect evidences of the presence of water ice under the planet surface, and it was later confirmed by the radar sounding of ESA's Mars Express mission.

very high temperatures, or in deep ice, at high altitudes above 70 km, etc. Bacteria can live like that in extreme conditions, without air, but not without water. Find the water on Mars, and you increase your chances of finding life.

This geophysics experiment was proposed as part of collaboration between scientists of the *Institut de Physique du Globe de Paris* (IPGP, Institute of Geophysics of Paris), the Royal Observatory of Belgium in Brussels, and myself. The experiment consists of deploying a line of 24 sensors (called geophones) to be firmly planted in the ground and connected to a data cable (called flute), itself connected to an acquisition system, a sort of field computer. A mini earthquake is generated artificially by hitting with a sledgehammer a metallic plate placed on the ground near a trigger geophone. The generated shock waves propagate in the ground in all directions, eventually reflect and refract on underground interface layers, between different kinds of underground materials. All signals, including those returned from the interface layers, are detected by the sensors, conducted by the geophone flute and recorded in the acquisition system for later analysis. From the calculated interpretation of these data, one can deduce several things, like the average speed of propagation, the geometry and depth of the interface, and the type of underground material. It is in fact the same method that geophysicists use to detect underground oil deposits. This seismic refraction method could be used on Mars during manned missions to detect underground pockets of water. The scientists from Paris and Brussels who co-proposed this experiment are already involved in other automatic experiments to be flown on the Franco-US mission NETLANDER in 2007.²

The aim of our experiment during this simulation is not to test the method (we know that it works), nor to find underground water near the Haughton crater, but to assess whether it is possible to conduct this kind of investigation in the field, in an extreme environment in EVA conditions, wearing a bulky EVA suit, with backpack, boots, and gloves. Well, believe it or not, it worked. It was exhausting but we managed to show that it is do-able.

We started with the traditional day briefing during which all the tasks of the day are distributed, while munching on energy bars. We anticipated that the lunch would be skipped. At about 10 h 30, the four persons foreseen to start the EVA (Robert Zubrin, Kathy Quinn, Frank Vizard, and myself) started to kit up. Frank observed the field operations and returned after a while. Charles Cockell, Bill Clancey, and Steve Braham, stayed in the Hab to support the EVA by monitoring the communications. Bill conducted additional observations on field operations for his research on human factors during EVAs.

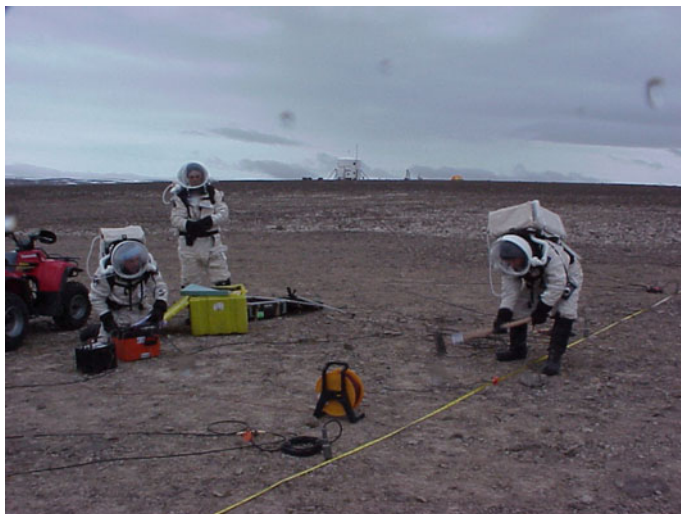
We went out from the airlock at 11 h 15 to load the equipment boxes on the ATV trailer and we wandered to the same location of the dry run of two days ago. However, it took us longer to lay down the geophone flute with the bulky EVA suits.

²Unfortunately, this NETLANDER mission was cancelled in 2003 for budgetary reasons.



Unloading the ATV and installing the geophysics experiment equipment. *Credit FMARS-2 crew*

At some point, my helmet was totally fogged up, and as I could not clean it with my nose, ears, or head, I just had to suck some water from the tube and to expel it off on the inner surface of the helmet while leaning forward to wash off the condensation. Not very hygienic, but it worked. Later on, it started to rain and a westerly wind started to blow. A few other mishaps happened, e.g. when running the setting test on the acquisition system, I could not bring the screen up to a visible brightness level. Stupid and so simple to do in the lab or in the office, but try to do that with thick gloves (like ski gloves), in the rain and the cold with a helmet half fogged up. For my defence, I have to say that activating the keys on the keyboard with gloves was not possible and I had to rely on an additional tool, a small screwdriver, to press the keys. This took us quite a while, but we could eventually complete the experiment. We ran the three series of tests, with the mini-earthquake generated in the middle and at both ends of the geophone flute. Each test involved ten shots with the sledgehammer. MIT Geophysicist Kathy Quinn mastered the art of hitting the hammer and performed this chore with success, each time managing to miss the trigger geophone.



Performing the geophysics experiment: from right to left, Kathy Quinn hits the slammer hedge, Robert Zubrin supervises and Vladimir Pletser check the data acquisition unit. *Credit FMARS-2 crew*

After successfully completing this series of tests, it was time to pack up, avoiding knots and entwinement in the one hundred metres of electric cabling. We went back home, to our Martian Hab, completely wet from the rain and the sweating and cold but happy of this first success. The EVA outing eventually lasted for 4 h and the whole EVA activity, including donning and doffing the suit, took more than 5 h. It was really exhausting but extremely interesting. I cannot wait to go back for a next EVA, which probably will happen on Saturday.

A word about our life in the Hab. This morning, we woke up to a strange smell in the Hab: the toilet incinerator did not work properly overnight and the toilet overflowed. So, someone (not me, luckily) had the unpleasant task to clean up the mess and fix the plumbing. It is again a trivial story and I apologize for that, but it shows an important aspect of human exploration. Wherever human beings would go, they would carry with them their daily problems, even the most unpleasant ones, and they would have to deal with them, like a crew would have to do on board a Martian spaceship. No way that you could call the plumber between Earth and Mars: you have to repair it by yourself. We could have interrupted the simulation and left the Hab while waiting for it to be cleaned and repaired. But no, we decided to stay and to continue the simulation following the rules. Nobody leaves without EVA suits and there is no external help, you do it yourself. The DIY capabilities would certainly be very high on the list of requirements for candidates to a first manned Mars mission.

The long EVA having consumed most of the day, the rest of the time was shared between writing scientific reports, daily diaries and other reports, and interviews for the *Discovery Channel* and Frank Vizard. Our dinner was prepared by British chef Steve Braham, and he did a good job with a combination of couscous with

vegetables and spaghetti with a chicken white sauce. Surprising but excellent when you are starving. The weather is awful as a storm is blowing with heavy rain and some snow is forecast for tonight and tomorrow. But, moral is high on arctic Mars. With friendly Martian greetings.

Vladimir

PS: If you did not find the reasons for the colours of the Martian flag I was telling you about yesterday, here they are: blue represents Earth, mankind cradle; red is for the Mars planet of course; and green is the colour that Mars would eventually take after Terraforming, giving a breathable atmosphere to the red planet. Another reason: this colour combination was chosen after Kim Stanley Robinson's novels 'Red Mars', 'Green Mars', and 'Blue Mars', that I recommend.

Friday 13th July 2001, day 3

Third day in the Martian Habitat. It was a quiet and relaxing day. Nothing you can do against the arctic weather: it was sleeting and raining all day long. No way to go out. We had to stay inside. We had hopes to carry out a short EVA to the weather station down by the airstrip to replace some electronic components but in view of the amount of rain falling and the increased level of the river, that idea was postponed until better weather. So, we cleared up a little bit the house. I took some photos of our Hab to better explain how we live with six persons locked in the Hab.

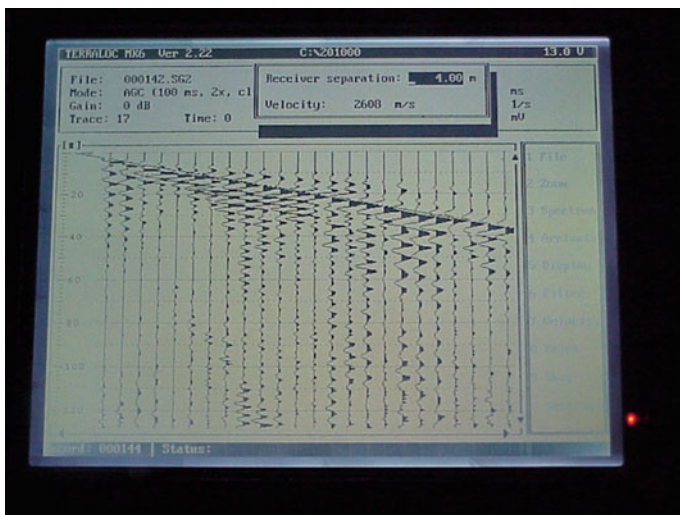


In the Hab, second floor, left: the living room with the kitchen corner and the sleeping rooms; right: crew working and interacting. *Credit FMARS-2 crew*

Two persons could take a shower today, Steve and Charles, being the longest in the Hab, were the lucky ones today. As one of the human factor experiments to which we participate, is to assess the overall water consumption of a confined human crew of six, we were asked to spare the water and to use only what is deemed essential. There are no restrictions for the direct consumption of water to drink and prepare food; we have to be cautious for the rest. This means that we wash with a glass of water in the morning and that is practically all. The showers for the rest of the crew would be for another day, and again, it would be with cold water (understand: melt ice or snow) and Navy-style showers, i.e. under the shower, water

on, get wet, water off, soap up, water on, rinse off, water off. *Et voila!* Anyway, one gets used to this style of living very quickly and it is still bearable: the constant day light, the occasional washing up, the lack of fresh food, the confinement, and the living together. Luckily, we are getting along well and there is no interpersonal conflict among the crewmembers.

I spent the morning checking the results of the geophysics experiment we did yesterday and to send the data to my colleagues in Brussels and Paris by e-mail, still from Kathy's laptop. It looks rather interesting, although we did not find any water under the Haughton crater.



View of the screen of the Terralog, the field computer for the geophysics experiment. *Credit VP*

The afternoon was spent reading and finishing reports. Robert Zubrin insisted on playing Martian chess, a combination of normal chess, card game, and dice throwing. We did not try yet, but he slaughtered me at normal chess. I am not a master player, just an interested amateur, but I did not see anything coming during that game.

In this morning briefing, our Commander Zubrin decided that, in view of the good performance of the crew these last three days, we would be rewarded by watching a DVD tonight. The crew's choice fell on "Vertical Limit" with Sylvester Stallone. As I do not want to miss the beginning of the film and the meeting planned just before, I'll finish here this short report. So, despite the weather, moral is still going well and we are looking forward to another EVA day tomorrow.

Vladimir

Saturday 14th July 2001, day 4

Fourth day in the Martian Habitat. After yesterday's forced quiet day due to bad weather, we had a social family evening. We had first a meeting regarding some

safety and health issues regarding the toilet that is still causing problems. Yes, it is not over yet. But a number of measures were decided. This incinerator toilet is not designed to be used by six persons and it appeared that the liquid production is too large to be handled by the incinerating system. So, we built a urinal linked to an emptied fuel tank and everybody uses his/her personal bottle for..., well you see what I mean. That seems to work. Then, the problem of paper bags for this incinerator. Normally we use a paper bag made of moistened paper that helps to burn solid waste. Here also we had a problem as we ran out of these special paper bags. Instead we are now using normal paper, which increases the risk of fire. But again, it works. We were not going to stop space exploration of Mars for plumbing and toilet problems. But again, it shows the importance of this facet of human life. I start to suspect that the first Roman engineers who invented the public urinals and later on the sewerage system to be benefactors of humankind. But one can still ask the question: which tortuous ways science must take to progress?

After getting a little irritated on these subjects, we could relax watching the film “Vertical Limit”. The projection of this DVD on the circular wall was somehow strange as it was still daylight outside although close to midnight.



Watching a DVD in the Hab. *Credit FMARS-2 crew*

I brought with me a box of Belgian chocolates and it was an excellent occasion to demonstrate once more that Belgian chocolates are the best in the world and that they can be appreciated even in the arctic, watching a good movie. I suppose that it did help also to relax the atmosphere.

Today was again a busy day. This morning we conducted our third EVA. Although initially planned to start at 9 h 30, it was delayed by nearly 2 h due to power problems in the Hab and shortage of portable radios for the EVA. Electricity

is produced by a generator working on fuel that you have to refill regularly. Steve, our engineer for the technical aspects of the simulation and of the Hab, is in charge of pampering the generator that sometimes, like this morning, has its own way. A problem of overload and fuses, eventually solved.

Our EVA was a motorized four-person EVA. Our biologist Charles Cockell was the EVA Commander, Bill Clancey, Kathy Quinn, and myself were the other crewmembers. We used four ATVs, accompanied by Joe Amaralik, the Inuit bear hunter and his shotgun, in case we would encounter some local wildlife.



Getting ready for the EVA, we dress in turns as there are not enough room in the EVA preparation room. Left: Bill Clancey helped to don his suit; right: communication radio check in the living room. *Credit FMARS-2 crew*



Kathy Quinn and Vladimir Pletser wishing each other good luck for this EVA. *Credit FMARS-2 crew*

The goal of this EVA was to deploy some cosmic radiation dosimeters and to collect microbial samples from inside the Haughton crater. We ventured inside the Haughton crater, anticipating to be blocked by the mud at some point, but we were lucky to reach our destination, Trinity Lake near Breccia Hill in the crater, without stepping down from our ATVs. The dosimeter deployment was successful. Some were installed under about 30 cm of breccia rocks, some deployed on the surface, some near the lake, and some in the lake at a depth of 30 cm.



Charles Cockell and Vladimir Pletser installing the dosimeters in the Haughton crater under the breccia rocks. *Credit FMARS-2 crew*

It is important to be able to measure correctly the radiation exposure on Mars, as Mars does have a very weak magnetic field, practically negligible compared to the Earth one. On our planet, the natural magnetic field protects us from these radiations by deflecting energetic solar and cosmic radiations. On Mars, as the Martian magnetic field is so small, radiations fall practically without being deflected, which has important consequences for the evolution or extinction of any potential form of primitive life and for the protection of the first human crews. In addition, Devon Island being so close to the North magnetic pole (only about 200 km away), it is also interesting to measure the cosmic radiation intensity reaching the surface of the Earth close to the pole, where the lines of the magnetic field come out of the planet surface and offer slightly less protection against radiations.

The other goal was to collect a series of microbial samples living in rocks and in lakes to further analyse them back in the Hab. On our way back, we took advantage of the EVA expedition to scout the terrain for our second deployment of the geophone flute. We visited four sites, three of them in the crater: the first one close to Trinity Lake, the second one at the bottom of a small valley at the intersection of two small rivers, the third one on the inside rim of the crater, and eventually the fourth on the crater external rim. We could not decide on any of them for the moment and we are evaluating other options. We have also to consider the weather. As you know by now, it is an important factor in the Arctic. The weather today was

extremely windy from the South, at 60 km/h with a protected temperature of 4 °C (so the chill factor must be added...). The weather forecast looks better for Monday than for tomorrow, and as the geophone deployment in EVA suits is quite tiring, we could decide to deploy on Monday, which would leave us tomorrow to conduct another exploratory EVA. Furthermore, we would like to make the geophysical sounding of a pingo, a mass of water ice in the ground. But we are not yet sure if there are any at a reachable distance by ATV. So, we are still debating the issue.

This evening, we are promised a shower. Yahoooo! The first one since I left Resolute just a week ago, and it is about time. Also, if all reports are completed in time, we will watch another DVD this evening, so that is why I will finish this report early this evening. Our Commander Zubrin will cook dinner this evening. Apparently, a surprise, but we expect the worse!

Moral is still high (although we will see after dinner...), the remaining Belgian chocolates are excellent, and I'll sign off to run under the shower.

Vladimir

Sunday 15th July 2001, day 5

Fifth day in the Martian Habitat.

Good news! We survived the Commander's spaghetti sauce last night. We did not watch a DVD yesterday night. Instead, we had a very interesting battle between humans and the power generator. Steve Braham, our Chief Engineer, was shuttling back and forth between the Hab and the power generator trying to reset it each time it failed, which was about every 15 min. We feared that the generator would eventually win and we were about to take bets. But eventually adding some fuel did the trick. Yes, the fuel tank was simply empty. Ah! Technology!

Our fourth EVA of today was a three-person expedition which lasted two and half hours. Commander Zubrin, MIT Geophysicist Kathy Quinn, and myself went on a scouting expedition, accompanied by Joe, the Inuit bear hunter, to try to find out new potential locations to deploy the geophone flute for our geophysics experiment. We went to the *Von Braun Planitia*, not too far from the Hab, although it took us 30 min to get there with the ATVs and crossing the river. We found two potential locations, which were neither too muddy nor covered by too many loose pebbles and rocks. Pushing it a little farther, we came to the end of the *Von Braun Planitia* and continued our exploration by crossing another river and trying to climb the ridge. As Commander Zubrin let me to lead as I am supposed to be the expert to assess which place would be suitable, I tried first to climb through the snow patch and the rocks, but the ATV did not hear it the same way and tried to kick me off. So, we decided to turn back and return through a safer way.



Leaving for the motorized EVA, left: from left to right, Robert Zubrin, Kathy Quinn, and Vladimir Pletser; right: Joe Amalrik, the Inuit hunter and his shotgun posing between Robert Zubrin (left) and Kathy Quinn. *Credit FMARS-2 crew*

During the debriefing, we discussed the merits and disadvantages of all sites visited yesterday and today, and we suggested to perform the seismic experiment at one of the locations in the Haughton crater, the one between two little rivers at the bottom of a valley. Several reasons pushed us to that decision. Firstly, all the sites visited are either too muddy or covered by too many loose rocks. Secondly, the area is mainly made of dolomite (a sort of carbonate and magnesium rock), so repeating the measurements that were done a few days ago in another area would not bring any new data. Thirdly, we could not find for sure any clues to pingos or ground ice in the *Von Braun Planitia*. And fourthly, the accessibility by ATVs with a trailer carrying 130 kg of instruments is also an important factor; currently the crater is more accessible than the surrounding area. Furthermore, measuring seismic data inside the crater is also quite appealing as there would be some interest for human crews to measure underground structures in certain craters on Mars. So tomorrow, it will be on to the crater.

We would like to conduct the measurements with the two kinds of seismic sources: the already used sledge hammer and the thumper geophysical gun, allowing to shoot shells vertically down in the ground, generating the needed mini-earthquake. It will be a very long EVA expedition, certainly 5 h or more. So, this evening, early to bed. As we could not watch a DVD yesterday, we will watch it tonight. And guess what? It will be “Mars Attacks”, to stay in the mood.



“Mars Attacks” is a cult movie and was so much enjoyed in FMARS. *Credit Warner Bros*

So, all in all, everything is going well. I am a little disappointed since so far, we did not spot a single polar bear. But who knows? There is another two days of EVAs and expeditions to go. So, let us hope.

Charles is cooking dinner tonight and it will be rice with chilli con carne, and for dessert, a mix of Belgian chocolates and canned fruits. Why not after all? On Mars, let's do like Martians would do, and in the Arctic, like iced chocolates... Signing off from a very foggy and humid Haughton crater.

Vladimir

Monday 16th July 2001, day 6

Sixth day in the Martian Habitat.

After the “quack, quack” of “Mars Attacks” last night, we kept on quack-quacking this morning showing that the mood was optimal for the most important EVA of our stay. It was also the most ambitious. We planned to deploy the geophone flute in two perpendicular directions in the Haughton crater, and to conduct six series of measurements, including ten shots with the sledgehammer in stacking mode and one with the geophysical gun at each of the six locations. This

was to be executed by a four-person crew during an EVA of at least five hours. Kathy Quinn gave her place in the crew to Charles Cockell, as his knowledge of ways around the crater could be useful. The other three persons were Robert Zubrin, Bill Clancey, and myself.

After having cooked a warm breakfast (that is throwing the contents of a corned beef can in a pan) and swallowing everything, we started to prepare at around ten o'clock.



Getting ready for the EVA, left: Kathy Quinn helps Robert Zubrin and Charles Cockell to suit up; right: Steve Braham with Bill Clancey (right) and Vladimir Pletser both very confident. *Credit FMARS-2 crew*

I have asked by radio that Camp Manager Joe Schutt review with me the procedures to use the geophysical thumper gun, using the same shells as the shotguns. After having loaded the trailer, we were all ready to go at around 11 h 00. Charles was leading the way and I was riding the ATV with the trailer and the 130 kg of instruments in second place, followed by Robert and Bill. The weather was cloudy and drizzling. Not really ideal, but on Mars also, we would not have nice weather every day. We expected to find some spots of mud and the instructions given to Charles and I were simple: respectively avoid mud and above all, do not stop in the mud!

Yes, easy to say. Well, we did find some mud *en route*, but it is the mud that stopped us. An enormous pond of mud, invisible from far away. As I was driving this ATV as fast as possible trying to avoid getting stuck in the mud, my speed gradually and desperately decreased in this huge pool of mud. But to the defence of Charles who was leading the convoy, the area looked dry from afar. So, Charles managed to pass but not my ATV with the trailer and the 130 kg. Coming to a stop, I could feel the ATV and the trailer sinking in the mud. I came off the ATV and immediately sank as well! Up to the knees! Unbelievable! I had more and more difficulties in moving, as this mud was so sticky. I immediately thought about the sucking of quicksand. Exactly the same effect! Luckily the others on their single ATVs, after escaping a similar fate, came to my rescue.



Falling up to the knee in the arctic mud, left: Robert Zubrin came at my rescue; right: finally, up on my own feet. *Credit* Discovery Channel

After debating on what to do, whether we should pull the ATV and the trailer with the other ATVs or unload the trailer and leave the boxes in the mud, we tried every possible combination of pushing and pulling by hand and by ATVs but to no avail. It was appalling. Each one of us in turn was falling in this mud and had to help each other to extract ourselves from this viscous and sticky coating of mud. After more than an hour of falls, of miry discussions and muddy trials, we had to seek external help. John Schutt and the team of the *Discovery Channel* accompanied us, the first one with his shotgun, the others with their cameras to record for posterity this Berezina. John finally threw us two rolls of ropes that he had the intelligence to take with him and he suggested attaching two ropes to my ATV, now sunk in up to the seat, and to pull it with the three other ATVs. The trailer had sunk up to the bodywork.



The trailer with the 130 kg of equipment sank in the mud and could not be pulled out by two or four people with muddy and wet EVA suits. *Credit* Discovery Channel

Everybody was in the mud up to mid-thigh. I asked myself why I was not sinking any deeper and why my feet were so cold. And then, I understood. First our EVA suits were not waterproof and water was infiltrating inside the suit and in the boots. And second, the reason why we would not sink any deeper was simply that we were standing on the layer of permafrost, the layer of ground permanently frozen under polar latitudes. Luckily enough, the permafrost layer was not any deeper as we would have sunk even deeper.

Eventually, combining our pushing efforts and the pulling of the three other ATVs, everything started to move, slowly. My ATV came back to the surface while slowly moving forward to finally stop on firm ground, a few metres farther. Meanwhile, after having pushed at the back of the trailer, I fell on all fours in the mud and once again, it was impossible to move. As my cable antenna broke off the radio box during an earlier fall, I was off communications: to call was impossible and any way, without hands, I could not activate the radio push button. Once again, I felt myself being sucked by this mire, but this time I was on my hands and knees. Fortunately, one of my companions still standing saw me and came quickly to lend me a rescuing hand. Once out of the mud and back on solid ground, we reviewed the situation. It was not glorious. We were all covered with mud, the helmet nearly completely covered.



Pulling the ATV trailer out of the mud finally worked with additional ropes (left). Robert Zubrin nearly unrecognizable with his helmet covered with mud. *Credit* Discovery Channel

Without radios, we could no longer communicate by voice nor by signs; we had lost more than an hour and a half and we were exhausted from this battle with the arctic mud. Furthermore, the weather was getting worse and worse. Shouting to each other through our mud-covered helmets, we eventually managed to make the only possible decision: to abort the EVA expedition and to return to the Hab. I felt most unhappy and frustrated by the situation, as it would mean to renounce to conduct our experiment and to come back without data and without scientific results. I do not like that and I hate giving up. But considering the conditions and the circumstances, I had to recognize that it was the wisest decision to take. We were hoping to come back to the Hab, to get warm and to get some rest.

But it was not to happen so easily. Having turned back, following another way and driving cautiously because of the dried mud covering our helmets, the ATV with the trailer that I was driving again got stuck in another pool of mud, again invisible from afar. This was unbelievable! A real nightmare! The last time that a similar situation happened to me was in Africa twenty years ago, where we got stuck several times with motorbikes and jeeps in flash rain and laterite mud. But here in the Arctic, nobody could have imagined that we would have so much rain in the last weeks to the point where it was difficult to move around.

Once more, knowing the tune by now, we eventually managed to pull the ATV and the trailer out of the mud, again in EVA mode, that is still wearing our space suits. Again, pushing the trailer, I fell on my hands and knees in the mud, but this time I had mud up to my shoulders and hips being on all fours on the permafrost in fifty centimetres of arctic mud. Luckily once more, one of my fellow crewmembers could help me out of it, as on my own, I would not have made it out. And once more, we left by another route.

Finally, we made it home, to the Hab, exhausted, after three and a half hours of a muddy EVA. Once inside the Hab, we burst out laughing seeing each other transformed into living statues of mud. Kathy and Steve, who stayed in the Hab and worried to be without any news by radio, looked at us as if we were becoming mad. It took us another half hour to take off all the suits and the undergarments totally soaked with mud and icy cold water.



The four crew members back in the Hab from a very muddy EVA (left) and taking the suits and the mud off in the ESA preparation room (right). *Credit FMARS-2 crew*

Slowly and step by step, we got warm again, washed ourselves, ate something, and started to feel like humans again.

Andy Liebermann, the *Discovery Channel* team leader, was exulting. He filmed the best images of the week. No doubt that he would exploit this disaster and show it as the story of a crew lost during an expedition in the Martian mud (although there is no mud on Mars...). We decided to give ourselves 2 h of rest before debriefing. Meanwhile, the *Discovery Channel* guys interviewed us individually to have the story told by each of the survivors of this unforgettable expedition.

At the debriefing, still being unhappy of the outcome of this EVA, returning without any results, I remarked that we could have chosen another route, or

requested outside help sooner which would have allowed us to continue. But what was done was done, and there was no point in rehashing the past.



Post-EVA debriefing, nobody smiles; from right to left: Robert Zubrin, Bill Clancey, Vladimir Pletser. *Credit FMARS-2 crew*

Nevertheless, everybody agreed that it was the most difficult EVA outing, that nobody could have imagined so much hidden mud and that it was the worst muddy experience that happened so far in all arctic campaigns. Of course, there is no mud on Mars, and as such, this simulated EVA was not representative of a Martian activity or of environmental conditions that astronauts would encounter on Mars. However, from every experience, positive or negative, there is always some conclusions to be drawn, some lessons to be learned. In this case, the way that the group managed to function in such adverse conditions and the interactions among the four EVA crewmembers could be monitored by Bill Clancey, from inside the group. No doubt that a human crew on Mars would have to face critical field situations, and the way that we acted in unexpected and repetitive situations allowed to pinpoint several important aspects: the breakdown of communications with the control centre of the Hab and among us, the need to improve the helmet visor (try to brush up a muddy visor with muddy gloves and you still see nothing), the decision chain several times broken, etc. All this would have to be analysed in depth in the coming months. So, in that sense, it was an instructive day. But unfortunately, not for our geophysics experiment. Anyway, to give it an additional

chance, we decided to try again to deploy the geophone flute tomorrow, weather permitting, on Hayes Ridge in front of the Hab to complete the three-dimensional characterization of the underground structure of the crater rim. Too bad for the crater. It is still raining and the fog thickens.

With very muddy Martian greetings.

Vladimir

Tuesday 17th July 2001, day 7

Seventh and last day in the Martian Habitat.

This is my last entry in this Mars simulation diary. It is just midnight and I am back at Resolute. The sky is bright blue and the midnight sun is still shining high. Again, what a day! It seems to me that every day spent in the Arctic is exceptional, in one way or another. And what splendid weather today! As an old Inuit saying, that Aziz just invented, goes: “If you don’t like the weather, wait 5 min: it will change”. Well, it has certainly changed, compared to the miserable drizzle and mud we had yesterday. But let me start back from the beginning, which means yesterday evening.

After having finished our daily reports, the entire crew was feeling a little bit down and exhausted after yesterday’s disastrous EVA expedition in the crater mud. The idea of repeating our geophysics experiment on Tuesday afternoon comforted me: after all, all was not lost. We treated ourselves also to spaghetti with a tin canned salmon sauce prepared by Bill Clancey and we sat down to enjoy Monty Python’s search for the “Holy Grail”. Although relatively old, this DVD made us laugh again.

This morning, waking up to a blue sky, it was time to fill in our psychological questionnaires from NASA and from Dr. J. Lapierre, a psychologist from the University of Quebec. We started full of enthusiasm but after an hour, we realized that it would take us far too long into our last day to complete them. Furthermore, we were informed by radio that there would be only one plane from Resolute to Devon Island and back in the coming days, and that it will be this evening at 6 h 00. Isn’t it ironic: bad weather, the planes can’t fly; good weather, the planes are suddenly all busy and they cannot come to Devon, as they have to service other arctic stations. So, as I have to catch a plane from Resolute Thursday morning at 4 h 30, I had to be on this Devon-Resolute plane.

So, suddenly it was all rush, to pack the bags and to prepare for the afternoon’s last EVA. We left our questionnaires for later and we concentrated on cleaning the EVA suits from the dried mud.

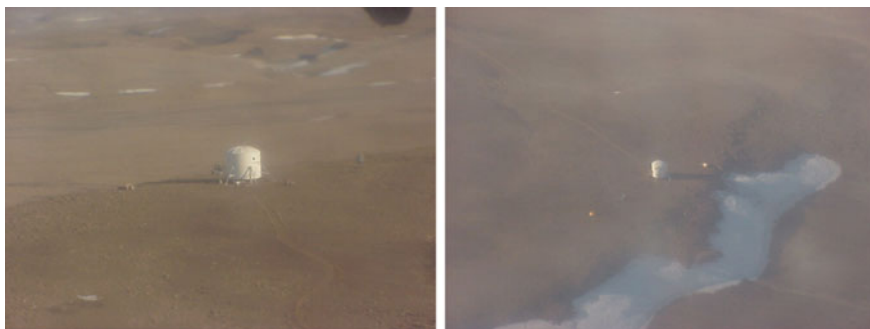
The afternoon EVA was a three-person EVA with Robert Zubrin, Kathy Quinn, and myself and lasted two and half hours. We went to Haynes Ridge in front of the Hab to deploy the geophone flute in the direction perpendicular to the crater rim, to complete the three-dimensional sounding of this part of the crater rim, after last Thursday’s first part. It was rather warm, up to 8 degrees Celsius (above zero!) and again we were sweating and exhausted from the heat this time. Some journalists and cameramen from *CNN* just arrived and we put on our best smiles, although it would

probably not be visible on TV, and we managed to finish all the measurements in time in front of the *CNN* cameras. Data were saved and I will send it tonight by e-mail to my colleagues at the *Institut de Physique du Globe de Paris* and at the Royal Observatory of Belgium for further processing. We came back in time to pack all the instrumentation to return to France and to prepare for leaving the Hab. The three crates of geophysical equipment were still full of mud from our expedition of yesterday and I would have no time to clean them before loading them into the return plane. I hope that my colleagues in Paris would understand the difficult conditions in which we had to operate here.

The new crew has already arrived on Devon Island Monday night, and the changeover was foreseen at 21 h 00, except for me who left immediately for the base camp to catch the six o'clock plane. What a strange feeling to walk outside for the first time without the bulky EVA suit and helmet, and what a mixed feeling of joy and sadness to leave the Hab to return to civilization (to base camp first) and the crew with whom I shared this unique experience.

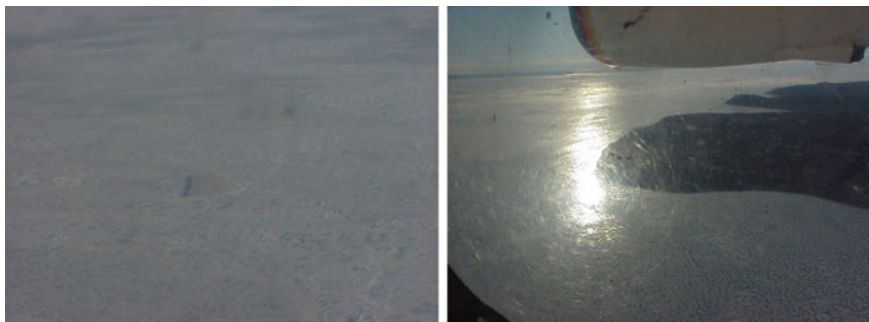
At the base camp, I met with Dr. Pascal Lee, the Chief Project Scientist of NASA AMES Haughton Mars Project, and we discussed potential future collaboration, which sounds rather interesting. I shared the base camp evening dinner, a giant Mexican omelette with green peppers, black beans, and salsa sauce. We exchanged views with the new crew on the Hab experience. And suddenly, it was time for me to leave Devon Island. The plane was there and all the equipment was on board. Scientists, doctors, cooks, camp managers, everybody helped to carry the loads and bags into the plane, the only link between this unique island and the rest of the planet. I shook hands with everybody and we exchanged our good byes and our wishes of staying and of leaving, and we took off into the infinite blue sky.

What a beautiful place seen from the plane, with a breath-taking view of this arctic desert with snow patches and this blend of brown and grey colours. Already the Hab was left behind, a little white dot on the rim of this huge crater, so similar to Mars in its desolate and scarred aspect and at the same time so hospitable unlike Mars.



Two views of the Hab from the Twin Otter plane leaving Devon Island for resolute. *Credit VP*

Flying above the frozen sea, we spotted a huge iceberg trapped in the sea ice. The flight lasted 45 min as it did a week ago. After landing at Resolute, we were greeted by Aziz and Colleen Lenahan, the NASA HMP logistics manager in Resolute. Temperature was a summer high of 12 °C, nearly unbearable.



Iceberg in a sea of ice from the returning plane (right). The sea of ice under the sun from the plane. *Credit VP*

I was looking forward to my first hot shower at Aziz' hotel and it was even better, as there was a Jacuzzi bath in the room. Yes, I confess: while I was relaxing in the bathtub, I had a thought for my companions who stayed at the base camp spending their first night out of the Hab and for the new crew starting their simulation with the same enthusiasm that we had a week ago.

Simple pleasures in life take on another dimension when you have been deprived of them for some time: a warm shower, soap, and tonight a real bed, after nearly two weeks of sleeping bag, camping, and sponge baths in the Hab. But don't think that I have softened; I could have continued for some time this Spartan regime. But it is so good when it stops!

All in all, thinking about these two weeks, it was a great experience. I met so many interesting people and we went through so many different experiences, sometimes difficult, but always rewarding. One always comes back richer of new experiences after an adventure like this.

A long trip awaits me now for the next three days. After Devon-Resolute tonight, Thursday morning, I will start my return journey to Europe: it will be Resolute-Yellowknife Thursday morning at 4 h 30 in the morning, then Yellowknife-Edmonton. Then the whole day in Edmonton waiting for the plane Edmonton-London on Thursday night and finally the plane London-Amsterdam to arrive eventually Friday evening. Next week, I will be gone again, but on mission for ESA. I will travel to Bordeaux, France, to take part in a parabolic flight campaign organized by ESA for student experiments. Weightlessness during these parabolic flights will be a little bit like the weightlessness that astronauts would encounter returning from the planet Mars to Earth in an interplanetary journey after a stay on Mars (well, relatively speaking of course).

I am looking forward to returning one day to the arctic 24h daylight in this unbelievable place, maybe next year. Nevertheless, the final word of this diary should be a sounding “on to Mars!”

Vladimir

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On To Mars!

Chronicles of Martian Simulations

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