NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY 2 TRANSCRIPT

JEAN-LOUP J.M. CHRÉTIEN
INTERVIEWED BY CAROL BUTLER
HOUSTON, TEXAS – 8 MAY 2002

BUTLER: Today is May 8, 2002. This oral history with Jean-Loup Chrétien is being conducted for the Johnson Space Center Oral History Project at the office of the Signal Corporation in Houston, Texas. Carol Butler is the interviewer and is assisted by Sandra Johnson and Cassie Cowan.

Thank you very much for joining us again today.

CHRÉTIEN: You're welcome.

BUTLER: The last time we talked about your two missions with the Soviets. After you came back from that one, you were still involved with CNES, the French agency. How did the opportunity arise for you to come over to NASA?

CHRÉTIEN: I was the head of the Astronaut Office in France, where we had around ten astronauts, and all—most of us, most of my team, was involved in the study and development, research and development program of the French participation to the European space program, in which we had the main project which was a small space shuttle that was born in 1985, I think, yes, 1985. Then that project got cancelled in 1992, [19] 93, was not realistic anymore. And so when that was cancelled, I had ten guys in charge in my office, and had to keep them and try to find more spaceflight opportunities and mostly for those who didn't fly. So flights in Russian

were not easy to find also. We had in mind to transfer slowly all of the astronauts in different countries in Europe to ESA, but that would take ten years. So, again, it was difficult to find flights for all the guys.

So I knew Mr. Abbey very well, George [W. S.] Abbey, at that time. So I called him for a meeting to see if we could do something here, at least transfer a couple of guys and just join a class and maybe got qualified and not get a flight, because France did not have direct opportunities to cooperate with NASA at that time, and to the point where we could be given a flight opportunity. So I met Mr. Abbey, and the meeting was supposed to last one hour; it lasted three minutes. George told me, "Okay, I understand, well, there is no more work in France." He said, "Okay, there is work here. Do you want to come down here? There is work on the ISS [International Space Station] program. Your expertise with Russia will be helpful for us. So are you ready to come?"

I told George, "Yes, but not me. My—."

"No, no, no. You come first, and then we'll take one of your guys in a couple of months. Are you—?"

I say, "Yeah, I can come." I went back to France.

A couple of days go, he called me again and said, "Can you come next week?"

And I say, "Yes. You want another meeting?"

"No, no, no. You take your luggage and come down here." So that's how it was done.

BUTLER: So you came down initially in an advisory type of capacity?

CHRÉTIEN: Yes. [ISS] Phase I started maybe one year ahead of that, and, of course, they were looking for a kind of expertise to help with the Russian program. That's the way I came down here, and we called a second [French] astronaut a couple of months later, two or three months later. So the idea was that he would follow the class of [19] 95 of NASA astronauts and that I would keep going on that expertise as an astronaut and stay in the Astronaut Office of NASA but be a counselor for all this kind of stuff. But that was that idea of Bob [Robert D.] Cabana as the head of the Astronaut Office. And Mr. Abbey said, "No, no. The two of them go to the class, and I want them to go through the class of [19] 95." So I got the oldest astronaut candidate in that class and joined the class, so that I got the full level after one and a half year.

BUTLER: Did you participate in most of the training then with that new class, or had some of what you had been through—

CHRÉTIEN: No, but it's mandatory. I have to agree with that, that here, and I think it's the U.S. way and probably in the military, too, to be very strict in what you ask people to do if you want them to get that label. If you want to get that label and title of mission specialist or pilot, you need to do all of it. But that was a pleasure, a nice opportunity.

BUTLER: Well, what did that training consist of in general? What were some of your impressions of the training?

CHRÉTIEN: It's a long training. In fact, it's not the training; it's qualification, like in commercial aviation when you go to get qualified on a new airplane. Here you want to qualify people for the

Space Shuttle flights. So it's mostly classes, but all the systems are special. It's a special 85 percent. And also simulators, they have simple simulators in which you go—I think it was like three, four times a week in those specific sims, those sims where you had the specific training on what you had learned the week before, just to practice on the systems. So it can be the computers. It can be the engines. It can be electrical power, hydraulic, whatever. So you spend a couple of hours with an instructor, and most of the time with a second guy. There are two astronaut candidates and an instructor, and you go through the checklist and a malfunction checklist and learn how the systems work.

BUTLER: When did you learn that you were assigned to STS-86?

CHRÉTIEN: I think, like, eleven months, ten, eleven months. I think that was November in [19]96, yes, one year before.

BUTLER: And at that point was the full crew assigned, which included Mr. [Vladimir G.] Titov from Russia and—

CHRÉTIEN: I think so. We were all, yes.

BUTLER: And what did your specific training consist of, once you began training for that specific mission? How did that—

CHRÉTIEN: So as a mission specialist, first the commander of the crew, we had the first meetings with the crew, crew meetings where you look at the tasks, and the commander gets a list of the tasks that will happen during that flight and asks everyone, "Who is candidate for this, this?" and tries to share those tasks between the crew members. So there are specific tasks for the mission, I mean which are required for each mission, like payload bay opening and SPACEHAB. We had a SPACEHAB module, also. I got the SPACEHAB active, activation of SPACEHAB, deactivation of SPACEHAB, stuff like that. So this is required for each mission.

It's a long training for those specific tasks that you need to do every time even if you fly one year after that flight. Then you have the training for more specific tasks for the mission itself, the mission to Mir, like cargo transfer, payload transfer, payload activation, and deactivation. So we tried to share those specific tasks to the mission between everyone, and the other tasks, I would say the flight plan tasks, the required tasks that you have on any Shuttle flight, also between everyone, so that you have a good balance between operational tasks and mission tasks.

So you do that, and then training starts, like three weeks later when everyone is ready and knows exactly what he will have to do. And also the instructors know, the crew knows. You also need to go for some kind of requalification on some systems if you have not flown for a long time, or for us coming out of the class one year before. So you go on each system with an instructor, and he makes sure that you are still current enough, and you get requalified. Then the crew training starts.

BUTLER: How different was this training for you, for this mission, as compared to your missions when you flew with the Russians before?

CHRÉTIEN: I think the main difference is the system is much more complex, Space Shuttle is much more complex than Soyuz, of course. And even if you are considered as a crew member of the Soyuz spacecraft and on the third seat—I mean, the Soyuz, you are in it, like those two days' navigation to the [Mir] Space Station, even one day, that could be shortened in a few hours, and then at reentry is also—and you can imagine, the small spacecraft is very simple compared to this big machine which is the Space Shuttle. So the training is much less complex, much less demanding.

In here, in that big spacecraft, seven people have a lot of work to manage each system and each event, because there are a lot of events during the days you are on Shuttle, and here on the Shuttle, you don't spend just two and a half days on mostly waiting. You spend the twelve days on the mission, even if you go to Mir and go back and forth in Mir, the Space Shuttle is, again, that big thing in which you have all of your systems, whatever it is, the galley, the food, the water. You have to manage all of the systems even when you are docked to Mir.

When you are in a Soyuz, as soon you get docked to the Space Station, the Soyuz goes to sleep, and you visit it maybe a couple of times a week, each of us, just to make sure your stuff is still there. The commander just makes sure that some systems are still in good shape, and that's it.

Here you use the Shuttle. The Shuttle is still active, and it's still managing a lot of the mission. So, of course, the training is very different.

BUTLER: Is the methodology of the training different as well, coming from the two different cultures?

CHRÉTIEN: No, it's about the same, about the same. I think people, it's true, have different cultures, but on the hand, they look alike also, and we all come from the same roots, and so we have a kind of same culture. If you probably compare to what would happen in China, then we could say that there's already a difference. But this is former Europeans working with Europeans, so at the end we find the same, kind of same culture. So it's not surprising to see that instruction and training really looks alike, and mostly now, now that we work together, it's even more evident.

BUTLER: Describe some of the relationship between the crew members that you had on this mission. You had quite a mix, quite an international mix. If you could describe how everyone worked together and meshed together as a team.

CHRÉTIEN: Yes. The training is there to really make sure that you are ready to do some tasks all by yourself and some tasks together with someone else, and that someone else, you know who it is, or she is, and that you have already done that before. And then during the flight, you are very, very busy, and it should not happen, for example, that you are thinking, "Okay, this is the task. I have another partner. Well, so let me look for him or for her, we get ready, we start in five minutes." "But I am not involved with that. I know nothing about that."

Of course, that's what we try to avoid, and that can happen. I mean, the mission is complex. Some stuff happen at the end. You know, like three weeks before the fight, there are still stuff which is not clear for us. We had a GPS, and we had the computers with GPS equipment that arrived late in the mission. So we try to keep current and to remember, and it's

even written who will do that. But then you cannot avoid it. There is, I would say, kind of 5 percent of the time in the mission where there is a little bit of confusion about who is doing what. That's when you need to be smooth, understandable, and if someone says, "No, I am not ready for it because I did not know. I did not remember," or "Sorry, I'm still very busy here helping someone," and then you say, "Okay. I'm going to do it," and that's good because that's what's happening in normal operational life. We tend to count too much on the organization, the management, on everything scheduled and precise with the minute, and say, "Okay, this was not written, so sorry, I won't—."

It's good to have as precise as possible organization and planning, but it's also good to keep in mind that percentage of it won't be organized, that there will some floating part, so that you feel responsible very quickly. And you need to be trained for that, not to say, "Hey, hey, hey. Don't ask me what. I've not been said I should do." You need to be a human being, responsible. And, again, like the military and operations and no more communications with the staff, "What do I do?" You say, "Okay, I go to sleep. There's no more communications." That's not the way.

And that, you can watch people when this happens and say, "They were not ready," or "They were ready." Again, if you think of what will happen when people go to Mars, and it probably happened during the Moon missions, when no one can help you, you are the one to decide, and it can be a very simple task here.

For example, to fill those big bags with water that we are transferring to Mir, and this was required and happening every two hours. We had to fill a bag with—I think we gave them, like eighteen full bags of water coming from the Shuttle, because the Shuttle makes a lot of water. And it happens that sometimes, "The bag, I forgot the bag!" And this is part of this percentage

of activities which are planned. It's normally on your flight plan, but there can be conflict with other tasks which went longer than scheduled and blah, blah, blah.

In our crew, it worked very well. You could see. I remember Jim [James D.] Wetherbee one day without saying anything—and I was rushing from Mir, "My bag, my bag!" And he was there. "Oh, I'm taking care of it." And that's the kind of stuff that it's a very simple example. But, again, we need to be ready for suggestions, where if nothing was planned, if you really want to be make it a big picture, it was not planned, it just happened that someone has to do it. Sometimes even two people need to do it. We need to find those two people, even if they are busy doing something else and they would have a flight plan, saying, "Oh, but you need to do this, this," and decide which priority.

And it might be something as simple as water. You know, water is not that important. At the end it can be very important because people were counting on the eighteen bags of water to finish the flight of Dave [David A.] Wolf and not counting on twelve bags, for example. So it's much more important than it could appear in the beginning. That's the way it is.

BUTLER: So that training helps bring the crew all together to be able to accomplish that.

CHRÉTIEN: Yes, all together and ready to face situations where the plan doesn't help and the ground cannot help either.

BUTLER: How did the training compare to the spaceflight itself? Was it very realistic and match up very well in that respect?

CHRÉTIEN: Yes, it does. But, also, that's, again, depending on each one. First, your own experience in spaceflight also helps a lot. You can see people were ready, can say our spacemen and those who are still not used in outer space, as soon as you arrive in orbit, there are a lot of tasks. You need to do a lot of stuff, and you can see very quickly.

For example, Vladimir Titov with more than one year in space. As soon as we arrived there, "ftttt," was ready to go over any place. And I had also had spent, at that time, a month and a week in space. We had to do together some tasks with filming the external tank and helping others get out of their suits and stuff like that. If you feel okay as soon as you arrived in orbit and you feel comfortable, like home, you will be given also some tasks that initially were not yours, just to help some others who don't feel too good when, the beginning of the flight. And that also is something that you cannot know before and that training cannot tell you.

BUTLER: Let's work our way up to the mission now. We've kind of talked a lot about training. As it came time for the mission itself, as it led up to, were you finishing some final simulations before training? And if you could kind of walk us through those days up to the launch and the launch itself, again contrasting them somewhat with your experiences with Russia.

CHRÉTIEN: I think the most contrasting is that you keep busy enough until the last days. You have the quarantine here in the Johnson Space Center for, I think, for five days, and then the three, four last days you go to the Cape [Canaveral, Kennedy Space Center, Florida]. But you still see a lot of people. You are still in touch with a lot of people. Maybe the main differences are much less traditional behaving, that you have. Baikonur [Soviet Cosmodrome, Kazakhstan],

there is a special movie, there is a special—you get the flag. I don't remember all of it, but there is a lot of ritual.

We don't do that here, and I think it's just because we try to make spaceflight as normal as possible, so that the profession is just like any other profession and you get ready to do your task and you don't need to put flowers around it. Just do your job. So that is the kind of ambience that we have until we leave for launch, and be in crew quarters, and the only ritual is when people meet you when you get out of crew quarters and go to the bus. It's more practical, more practical.

BUTLER: Was your family able to come down to watch your launch?

CHRÉTIEN: Yes, here, families can be there. You can have as many people as you want, almost. That's very simple, too, very simple.

BUTLER: How was the launch itself different from launching on the rocket with the Russians?

CHRÉTIEN: The impression is quite similar, quite similar. For ascent, I was not on the flight deck. I was on the mid-deck, and reentry I was on the flight deck. So it's quite similar, too, because on the Soyuz, when you launch, you don't see anything. Everything is closed. You are in a closed cabin, where you absolutely see nothing.

The only main difference probably is the rotation of the Shuttle into orbital plane as soon as you take off, I forget the name—the roll, and you really feel it very strangely. For a pilot, you feel like the Shuttle is falling down on the side, and that's not very pleasant when you cannot see

around, because it's climbing very slowly. The push there, the acceleration is very small at the time. You feel that thing is really shaking a lot, and it's starting to rotate, and you—the sensation is that it's falling on the side. So, that's kind of impressive.

Before booster separation, you also have the time when you go through the maximum pressure, which is the transonic step, and when we reduce power a lot, to go through that, what we say, a tunnel, aerodynamic tunnel. So it's also a strange feeling because it's shaking less, and you really feel that the power, that's like, again, for pilots, you really have the feeling that the pilot is reducing the power a lot, going to idle. As you are climbing vertically, we don't understand very well how it can still climb on idle. But you know that's going to happen, but the first time it's impressive enough.

And then you get the boost again. But then it looks very much alike, and you get booster separation, and that's also very similar to what happened on the Soyuz launch, when you lose the first stage. The main difference here is that you get a very smooth ride, and you know that also your flight then is much safer. You know the numbers, and to two minutes with the booster [Solid Rocket Booster] on top, that's the most dangerous part of the flight. And everyone knows that, and that's when they ask you to have your helmet closed.

As soon as you're on main engines, it's still six minutes to go, but it's a very, very smooth ride, and then you are allowed to open your helmet—it's really like going to a clear flight, I mean, very, very simplified. It is not true—you're still on a rocket, but you feel a huge difference.

BUTLER: As you reached orbit, you mentioned that one of your tasks with Mr. Titov was to film the separation of the external tank and also to help other crew members out of their suits. What

were some of your other tasks in the time between reaching orbit and docking with the Space Station?

CHRÉTIEN: So we had most of those tasks were together with Vladimir. So first the filming of the external tank, which was a short time during the first orbit. And then prepare the mid-deck technically and to store, there is a lot of stuff that you need to store, store all of the suits of seven people, the bag, and arrange all of that, and then activate the SPACEHAB module; that was our main task, which gives a lot of room to the crew, and then get ready for the first night.

Then the next day, if I remember it well, we were involved in the computer activation and all of the tools that we would need before docking, the radio communications system and a couple of laptop computers that we needed to use, too, and also start one of these experiments, the GPS experiment. There was another one; I forget what it was. There were two GPS experiments. And then prepare the last, the final navigation for that.

At that time I was busy with Scott [E.] Parazynski activating the docking system, and after docking, same with Scott Parazynski, checking all the events. It's a long process after docking, all of these microsystems. The link, in fact, started to work, so we get ready for the power transfer, there on—not only the—I forget the name of this, what is the English name for—[Chrétien gestures]

BUTLER: Oh, the latches?

CHRÉTIEN: Latches, all of this. So there is a long list of stuff to check during the process of docking, and check the hermeticity of the docking, of different compartments to make sure that there is no leak before you get the authorization for door opening and meet the crew in Mir.[1]

Then most of the work during those days, docked to Mir, were to transfer all of the cargo from the Shuttle to Mir. And also each of us had complementary tasks, like, I was in charge of a couple of experiments measuring—mostly connected to radiation in space. So we had plenty of devices that had been placed everywhere in Mir. So you need to recollect them, and to find them is a kind of nightmare, because they are hiding on many places beyond compartments, as close as possible to the body of Mir, and they stay there from one flight to the other. I think we recovered them. They had been placed by the one crew member before me. So you have a list, he tried to explain exactly where he put them, and you are looking around trying to find them, put the new one. And then there was another one. It was two big modules that also we placed one day in one place, do measurements, and the next day another place. That was radiation.

But these were like 20 percent, supposedly, in our mission, which is 25 percent of the activity of the crew, scientific experiments. But most of the task was really cargo transfer from the Shuttle to Mir and the same thing from Mir back to the Shuttle, and to activate a lot of those systems, the new systems that we were bringing. We had been trained to activate them, not only bring them to Mir, but also a lot of them had to be activated. Wendy [B.] Lawrence mostly was in charge of activating all of this equipment that Dave Wolf would use for his six-month mission.

You know, we were taking Dave Wolf up there and Mike [C. Michael] Foale back to Earth. So we were taking back all the equipment of Mike Foale, and Dave Wolf was having all of this new stuff, and it was mostly Wendy Lawrence helping him fix that stuff and activate it. So each of us already had that, and that keeps you very busy. It's busy.

BUTLER: Well, this was your second trip to Mir, but the space station had changed a great deal since your first trip.

CHRÉTIEN: Right.

BUTLER: What were some of your impressions of the Mir in its new configuration, at least new to you?

CHRÉTIEN: Of course, it was a much bigger Station, a lot of modules. And the module to which we were attached with the Shuttle was kind of a long cylinder. There was the module of Mir plus another module that was attached to give room enough to the Shuttle, not only to dock, but in case of problem, to maneuver and not hit any part of Mir.

So they had built this long kind of tunnel, and after the opening, it's really funny. I was with Scott Parazynski, and we were floating in this long, long, long, long tunnel, the two of us. The first impression was not only this tunnel was long, it's so different from what I knew of Mir, but also the smell was bad, like an old sailboat when you go down and start to move the sails which are humid and the smell of humidity, of longtime humidity. We understood at once what was happening, and, in fact, people had talked about that many times, that there was so much stuff inside Mir. There was so much stuff from ten years that had been brought and remaining there, that the air circulation was not going to work. So there were plenty of places where the humidity was even not under control anymore, and there was nothing that people could do.

Again, that's a problem in space. The air, if you don't flow the air to move, it doesn't move by itself. There is no convection, and so, naturally the atmosphere doesn't move as it does on Earth, even in a room, just because of the convection and the gravitation. So that was our first. We looked to each other, and "It smells, eh?" But that was just the docking system, which, in fact, was not that old; it was brand new.

I had the impression of, again, a very big Space Station, but full. It was already full when I went there the first time and it was brand new. Here, when we arrived in the main room, the main compartment, the life compartment, it was full, full, full, full of stuff all over, and very—and the guys were very impressed by the way these guys would stay for long-duration flight and get organized to make sure that everything is there and doesn't interfere with each other. All those videocassettes stored under—what do you call this? [Chrétien gestures] Extender? Expander [Bungee cord]. A lot of tricks that people discover on long-duration flights to make life agreeable. But there was stuff everywhere, everywhere.

And it will be the same in the new one. Many people here think they show the—they told me once, I remember, they showed me one of the sims, one of the modules of the ISS. They said, "Look how clean it is," when you remember those movies of there. I told them, "Don't worry. Mir was the same in Star City. Both modules of Mir were also very clean when we are training for our flight." It's a big difference between a sim and a nice stuff, where you can install stuff, it doesn't move with gravity, and the real thing whereas things start to move around.

I've seen movies of the ISS, and you can see exactly the same thing, exactly the same thing. There is nothing that you can do against it.

BUTLER: Only so much room, and you have to adjust to a different way of life.

CHRÉTIEN: Yes, it's just because it's zero G. It's very interesting to see how difficult it is for people who train you, and that's the difference between training and real stuff, to imagine what life is in zero gravity. It's not that you are the victim of zero gravity, but you are a victim sometimes because the camera can never stay on the table. But sometimes you also take advantage of that. Your processing of your mind is totally different. Here if I want take this, I put this here [Chrétien demonstrates], and in space I won't have a table, of course. There is no table. So I will look somewhere and put it here on the wall, and day after day there will be more and more cameras and stuff like that all around.

It's not a question of the Mir was a little bit of disorder, and ISS will be in good order. No. It's just because people live in zero G and have been trained in 1-G, and they are not the same people anymore, wherever they come from and wherever they are trained. Again, I have seen movies of the ISS, and it's exactly, exactly the same thing as Mir.

BUTLER: This is actually jumping a little bit, but how much do crews, like your own crew, that have just been up on a mission and that have seen some of these differences, how much interaction do they have with later crews or with the trainers to point out some of these facts that—

CHRÉTIEN: That happens after every flight. There are long, long debriefs as soon as you come back, and that's good. There is no way to go first on vacation and come back after three weeks for debrief. You need to debrief when it's still warm in your mind. So there are very, very detailed debriefs with each crew member and with all of the instructors, especially. I think

people on the ground take very well all of this information, but again, it's very, very difficult to do on the ground, I mean, prepare on the ground with 1-G what you will have to do in space with zero G. It's a huge difference. But all of your tasks are exactly the same. It's just the conditions are different, and the results, or the result of the—the frame becomes different. But the task and the frame is exactly the same, and training on the ground is always 80 percent good and realistic to prepare from it in space. But the conditions within the frame give it a totally different appearance.

But, yes, people take well all these debriefs, and they work hard to adapt for the next flight.

BUTLER: During this mission, were there any moments for you that were particularly memorable?

CHRÉTIEN: I think the most memorable one was one day with Scott Parazynski, when we were finished with transfer. It was, I think, the last day before, or even after undocking. Yes, that was the last evening. I don't think we were docked anymore. I think that, yes, it was the last day before deorbitation. We were in the SPACEHAB, and we had decided to play tennis in the SPACEHAB. There was a lot of room there, and the two of us spent much of our time there, and we had two books, a checklist, and we had made a ball with gray tape, and we were playing tennis, and Jim Wetherbee was wondering what we are doing. He was on the other end of the Shuttle, because SPACEHAB is all the way at the back, and there is a long tunnel to go to the Shuttle. You are really separated and isolated. And we were laughing and doing—.

So Jim Wetherbee, I remember his face, he arrived at the tunnel [Chrétien demonstrates] and looked, "What are you guys doing?" And I remember Scott Parazynski was upside down, if we can say so, and he has one leg all inside one of the soft compartments where we had storage before, but that was empty, and was trying to get out of it, reaching the ball, and all of the others were open and floating. He looked again. "You seem to have fun here." And he left back. [Laughter] Oh, yes, he was impressed.

Of course, there are more serious memories. I think one of the most fascinating also was before docking when it was the night. It was night, but Mir was still in the sunlight for thirty seconds. So we were kind of a dark night already, and the dark sky, and looking up, you could see this white luminous object over our head. It looked like a very old multi-plane, you know, those with the wings, like a really old, non-natural old airplane with plenty of wings, and they're projector, which would have been like if from plenty of projectors. It was really luminous, and I saw a funny bit of light just up over our head, and it was very impressive and very beautiful. Then suddenly you see the light, "fttttt," disappear, and you don't see it anymore. That's the magic of spaceflight.

There were a lot of events like. Then after undocking, when we went around Mir, that was also a very impressive time, rotating in fifty minutes. I think it took us fifty minutes to turn around Mir, maybe less, because we did that during daylight, and the daylight is a maximum of fifty minutes on our flight. But there, probably forty-five, fifty minutes, turning around Mir. That was a neat flyover.

BUTLER: Well, unfortunately the mission did have to come to an end and return to Earth. If you could describe, again, contrast the differences returning to Earth on the Orbiter versus on the Soyuz.

CHRÉTIEN: Now, that's a huge difference. That's really where the things are the most different. I was on the flight deck with Scott Parazynski in the back of the pilots, and Scott has already flown on the Shuttle. He knew the tricks, of the things not to miss during reentry. He had a big mirror so that we could see through the upper window, the window on the ceiling in the back of us. The trail of plasma during the very beginning of reentry, that's beautiful and impressive, to see those pink color, orange-pink-color plasma, and mostly the speed of that plasma because you're still flying Mach 25, very fast. So this plasma is like quitting, even when you see the trail of a fighter when you are flying at high altitude with another airplane, a fighter airplane, you look at the trail coming out. It's fast, but it's only Mach 1 or a little bit more if you do that on a supersonic flight. But here you have Mach 25, so you see that plasma coming out, "whoop." It's really at the speed that you cannot imagine, on the back of the Shuttle, so that's very neat to see that.

The only very bad thing that I did not like at all during reentry on the Shuttle is they ask you to fill yourself with liquid, because they pretend it helps coming back to Earth, and I've never done that on my other flights. Even after one month in space, like Titov, I was in good shape the first minutes on the ground. But here it's [unclear]. You need to drink I don't remember how many bags of either soup or salt water, and that's awful. And we had a wave-off on the first day, a wave-off, so, after all that, and I had to drink that awful stuff, and I got so sick. I had to hurry to go to the toilet first, as soon as we got out of our seat and back to reactivate.

And I told Jim, "Tomorrow when we go back to deorbitation, I'm not going to drink all this bad stuff."

Conscientiously the American astronauts do it, and I asked Titov, "Do you do that?" He said, "Ah, a little bit, but I don't drink it." I think it's, like, drink the equivalent of a couple of liters of liquid. It's a lot. These are salty, salt water or soup, chicken soup, and it is awful! So the second day, I drank, still drank it because maybe it helps. I need to see whether—so that's the bad thing.

The second bad thing when I went to the ground, twenty minutes, you know, to see the doctors. They are at the Shuttle. They have a first exam. After twenty minutes, I threw up all of that stuff. I was feeling it. Usually you get sick when you go to space, but some people—I never got sick going up. But I never got sick going down on my two other flights. Then after fifteen minutes of this, and a good thing I had drank only one-third of what was required.

After that, I was feeling much better, and a couple of hours later I was at a barbecue at a beach with my family and friends, and so I don't know whether the third that I drank helped me do that, but on my two other flights I also was in good shape doing that. But I don't think we really need that. It should be said, "People, you do it if you want. You don't want, you don't do it."

Then coming back to deorbitation, that was just the negative part of this, of the end of the flight. All the rest is great. I forgot about the soup. And I look outside and people told me, someone told me, "Don't miss when you do the first roll," which is almost as soon as you start real reentry, you touch the atmosphere, you take a hundred degrees left- or right-side roll, and you keep reentering. So by the side window you can see the ground, and your altitude, of course,

is one—you are used to be, like, 200 miles high, and suddenly you are, like, fifty miles, and forty, fifty miles, which is almost ten times, five times, six times less.

So you feel that you are really low, and you can see, at that time it was water, the clouds. It seemed that they go very, very fast, and you say, "I'm almost down to Earth now, and we are still going Mach 25," and that's very impressive. It's beautiful to see the details. You start to see details like the trail of a boat, and the boat and the trail. Same thing, they pass so fast.

And then slowly it becomes an airplane, go back to normal attitude, and the Mach numbers go down, and you are at the entry of the southwest entry of the Gulf of Mexico, and still at high attitude, but you're almost an airplane. You are really in the atmosphere and still flying fast. Then you can really see like from an airplane. So it's very neat to see the transition between the space object and slowly to an airplane.

You still have the impression that you won't make it to Cape Kennedy because when you look at the distance and you feel really flying low, and Houston is still far away, and Cape Kennedy's *really* far away, and I say, "I have no engines. I'm just gliding with that thing that doesn't glide very well." It's a kind of a joke, that's why we say, "Are you sure we'll make it?"

Of course, you know that we'll make, always make it. That's very, very neat, these final—and you pass over Florida and it takes a couple of minutes to get to the Cape and fly over and go for a landing. And that's really neat, all these parts of the flight. For pilots, it's probably the best thing you can see in the life of a pilot.

Then landing, which is no surprise. A smooth landing. There.

BUTLER: It certainly sounds like it was fascinating.

CHRÉTIEN: Oh, yes. Oh, yes, it was great.

BUTLER: Good time to be on the flight deck, it sounds like, too.

CHRÉTIEN: Yes, it is a good time to see, yes, that part. Yes, that's great.

BUTLER: After the mission, of course you would have some of the debrief, as you talked about, and some final mission activities. But what tasks did you move on to next? What were your responsibilities following the mission?

CHRÉTIEN: The first after that, we moved back to what we call a job assignment, and it takes from one, two months, depending if also some traditional events and debriefs in other places. You go to the Cape. You go—I'm not sure, I had to go back to France, but you have to go debriefing some places. And when all of that is finished, considered as link to the flight itself, then you go back to a job assignment.

So I went back to the [International] Space Station program, and very quickly moved to the Expedition Crew Corps we had built, and inside the Astronaut Office, inside of the whole frame of the Astronaut Office, a second entity, a second frame, which is called Expedition Crew Corps, which is where all the astronauts were scheduled for flight on the ISS. So you are specifically attached to the training for long-duration flight, the organization of the flight, organization of the training, and so I was doing that with Mike Foale, Mike [Michael E.] Lopez-Alegria. So we were in the staff of that corps, and I was supposed to take over as a chief branch for that team. But then when I got in that accident with Home Depot, then I left.

BUTLER: Unfortunately.

CHRÉTIEN: Yes, because also at that time, that's important, too, and to end the interview, I was at the end—we had been trying to do that almost right after my flight because for the French system I was already to the end, because there is an age where they would say, "Okay, sooner or later, you have to quit. There is no choice," when in NASA people quit when they want. See, John [W.] Young is still here, and everyone is very happy to see John there.

So Mr. [Daniel S.] Goldin and Mr. Abbey, they will work to keep you in here, find a way, and at the end the way they did was to get me in the U.S. astronaut corps and help represent NASA astronauts as a U.S. astronaut, even without the U.S. citizenship, just because I applied for it automatically. I've been married for fifteen years to an American wife, so I think the [U.S.] State Department has to make sure that I had applied for U.S. citizenship, and so they would accept it. I became a U.S. astronaut for NASA and stating that this would happen very soon. So I signed my contract with NASA as a NASA astronaut like six months after that flight.

BUTLER: Looking back over your career with the space programs on both sides, you worked on the Hermes, that you mentioned, for the European Space Agency. You worked a little bit on the Buran also with the Russians. Then you worked with the Space Shuttle, obviously, here. If you could compare those three systems and, obviously, the Shuttle is a flying system, and the Buran had one flight, but if you could compare some of the similarities and differences between them.

CHRÉTIEN: The first one, I mean the Hermes, was a nice dream, but it was just a dream, and I don't think it was even possible to build such a small machine and fly it as a shuttle. There were a lot of—but again, it was made only on paper. So it's really difficult to compare, and we had no training. Nothing was done for that.

The Buran, yes, Buran had flown once, and it seems to me that the Buran, of course, was a copy of the Shuttle, as they also had their Tupolev-144, the copy of the Concorde, but just to demonstrate that they could copy it and make one. But it was way rougher than the Shuttle. It was just built. It was an airframe built to fly, and I don't even think that they opened the payload bay doors during the first flight. I think everything was closed. I heard later that there was nothing inside. I mean, there was still a lot of work to do to get it ready for operations and space, real spaceflight. But the Russians always surprise us by what they are able to do. So who knows? Maybe. But I have a feeling that it was just to demonstrate that they could do it, and it was too late. I mean, the program was late, and they knew that it would be cancelled by Mr. [Mikhail Sergeyevich] Gorbachev. They did not have the budget, the money, to finish it.

And the training, the training that I had, I cannot compare it to the one I had here because that was pilot training, and here we've never been trained as a pilot. We are trained as mission specialists. So I have never flown the sims of the other Shuttle. When I flew many times the STA [Shuttle Training] Airplanes, the flying simulators of the one in Moscow.

I've flown on the back seat of the STA here in El Paso [Texas] many times with the crew, because I wanted to see what it is from the back and standing up in the back of the crew. It seems to me that we are much safer here in case something happens than down there because—it's probably also because of the weather. They wanted to fly Buran on their own places and be

able to land it anywhere in Russia where the weather in winter is what it is. So the weather minimum are not at all the same.

My first training, I remember we had 500-feet ceiling in a Drukovsky [phonetic] Air Base, all those landings, and we are flying a Tupolev-154, which is a Russian STA of the Buran. That was my first real landing, because you go also to touch-and-gp. If you are on the runway, you land. If you are not, you go around. And with the equipment that you had on that airplane and mostly for the first time there is no way that you can be aligned with the runway because you are over the clouds and the equipment that they give you at the beginning of training doesn't allow rookie pilots to really go for the runway.

So we enter the clouds, and you start to pull up over all the clouds, because the clouds were like at 1,500 feet. It was typical of the weather of Moscow in winter, and then it's 1,000 feet of clouds. You have to start your maneuver, landing maneuver, over the clouds because it's 2,000 feet. It's exactly like the Space Shuttle. Getting out of the clouds at 500 feet and you are already finishing and go for the flare, and the runway was either there or there [Chrétien gestures to either side] not at all where it was—[Chrétien gestures to the front]. And see the guys starting to act on the engines and everything, because the plane is really getting slower and slower. It's on idle, two engines are on reverse. The landing gear is down, and that thing doesn't fly very long in those conditions. So we are flying over all the buildings of Drukovsky [phonetic] Institute, and I handled it. I'm getting slower and slower, and no one was panicking. The flight engineer was saying, "Okay. Ready," and the pilot getting full power. I was wondering, just imagine that those two engines which are on reverse keep on reverse.

That's a huge difference. That's a huge difference between—we don't do that here. We go to El Paso. I don't think any instructor would let the pilot keep going when they feel that we

won't make the runway. Say "Okay, we go around now." Don't wait like being at 300 feet to have the gear up, the flaps up, the air brakes, and go from reverse to full power, because it can always happen that one of the engines doesn't go back to normal, and then you are in big trouble. So that's something. I was impressed. I mean, impressed. I had some doubts about the limits. That might be playing too much with what they call Russian roulette with the pistol. One day you get the bullet in the wrong place.

BUTLER: Well, fortunately, that didn't happen for you at least.

CHRÉTIEN: No, no, no. Right, it never happened. I mean, they did a lot of these flights, and it never happened. Maybe their system is so safe that they can do it. I don't know. I've never been flying before in an airplane that was 75 percent of his engines in reverse and fly it and go a hundred feet over buildings thinking that they will go back to normal, 100 percent, no doubt. But in aviation, but, again— [Tape recorder turned off.]

BUTLER: As we finished the last time, the first time that we were talking, you mentioned a story after where we had turned off the tape, that I was hoping that you would recount for us, and that was on your first mission with the Russians when you were docking, that there was a computer failure, and I was wondering if you could describe that event for us.

CHRÉTIEN: Oh, just because it did not print?

BUTLER: Yes.

CHRÉTIEN: Yes, the failure, the computer failure. What happened?

BUTLER: Yes, what happened there, if you could tell us about what happened and how you were able to correct the problem and—

CHRÉTIEN: Yes, that was also a typical situation when if you are not trained for it, you need to think quickly and behave with your own brain and not with documentation. The way we were, like, fifty seconds from—not from docking, but at that speed that we had at that time, if we kept that speed fifty seconds later, we would hit the Salyut 7, because that case was the Salyut 7, my first flight.

The computer failed. When we started the rotation, in fact, we were backwards to Salyut 7, to get our engine braking our speed down, and that had happened. So at that time we were fifty seconds, and we were starting to rotate, to go nose up, for the final docking and then brake the final speed with the other engine, and during that rotation the computer quit.

So the situation was simple. We could not see the [Salyut] Station at any time. We did not know whether the nose would arrive before or after a collision and what to do. So normally what the checklist say is that you, again, relight the main engine to correct that maneuver, and even if you don't stop rotation at this, there are a good chance to go somewhere else. You won't collide with the [Salyut] Space Station. And, of course, and then your flight is over. You have no more weight to go back in orbital plane—enough energy and fuel. So the next event is to go back to Earth.

Of course, in the mind of the commanders that's very tricky decision. So while he was thinking, I quickly pushed the TV camera that we have, but which is not used for that situation. Which at that time it was off and it's supposed to be. Later on, I mean, until that flight, just at the end. So I quickly had it on, thinking, "Okay, maybe with the wide angle," we had to also choose between two angles of camera, "which we were lucky enough, when the TV gets warm, we will see Salyut 7," and that's what happened. In twenty seconds, which was thirty seconds from the—and the commander, [Vladimir Aleksandrovich] Dzhanibekov, was watching me. He did not say one word, but here he waited to order the maneuver, the escape maneuver, and when the nose of the Soyuz came to the Mir, and with the wide angle, we could see the white dot on the TV screen coming. And then he took over and stopped the rotation and then went back into his manual, optical stuff to go back for the docking procedure, and we docked.

That, again, is a pure situation of things that have not been thought about before. They don't train you because that was not imagined. Again, the 20 percent we talk about and—in fact, that's a Shuttle flight, but generally talking about training, in real flights you need to always be ready for situations where you did not get any training, and that can help a lot.

That helped because on the next flight, they always required that the TV system was on before docking, way before so that— But, again, it was not the system supposed to be used for docking. It was supposed to be used for docking but for not navigation. Here we are in navigation, and it was not supposed to be used at all for navigation.

BUTLER: Just another example of the benefits of training to know how to react, just in general.

Looking back over your career with the space program, what would you consider to be your biggest challenge, and then also what would you consider to be your most significant accomplishment?

CHRÉTIEN: I think the biggest challenge was to keep going twenty-two years, keep going and get ready for those three flights. Normally I should have had four, but only three.

And maybe the biggest—what?

BUTLER: Accomplishment.

CHRÉTIEN: —Accomplishment is to have been starting on this Russian stuff, Soviet stuff, go through all of that, also with the Buran stuff, and finish as a U.S NASA astronaut, a strange road.

BUTLER: It's certainly a very unique one.

CHRÉTIEN: A funny one.

BUTLER: Well, we appreciate you sharing all of these experiences with us.

CHRÉTIEN: You're welcome. I told Mr. Abbey yesterday maybe that will help describe that frame. I came here in 1977. I was a test pilot, still a test pilot in France, and I came here to test an airplane in Austin, and on my way I stopped here and went look at my dreams. They are showing the movies of the early age and the Apollo and the Skylab, and Apollo-Soyuz, I really, I

want to do it. Then I moved the air defense stuff in France. I went back to the Air Force, and for two years I was responsible for the training of the Sixth Fleet and the French-U.S. air defense system, and we were supposed to meet once every three months, and we were liking each other so much that we finished meeting every three weeks, and I was spending one week a month on the *USS Nimitz* or *Enterprise* and all of these Sixth Fleet aircraft carriers.

Then came the possibility to be a candidate for our Spacelab missions. I say, "Okay, great," and all the guys say, "We'll help you. We know people down there," and happily they could have done that maybe if I had been selected, but no French guy, I think we talked about that before, was selected. And I had already the U.S. Sixth Fleet's help, but they sent me to Russia. But after twenty years I landed in NASA. So that's funny. [Laughter]

BUTLER: Certainly a very unique path.

[End of Interview]