The oral histories placed on this CD are from a few of the many people who worked together to meet the challenges of the Shuttle-Mir Program. The words that you will read are the transcripts from the audio-recorded, personal interviews conducted with each of these individuals.

In order to preserve the integrity of their audio record, these histories are presented with limited revisions and reflect the candid conversational style of the oral history format. Brackets or an ellipsis mark will indicate if the text has been annotated or edited to provide the reader a better understanding of the content.

Enjoy “hearing” these factual accountings from these people who were among those who were involved in the day-to-day activities of this historic partnership between the United States and Russia.

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This PDF contains three oral history sessions with Mike Foale. Go to Oral History

C. MICHAEL FOALE (Session 1)
June 16, 1998
Interviewers: Rebecca Wright, Carol Butler, Mark Davison

Wright: Today is June 16, 1998. We're speaking with Mike Foale, as part of the Shuttle-Mir Oral History Project. I'm Rebecca Wright with Carol Butler and Mark Davison.

Looking over your information, we realize that last year at this time, you were aboard the Mir.

Foale: Yes. This is like nine days before the collision. (laughter)

Wright: (laughter) How have you adjusted to being back on Earth? Been busy?

Foale: I certainly feel I have been very busy since the flight. Unfortunately, I feel I haven't taken a big enough break in terms of vacation and psychological unwinding as I should have, could have. A lot of it was because this job with Mr. Abbey, I think, needed to be filled, and I can see that Mr. Abbey needed to have someone near at hand, who had been on Mir and could apply that experience to Space Station. So I kind of was invited to take the job earlier than I think I would normally have chosen to. Because of that, I'm kind of ready to go on vacation again.

Wright: I hope you get one.

Foale: Yes, I'm going to go tomorrow for two weeks and then take another vacation in August. But getting back to Earth, I basically felt I was kind of in tune with my life, bills, payments, all the rest, by the time I had gotten past Christmas, I guess, so from October. I landed on October 7th or something, 10th or something. By the time I came back from New Year's Eve in Great Britain, where I'd been on vacation with the British part of my family in Scotland, came back here, I sort of felt that, yes, I was ready to start normal life here in Texas.

The other thing was, for me coming back from the Mir, and I think probably maybe Shannon [Lucid] has reflected this, and all the other guys before me, it's also moving back to America, you see. It's not just coming back from Mir; it's coming back from being posted overseas. My post overseas was one and a half years to Russia and then it was into a Russian environment, but in space. So it was still a posting. And even though my orders were the PCS, the transfer orders, were transferred back to the U.S. right before I launched, all kinds of things didn't really get sorted out until sometime like the beginning of this year. In fact, I was still handling paperwork for that move, tax impacts and other things like that, just a month ago. So it goes on a long time. Just like anyone coming back from deployment, say, in the military, I think I've had that to readjust to, just going, "Oh, you mean there's a new street here in Clear Lake? There's a store here?" I've gone to stores and they're gone! (laughter)

Wright: Look at the money you saved, though, right? (laughter)

Foale: So I've finally become used to the new arrangement here in Clear Lake. The only thing I hoped that would have happened while I was in Russia and then on the Mir was that they would have finished all the modifications to NASA Road One while I was gone.

Wright: Well, we're all hoping for that soon, but we've been hoping for that for years.

Foale: Since I was disappointed, I'm not going to ask to be sent to the Mir again until they finish that road. (laughter)

Wright: You were here and then, like you said, they shipped you off to Russia for your training time there. How long were you there?

Foale: Basically it was in the summer of 1995, and I had recently finished a flight on STS-63, which had been the very first approach to the Mir. We did a flyaround and a rendezvous with it, but we didn't dock because we didn't have the docking module there. That was with Jim [James D.] Weatherbee as the commander. I had learned just a little bit of Russian, maybe three hours a week for maybe six months at the most, so that wasn't all that much, so it was like fifty, sixty hours.

I was comfortably in this building, working EVA issues, when we became aware that Wendy Lawrence--well, first Scott Parazynski was too tall, Wendy Lawrence was too short to fulfill the role of a NASA flight crew member on Mir. It was about September when I became aware that Mr. Abbey and Jim Weatherbee at the time were considering me to fill that slot. This is a big change for me. I at that point had targeted STS-86 as the flight that I might be flying on. That had been hinted at to me. I wasn't really ready, with my small children, to go to Russia. I didn't want to do that at that point. I wanted to fly on station maybe five years down the road when the kids were bigger. But it looked like that was the way the wind was blowing.

I went to Russia on a business trip, actually, in October, and it was just starting to rain and be dark and grizzly there. Drizzle was falling and it was dropping to freezing. It was while I was in the office of the DOR, Director of Operations-Russia, in Star City, that one of the Russian secretaries says to me, "Oh, but Mike, we've heard that you're coming here in three weeks!" I went, "Huh? No, I'm not!" She said, "Oh, yes, you are. They just made an agreement with General [Yuri] Kargapolov and General [Yuri] Glazkov." And I was pretty angry, actually, that I hadn't had a clue that that was coming. So anyway, I

said, "Really?"

So I thought, well, I didn't even bother to call anybody here. I just called up Rhonda and said, "Hey, Rhonda, they're talking about us being here in three weeks' time. Do you mind, I'd really like you, Rhonda, and the kids to be here when I move over. I don't want to leave you in the U.S. Are you willing to do it?" And she said, "Yes. Okay."

So we went through a big, big [unclear] for three or four weeks, packing up the house, getting everything done, finding a renter for the house, and we were in Star City, living in a one-room hotel room in the Prophylactorium, my two children and my wife and I, and some meager belongings in November, the end of November. Actually, it was Thanksgiving. We got there for Thanksgiving, at which time there was snow on the ground and all the rest.

Rhonda, bless her heart, it was the first time she had ever lived abroad. She's been abroad a few times, of course, but in better conditions. She'd just been dumped in Star City. At that time you couldn't find much food in the grocery store. There weren't any grocery stores as such; you had to go and get food out from the back of trucks and things. The first thing we did, I remember, the first thing we bought after we arrived there was a sled so that Rhonda could pull the kids on the sled, going around the little kiosks and stores, to go and buy food. Now, this was a big hardship for Rhonda, to begin with.

Things got steadily better. In fact, Russia has changed incredibly in terms of services, ability to get food, etc., communications, over the two years that we have been posted there. Moscow is unrecognizable compared to the way it was two years ago. So those hardships did get better for us, and indeed we adapted. We learned how to do things, and Rhonda got better at Russian language, I got better at Russian language.

So we started off with a pretty shaky start back in November of 1995, and then lived there through two winters. If you're Russian about this, you always count seasons by the winters. (laughter) It's two winters and then moved back here.

My family moved back basically and were very excited. It was early May, late April, last year. It was always wonderful to be in America, land in America, with the conveniences, tidiness, the orderliness of life in America compared to in Russia. Whenever we landed in a Western airport, it was like being free. It has a lot to do with freedom, living in the West, compared to living in Russia. So they were very excited to move into our house again, which is on the bay here. We like it very much. Whereas I couldn't refocus on the move to here. I had to still get myself ready psychologically and be prepared to go and do my Mir flight, which I didn't expect to be much fun. I expected it to be very hard, but just something I could deal with and handle, and I would get a sufficiently positive amount out of it that I would look back on it and

say, "Yes, this was good." And that's really how it turned out.

So now after going through the five months in space and then coming back, I finally caught up with my family, who have already been back here basically a year.

Wright: How old were the children when you were in Russia?

Foale: When we went to Russia, my daughter was three. No, four. And my son was just less than one. One. Yes, he was one year old.

Wright: And they adapted well?

Foale: Pretty well. My daughter went to the children's kindergarten, called [Russian phrase], and unfortunately they had just finished teaching the Russian alphabet and basic Russian to the children, so they never made any effort, the school, to teach Genna Russian specifically. There are no English-speaking people there. So for whatever reason, Genna only really started speaking a fairly coarse, I would say, fairly rude Russian by the time we left. When I say rude, it was very demanding. She had all the demanding words down, but nothing very polite. It kind of appalled me to hear her speak Russian. That only came in after a year and a half of her going to this children's kindergarten. I was rather disappointed by that. All the Russians said, "Oh, she'll learn Russian really quickly." It didn't happen, because she just came in at the wrong point into that school. So she basically got all that she wanted and needed in that school by using gestures. Extraordinary.

My son had a Russian babysitter for about two hours every other day when Rhonda had to go into Moscow on a two-hour drive into Moscow and a two-hour drive back to get foodstuffs. Then Ian actually did respond fairly well, but he wasn't speaking English at all. He didn't speak until he left Russia, but in Russia he understood Russian commands as well as English commands.

Wright: It would be interesting to see how they've developed their language skills.

Foale: Even though Genna has such trouble with Russian, she was learning to read quite fine English at the time, just at the house with Rhonda and myself, and she's now six and reads well. Ian's now three and does not read, but is learning his alphabet well and speaks. He was starting to speak while I was in space, which was particularly poignant for me.

Wright: You said you were here and they were adjusting back at the house, but you had to gear yourself for getting ready to go. Can you talk about all those different things that you were doing, training here in

order to prepare yourself for your ride on the Mir?

Foale: Well, actually, in all honesty, the most valuable thing I did when I came back from Russia, which was like April 10th, to get ready for my flight, which was May 15th, I had basically a month, I had already received some good lessons learned from John Blaha, and he was the one who stuck in my mind the most in that early '97 time frame, and that was, he said, "Mike, take charge of your schedule. No one else will." And his point here was that so many people want to give you their last little bit of valuable information in those weeks, that they treat it like a Shuttle flight. They think if they don't tell you now, the mission's going to fail.

Well, no one here knows how to train someone for long-duration flight except those people who've been through the long-duration Mir experience. So the schedule fills up horribly with people giving you that last little bit of information, which you're going to forget anyway over a few months and, in fact, you probably don't need to know, because you'll have time to ask. It's not a Shuttle flight of ten days. So John said, "Mike, do everything you can to take control of the schedule. Don't fill up your day. Spend time with your family. Get your house in order. Get the bill payments set up. Get your will in shape. Go on vacation."

So, what I did when I came over from Russia was, I went on vacation straight away. In fact, the first thing I did was I went to Ellington {Air Field} and got myself rechecked out in the T-38. I always made a point. This is kind of an American anchor for me, was, I was still an astronaut if I could at least do what astronauts basically do here, which is fly in the T-38. So that's the first thing I ever do on a business trip, is I go straight to Ellington, I wouldn't tell anyone I was here, and I get checked out in the T-38 is the first two days.

Then I planned to go on a vacation. We disappeared with another family, not at NASA, went to Corpus Christi for a week. Then I came back and said, "I'm ready now. You can have me." And the schedulers had me, but they only had me for three weeks, and by that time they had to be pretty efficient about what they were going to give me.

So I just trained twice. Charlie [Charles J.] Precourt was my commander on the STS-84. He already had worked in Russia as a DOR. He knew about these pressures on the long-duration crew member because he'd had to represent their interests. He had to represent Shannon's and John's interests when he was Director of Operations in Russia. So, Charlie had been giving me a hard time for only doing the minimum Shuttle activities that I needed to do. So I basically spent a lot of time at home, just being with friends, wanting to talk to my parents, just trying to be as relaxed as I possibly could before that flight.

So when the flight came and I launched, it was like being on vacation. I was coming to the end of a vacation I'd had in the U.S. The U.S. is like a vacation for me. It was like a phase, an interruption between training in Russia, which was not a vacation, and then going to Mir, which is not a vacation. So I arrived on Mir in a very relaxed and resilient, I would say, psychologically resilient frame of mind. So as the surprises started to come fast and furiously, initially just because of the condition of Mir, which is not the same as the condition of the Space Shuttle--it's a place that's been lived in and worked in for twelve years. It's a bit like a frat house, but more organized and better looked after, actually, but nonetheless it has some of those characteristics. Dealing with that and then dealing with the kind of camping out, making your own spot, and then having to figure out all of these different experiment activities that you are going to be asked to do, all that I didn't rush into. My whole frame of mind was, "This is not a Shuttle flight. This is long duration. This is like being sent to Russia. So in the first two or three weeks, if I don't get all these things done, it's not a problem."

I knew that this had bothered terribly Shannon. It had bothered terribly John, trying to go, and so I wasn't going to get myself into this big personal punishment cycle where you punish yourself for not having achieved all those things they thought we could have achieved, because I just treated it as an experiment in people living in space, and I would just do my best-faith attempt in like the ten hours of the day that I was working, seriously, to try and do what I could. But once ten hours were over, I was going to go wash, I was going to exercise, and I was going to go to bed, and I was going to eat comfortably and talk to my crew members. I was not going to kill myself at the beginning of a four-and-a-half-month flight.

As a result, I was pretty comfortable with the crew. I liked the crew. I was spending time talking to them. Sometimes in the afternoon Sasha Lazutkin would find me and say, "Mike, you want to drink tea?" Because I told him I like to drink tea for a ten-minute break. "I want to talk to you guys during the day. I want to know what you're doing." So they would find me and we'd just drink tea. Then we'd go back to doing whatever we were doing. That was kind of the existence I had up to the collision.

Wright: You were explaining how you met for tea. You were all off in separate areas doing separate things, then got back together?

Foale: Yes. On the Mir, it's very easy to lose each other, where you don't know where the other people are, because it's not that the Mir is such a big space, it's because it's such a cluttered space. You're basically winding your way through, effectively, tunnels to go to one part of the station to another, so that equipment just isolates you from other parts of the station. So especially if you've done into one of the further storage areas, where there may be food boxes stored or space suits stored or just trash, if you have

to get to the back of that module for some reason, then there's a whole bunch of stuff in front of you that is floating around and you can't even be seen from the node area on Mir.

So there will be times when I would suddenly pop out of my warren, you know, out of my hole, into the node, and Vasily would say, "Mike, have you seen Sasha? I haven't seen him all morning." I'd say, "No, I haven't seen him all morning." You know, we didn't know where Sasha was. Well, we knew he had to be on station. (laughter) But we didn't know where he was. So you could easily spend a day without talking to crew members, and that we considered, the Mir-23 crew and myself, not a good thing. So we made an effort to try and tag up, especially for lunch and often just for a ten-minute tea break, basically, in the base block.

The other thing that makes you come together is the communication sessions. NASA long-duration guys had different approaches to this. Basically, again, with the Shuttle idea in mind, of trying to be terribly efficient and get as much as you can done in a day, communication, especially by Jerry Linenger, was regarded as an interference. Communication with the ground, being on the com, waiting to talk to your specialist, your American specialist Jerry found very irritating and didn't like it, and he wanted to use email to do to-and-fro traffic.

I, on the other hand, felt exactly the opposite. I felt, "This is a long-duration thing. You should be more easygoing about the whole thing. Anyway, my job here is to learn about the Russian part of the station as well." My Russian was fairly good, better, I think, than other crew members, so I would always go for every communication session. Now, most of the time it was not geared towards me; it was geared to the Russians on board with the ground, but I was always present for the communication. Because I was there, I decided to take over all of the email, all of what we called flight data file, up and down in the packet--we call it packet--transmission of flight instructions, flight data files, is American for it.

So, as a result of that, I did see the crew more and more often just because I would go for the com sessions, and the com sessions would be every nineteen minutes, for about ten, twenty minutes. So, again, that was a way to stay close to the crew. I made a big effort to go to the com sessions, even if I didn't have something to say or they didn't have something to say.

In the same way, the Russian ground controllers then got used to me being on the radio. They got used to my voice. I got used to their voices. My Russian what I would call communication language got better, because, you know, if you're an American and you hear an airline pilot talking on the radio, you don't understand what he's said if you're not a pilot. It's like any technical worker basically seems unintelligible even if it's in your own language. The same is true if you've studied Russian but you haven't been working on the radio with the controllers; you don't really understand them very well.

But over the time of a month, I got to know the controllers quite well and they got to know my voice well. I lost my inhibitions to talk to them on the radio. That kind of integrated me into the overall Russian operation of the station better.

Wright: Was it good to hear other voices as well?

Foale: Yes. I'm fairly gregarious anyway, so I like to hear other voices generally. I developed a whole picture and a whole image of these people who I'd never met before. Half of them I had never met before, and it was really strange to see them for the first time, some of them, in the TSUP when I went back about a month ago.

Wright: Do they match?

Foale: No. Voices never match your expectations.

Wright: It's okay, they were there when you needed them.

Foale: Yes. But that was kind of how the mood developed. In those days before the collision, I learned a little bit about the troubles they've had, especially with the fire. Vasily talked about it quite a bit, and Sasha. At some point Sasha explained to me--and he actually took me to where the fire occurred and showed me what he was doing and how the fire happened, and he gave me a long hour's description of everything that happened during the fire. It was very amusing. We were enjoying it. It was a good story, with serious undertones. But he wasn't making a big deal out of this; he was telling me a story, because I wanted to learn.

And other times Vasily would talk about the near miss of the Progress docking, that Jerry has since then talked about a lot in the press, as being a near miss, and it was. A very close call.

Wright: You've mentioned the collision a couple of times.

Foale: The collision demarcates everything for my flight, not because of the terribleness of the collision; because it changed the whole condition of the station and the environment in which we worked.

Wright: That's what we'd like for you to talk about, because it's been called the worst collision in the history of human space flight.

Foale: I'm sure that's true. (laughter)

Wright: And who better to know that. You've explained to us how relaxed you were when you went up there. Did it {the collision} change everything about the flight for you as well, your attitude? Did you feel differently than you had six weeks prior, when you boarded?

Foale: No, it didn't really change it for me. One of the early thoughts that went through my brain, that occurred to me in the five minutes or so after the collision, when I had just finished doing my bit of getting the Soyuz ready to leave for the emergency, and while I was waiting to see whether or not the leak really was in Spektr, I was just basically passively helping Sasha gather up cables while he was clearing cables out that pass through into Spektr, during that period of time I was thinking--or even as I was cleaning out the Soyuz, it crossed my mind, "You know, I've been here six weeks and I think we're going to be going home right now." I was actually kind of sad. I thought, "Well, you know, that's a shame. I won't finish this whole thing. I had set out here to be four and a half months, and now it's going to get cut short. This is a real emergency." And we had all the danger of getting out of there, but it was crossing my mind, "This is a shame. I've only been here six and a half weeks. What a shame I'm not getting to do the whole thing."

Then it occurred to me, "Well, you know, you'll get to see your kids and Rhonda sooner." And I thought, "Oh, but we're going to be landing in Kazakhstan. That's going to be a delay." (laughter) The thoughts that went through my mind, it was exactly like that. I thought, "You'd better focus on getting this sealed off here." (laughter) That's what went through my mind.

Then we started pulling the cables, and I got serious, pulling the cables with Sasha. There was a cable or two that burned in spots, so we had to find a way of disconnecting that one. Sure enough, we thought the way was clear from Spektr, we then tried to position this big, big hatch into it. You should remember that a node is built with six holes. It's like a dice with six faces. Each hole has a hatch. Well, since the hatches are bigger than the holes, they had to put the hatches inside the node before they built the node, and those hatches don't come out there. These hatches have been there ever since they created and built the node--six hatches--and they're somewhere.

The thing is, you have to get them out of the way in Space Station life, so they've been tied up, and they've been tied up pretty securely. The biggest hatch, the one that we wanted to put in there with a valve and all the rest, air equalizers between it, was really tied up pretty severely. I mean, we wasted about a minute trying to untie that hatch. And the pressure's falling, pressure's falling, so it's getting pretty frantic. I was worried that Vasily was not particularly ready--he was now talking to the ground, but there was no obvious movement to evacuate yet. So I was thinking, "Things are getting pretty tense now."

So we wasted some time on this one big hatch, and it was then as we moved--we gave up on that, basically. It was too tied off. We found a smaller hatch. They have two types, thin ones and fat ones. We

found a thin one, and that was pretty easy to untie. Sasha gave it to me to put in place, popped it in place, and he says, "Mike, hold it while I go and find the key to crank the latches that hold it closed." In fact, the key was present in all this space, but with all the wires, cables, and hatches, the key was not really easy to see, and we didn't see it. So he went off to another part of the station to go and get a key, a hatch lock. I held it.

Well, as the hatch pulled in because of the pressure difference, I thought, "Truly there is a leak on the other side of this," so I knew at that point we had isolated the leak, because I could feel the hatch holding in and then the pressure stopped dropping in my ears. So I thought, "Hmm. I guess I'm not going home." And I wasn't particularly pleased. In just the five minutes I was getting excited about going home. Then I thought, "Well, okay, we're here for the long haul." It's a whole matter of adaptation, and I guess that's the way my psychology works. In the space of five or ten minutes after an emergency, I will already be trying to make something positive out of what that situation has dealt me. As soon as the tables turn around, I'll try and turn the tables one more time and make something positive out of what's happening. So then I thought, "Well, hey! We just survived a pretty big emergency!" (laughter)

Then all hell started to break loose, because at that point I thought, "Well, we're kind of out of the woods," but then stuff that I hadn't any clue of started to happen, which was this whole--I had no idea how fragile the Mir guidance and control complex is so dependent on the station being in a good attitude and in good guidance and control. Believe it or not, our International Space Station, the American Space Station, is far, far worse. And because of my Mir experience, I'm now applying that in advice to Mr. Abbey into the station program.

But the Mir, having been hit by the Progress, set into a bit of a spin, and as a result, because the solar arrays weren't getting any energy and as a result of all the activities to isolate the leak, we hadn't turned off anything. We had used up all of the reserve energy in the batteries, and the batteries went flat pretty fast, and we went into a very severe power-down, so severe that in the night pass there was nothing alive. As we were on the dark side of the orbit, there was nothing on. This lasted for about thirty hours, I think. Yes, a day and a half, where when we came into sunlight occasionally would we get enough power on to a solar array that happened to be catching the sunlight at that moment, because we were still spinning, would we have enough power to talk to the ground and then try and recover.

So that was a pretty hard time, because we got very tired. And that was the hardest time I ever had on the station, was that period, because we just got so tired. Of course, the commander's morale was pretty--he was just shot, stunned.

But anyway, that was actually quite an exciting time for me, because it was the first time I was

asked to do anything to actually help the Mir, or starting with helping Sasha, I guess, isolate the leak. I had already volunteered to do some significant work on the Mir, and the specialists on the ground were sort of considering letting me do it, but, as you probably know, most NASA long-duration flights haven't been allowed to operate the systems much. They weren't relied on to do that, for a number of reasons, to do with contracts and bonus payments to cosmonauts, and whether or not you would [unclear].

But in this case, I had been offering to clean up all of the condensation that was already present on the Mir before the collision, which got a lot worse after the collision, and I was just waiting to go and get myself wet and go mop up all this water. There was a lot of water on board, many tons of it on the walls. Because I had made that effort, that proposal to the ground about a week before the collision, the ground was kind of negotiating. I don't know, for whatever reason, they were discussing whether they wanted me to do this or not, and they came back and said, "Yes, we'd like Mike to do some of this work." I couldn't stand seeing Vasily and Sasha always doing the grungy work, just getting beaten. I mean, scratches, the hair wet, the most foul places. And here I was, the pampered American poodle, just doing my experiment stuff and them having to maintain this whole place, just so that I could do my experiments without getting dirty. I couldn't--I thought that was just totally inappropriate for a small crew.

So to improve my relationship with the crew, I felt I should be doing some of the work. That was the basic goal in my proposal to the ground to do that work. I didn't want to do it, but it was work I could do. However, it opened up, after the collision, a whole bunch of things for me. Because I'd already made that proposal and they'd basically said, "Yes, let's let Mike do that," because I was speaking Russian on the radio and they could understand me, they then came and quickly started to accept what I proposed. If I hadn't done that before the collision and made that overture towards the crew and the ground--it was really to the ground, but the crew proposed it for me--I don't think they would have listened to me at all in those hours after the collision.

But in the subsequent orbit after the collision, we were spinning at about one degree a second, and the call came up on the ground, and because it was my habit to be on the com, I was on the com, the call came up, "Guys, what's the spin rate? We don't know. We've got to know how fast it's spinning." And Sasha, see, at that point, worked very fast, for whatever reason. Sasha knows how to do this. I'm not sure Vasily really had a--he wasn't quick at this. I'm a physicist who's worked on guidance and stuff, so I quickly get this. I look at the stars' wobble. So for whatever reason, I more quickly got to the window, put my thumb against the window, looked at the stars, and was able to tell the ground what the spin rate was. I called it down, and basically Sasha--I knew this was the first time I had made an operational call on the state of the Mir to the ground, and it was right after collision. They had no other choice but to accept my

word for it, because at that point Sasha says, "Well, yes." He basically said, "Yes, Mike's right." So that went down to the ground as well.

So they said, "Okay," and they then took that information and fired the engines in a blind mode to stop the spin. And it worked. They said, "Did it work?" I then looked out the window again, looked to the stars, and said, "Yes, it worked." And so they said, "Good. Well, you know, we think you're going to have to spin the station with the Soyuz."

And then we went out of contact with the ground. At that point we then lost all power. So now Vasily and Sasha--no one's been trained how to spin the station. At this point I then had some definite ideas. Because I was puffed up that they'd accepted my measurement on the rotation rate and they basically bought that, I thought, "Well, now is the time to tell these guys how I think they can spin the station." I am a physicist and I understand rotation dynamics of irregular bodies like the Mir. I said, "You know we need to use the Soyuz to fire the engines in a translation mode, not in a rotation mode," which is what I think--see, Vasily was thinking to use the Soyuz like an airplane. If he turns the Soyuz this way, he's going to turn the station. I said, "No, that's not the way you want to do this, Vasily. You need to approach it where you actually fly the Soyuz to the left or to the right, and then that effect has an effect on the station's rotation."

So we discussed this at some length. I was not totally sure of myself. I knew I could easily--what my biggest fear was, was that I would give them instructions that they, just in their desperation, would act on, but would use up fuel excessively out of the Soyuz, that we couldn't get out of the situation if we had to use the Soyuz. So the whole concern in my mind was, "They're starting to listen to you. There's a real danger here, because you may not know enough."

So I spent a lot of time, and we had a lot of time to talk. There was nothing to do. There was no sound. There were no fans. At that point we were very afraid the carbon dioxide building up around us would poison us, so we were keen to be with each other, keep waving paper like this, to keep the air moving around us, to keep the CO2 from puddling around us. It was in that time frame that we discussed how to reorient the station initially with the Soyuz and then put a spin on it.

At that time after the collision, I had no clue, really, about the moments of inertia at the station, and that specifically is those properties that determine how the station either spins like that or like that or like that. And those moments of inertia are all different for this piece of paper. For the Mir, if you look at the model of it, they're actually fairly close. They are different, and that's important, but I didn't know which axis would be different from which. That's not something anyone in the cosmo corps is taught. They just don't know it. In fact, I'm not totally sure the ground knows it. They could sort of calculate it

and think about it, but based on where you've put payloads and food boxes in the Mir, it changes what I call these moments of inertia properties in the station.

What all this comes down to is how you approach rotating the station so that the solar arrays point towards the sun is very dependent on what you think those moments of inertia are and how you think the solar arrays are going to rotate to track the sun. So there was a lot of discussion, and I really didn't know. I said, "Well, Vasily, we've got to do something." And he said, "Okay." At this point Vasily was sort of in a just--if someone would give an order, he would carry it out. I knew there was danger here. And Sasha was in the same mode. He was telling Vasily what to do, even though Vasily was the commander. So Sasha and I would basically agree. If we agreed, I would tell Vasily, I'd say, "Look. It looks like we agree," and that was good enough for Vasily. So then he would go off and act on it. Because Sasha had the real knowledge about the Mir.

So we worked out a scheme whereby in the Soyuz Vasily would fire a thruster or a jet and try and see what effect it had on the station. It was horribly complicated because the Soyuz control axes were controlled by 45 degrees to the station axes, so we had a very, very confusing technical dialogue with Vasily as to what the orientation--and Sasha and I were both confused for at least an hour as to quite how the axes of the Soyuz lined up with the rest of the station. We had no clear picture. There was no picture in our flight files. The model wasn't correct.

As you fly through the base block into the Soyuz, the node, because of the hatches, you have to do a twist around the hatches, and that twist totally throws off your orientation. You can't just move in an orientation from the Soyuz to the base block and maintain what was in the Soyuz in the base block. So we had a running argument as to what that orientation difference was. We knew it was 45 degrees out; we didn't know which way.

So anyway, I said, "Okay, let's just try it." So I went to the window. It was dark. Vasily had already turned on the Soyuz, so that was possible. That's a subtle point that probably is going to go over your head. But it turns out you can't disconnect the Soyuz from the station power bus and turn the Soyuz on if you don't already have power on the station. And for whatever reason, I think Vasily had already disconnected the Soyuz from the station while we still had power on the station, so we were able to use the Soyuz.

There was a subsequent event many weeks later, when Sasha disconnected the cable packs, that put us in a huge power-down mode, and then when we wanted to use the Soyuz, we were already powered down, had no power, and we couldn't disconnect the Soyuz. We couldn't even turn the Soyuz on. Then we just had to wait until sunlight somehow entered the station arrays.

But we were in that case after the collision, so we basically had a lot--I actually kind of enjoyed this. Vasily would say, "Okay, do three seconds." I said, "You need to do three seconds, Vasily." He was so worried about wasting fuel, terribly worried about wasting fuel, that he wasted a little blip, it turned out, but he told me he'd done a full thing, a full three seconds. I said, "You've got to count how long you hold it over." Well, I looked out the window and nothing had happened. I said, "Vasily, did you do it for real?" He said, "No, no, I didn't. I just did a blip." I said, "Vasily, we can't do this. We can't measure this thing, the effect of what your impulse is, unless you do it for the time you say, and we've got to know how long you've done it for so that we can get rid of that motion if we need to. Because we don't know that this motion is what we want." So he says, "Okay."

So we go to do it longer, and then I slowly saw the stars moving out the window, because why would he yell? He was like fifty feet from me, through two passageways. So then I come back and say, "Hey, it looks like it moved. What did you do?" He says, "Well, I did this." Okay. I said, "We don't want to do that. We want to go the opposite direction. Can you take it out?" He said, "Okay." "Just go the opposite direction, hold it over there for three seconds." He says, "Okay." "This is why it's important you know what you did."

So I went back, and it turned out he didn't take it all out. I said, "You need to do that again." "Okay." So then he kind of got the idea, and Sasha was always following. I was always making sure that Sasha knew how this conversation was going, because I didn't want to be the American telling the commander how to do things when I really didn't have the training. He didn't have the training, either, but this wasn't my station. So Sasha was always basically buying off on what I was telling Vasily, so Vasily would have some confidence in what I was saying.

So then we agreed on a specific thing to do to get the station into orientation, to where I think the sun was going to appear. Now I had to think, "Well, where is the sun going to appear?" Because that was the direction you want to move the station to get the solar arrays pointing. So we then went and found where there was some twilight coming on the dark side, but the sun was about to rise, and you could see the Earth lightning just on the horizon. I said, "Looks like we need to get the station over there."

So we started a motion to get the station over there, and within about fifteen minutes, lo and behold, the station was basically with solar arrays in that direction. So I said, "Okay, Vasily, do the opposite. Do the opposite," and he would do it, and it looked like it sort of stopped.

So then as the sun rose, and, yes, it truly was in the right direction for the solar arrays to track, I said, "Okay, now we're going to do the spin." And we agreed on what axis to spin. I had no--I just chose the axis. There's one axis the Soyuz can't control because it hasn't got what we call a roll [unclear]. And

there was nothing we could do about that, so there was one axis of the station that we couldn't control. It would have been the best axis, actually, but it turns out that's the stable axis and that's the best axis to spin about. The Soyuz can't do it. It's on that axis. And I knew that just from the geometry; we all did.

So I said, "Well, there's only one other axis we can use, and that's the vertical axis through the Command 2 and Spektr, so we're going to have to spin about that." So he says, "Okay, I'll do it." Every motion he's doing is not a pure left or right; it's an up or down, up and to the right, or down and to the left, or up and to the left, up and to the right, and down to the right. So he never does a pure movement. This is the problem. So he's not intuitive at all about what he's doing.

I said, "Okay, you need to do up and to the right." He does it, and sure enough, we started to spin. It looked like the spin was holding there towards the sun. We went through the whole orbit just pleased as punch. We had some power on the station, talked to the ground. Vasily says, "Mike and I worked out how to spin the station, and we're in a spin and we're charging."

And the guys on the ground said, "What's your charge rate?" And instantaneously we looked at it and it was charging pretty well, the batteries. They said, "Great." In the ground's mind, they thought we had solved the problem. That was it. They don't have to ever sweat this one again. And this was the biggest misconception, I think, between us and the ground, through my whole time on Mir, was that they have always felt that rotating, spinning the Mir, because we did it that first time pretty well, it was something we could always do easily. And I was never sure we could do it easy.

Sure enough, after two orbits, Sasha says, "You know, we're not charging at all well on the sunlight side." We're always dead on the dark side. And it was as we were coming into the third orbit after the collision, it was apparent that we were rotating almost edge on to the sun, and so the sun was not pointing on the arrays at all in terms of the arrays being edge on to the sun. I said, "I don't know what's going on here, Sasha." We didn't put in any thrusting that I could think of at the time that would put us into this position.

Then Sasha was brilliant. I mean, he and I worked well together. We had a little periscope that shows where the sun is, and he started to just put a piece of paper on the periscope. This periscope used to be used for tracking the Earth [unclear]. (laughter) But anyway, he's using the periscope and the sun's in the periscope, and it's a full 180-degree half-hemisphere view. And he just pointed where the sun was every five minutes, and the sun was doing this kind of thing. I said, "You know what's going on, Sasha?" It was really good that he did this. "We're processing." And not only that, these loops were getting bigger and bigger. I said, "I know what's going on. We're spinning about the unstable axis. The axis we've chosen is the unstable axis, and we're going to flip." He said, "Well, how?" In space it's really easy to do this; you

just take an object that has irregular moments of inertia and spin it.

If this didn't have so much drag--there's a book, if you span it. I need that. Pass me that box there. This thing, if you spin it like this, it spins stabley. If you spin it like this, it spins stabley. But if you spin it like this, it's not going to spin; it's going to do a flip. It tumbled. See that? I didn't put that in. It does it naturally. And that was the axis we had been forced to spin about. It was the one we'd chosen. It turns out there is no other axis we can spin about using the Soyuz that generates power.

But at the time I wasn't totally--I was trying to remember my physics. "Is there another axis that we can use?" And none of this was really clear to me in those first hours. I just knew that we were in an undesirable situation. I said, "The good news, though, is that eventually we're going to end up upside down and spinning the way we set it up." It was like saying, "Trust me. It's going to be okay." I didn't know it was going to be okay. I didn't know if we were going to have enough power. But sure enough, after another three hours, we were basically upside down and spinning and charging again at about the rate that we set up.

Over that period of time we slowly got the base block systems back on line, the CO2 scrubbers especially, which was very important, and were able to let Vasily sleep. They actually had me sleep for six hours before the other two did. It was just too much. They had to be on watch.

Vasily was just too uptight about the whole event that he wanted to have me sleep at that point, and I, realizing that someone was going to have to be awake later on when they did fall asleep, went to sleep for about six hours. They woke me up and I felt pretty good, after a thirty-hour break, to wake up after six hours, so then I just said, "Vasily, go to bed." Sasha wouldn't go to bed. So I then stayed up. Sasha had been awake for forty-eight hours, and he was just totally dead, falling asleep next to me. So finally when Vasily had about six hours, four hours, he woke up again and I said, "Vasily, Sasha's got to go to bed," so he ordered Sasha to bed, and I stayed up with Vasily and kind of watched over Vasily. I was by far the freshest one in the kind of two-day recovery period.

Then after that, we basically hunkered down and had to deal with the station that had all powered removed from all modules except for the front two, and then had to start moving batteries from the dead modules to the base block, to charge up those dead modules' batteries, and then keep a supply of charged-up batteries ready to power the base block if we went down in power again.

In that time frame, also, the ground--we established basically full continuous power to the base block after about thirty hours, and after about forty-eight hours we had power on the toilet, I think, which was terribly important, because by that time we were just bursting.

Wright: Our time that we said we would spend with you is up, and we don't want to keep you from your

schedule.

Foale: What I'd like to do is go away and review what I said. I touched a number of different areas here today. The areas that you might focus me on in the future, knowing how these things go, would be basically the recovery period; the crew activities; science activities; the change in science activities between before and after the collision; the preparation and the brainstorming of the Russian ground control with us about how to put this hatch adapter into the Spektr air lock, Spektr hatchway so that they could get the power from the Spektr solar arrays to the rest of the station. That was a very interesting development. And then the training and preparation of the EVA suits to do the EVA into the Spektr by the Mir-23 crew.

You might talk about the unfortunate medical condition that Vasily developed, which then forced me into the role of one of the EVA crew members going into the Spektr. Then the unfortunate consequence of a very tired crew pulling a cable, one of hundreds, mistakenly so that we then went out of control again, and in a very deep part. That then forced the Russian ground control management to decide to totally postpone the repair effort to get power from Spektr module back to the station until the next crew arrived. I think they were starting to feel they were jinxed with the current crew, and the current crew was starting to feel it was jinxed, too.

It then led on to, after that, then it would be the arrival of the next crew, the change in mood of the crew as a result of that, and then the extraordinary amount of activity the Mir-24 crew had with me in the first month, basically doing initially a flyaround inspection of the damaged solar array, which I did myself from the Soyuz, flying around.

And then the IVA into the Spektr, the connection of the power to the--half of the power, anyway, from the solar arrays to the Spektr module to the rest of the station. My time in the Soyuz there while they were doing the IVA, because I was kind of cloistered away in the Soyuz. And then finally after that, preparation for this EVA I did with Anatoli [Y.] Solovyev, the Mir-24 commander, to do an inspection, an excavation, of the damaged site on the Spektr module, and then the conduct of that EVA.

Then after that we can talk about some of the computer problems we started having, with the continuous loss of attitude control and this repetitive sequence that I got to know very well about spinning the station. I had to convince Anatoli all over again, you know, get him confident I knew how to do it, confident that he would listen to me. That worked out quite good.

Wright: We look forward to speaking with you again.

Foale: Who have you talked to already?

Wright: We have tried to talk to all the chairs of the working groups.

Foale: What other astronauts?

Wright: You're our first one.

Foale: Oh, I'm the first one. I'm sorry, I keep assuming you've spoken to Jerry and Shannon. It's not like the media. See, if you're like the media, you've already spoken to these people.

Wright: Well, scheduling has been quite an adventure for us, and we are scheduled to speak with Shannon Lucid tomorrow.

Foale: Okay. Good. Good. Certainly use the framework of--another thing you should remember is that my flight represents a totally off-normal flight. I didn't really experience the routine of science on orbit for more than about five weeks, and after that, there was nothing standard about my flight. Totally unexpected, unplanned for.

Shannon had a very, I think, classic stay on board an orbiting station, and I think starting with Jerry, it all started to go to rot. Then David actually basically had a pretty much standard tour of duty. At least half of it was. I think Andy [Thomas] finally has had a pretty clean flight. I just spoke to him this morning, and he believes that his increment probably was, next to Shannon's, the most benign.

Wright: That's good. Enjoy your vacation.

Foale: Thank you.

[End of interview]

C. MICHAEL FOALE (Session 2)
July 7, 1998
Interviewers: Rebecca Wright, Carol Butler, Mark Davison

Foale: [*After the collision, the biggest priority was to re-establish the power that was available from the existing solar arrays on the base block and on what we called Module D, which is Kvant-2*] and get the station powered up. The way we did that, over that thirty-hour period and then going on into the next week, was to basically allow the batteries--these are just large lead accumulators that are in the base block, just in front of the commander's and port engineers' cabins, take those out from behind the panels, disconnect all the cables, which are very heavy, and then move those batteries to the other module, Module D, to recharge them. So that way we got the toilet running.

We'd take batteries from Module D back to the base block. We were also switching out batteries from the module Priroda, which was not powered, and the module Krystall, which also was not powered. All of this involved, because of the very extensive overloading of the station with general equipment over the many years, involved us having to continually move, totally rearrange the module that we were getting the batteries from, because we had to get to the panels behind which the batteries lay. And that occupied our time for about a week, I would say, after the collision.

During that time frame, the one experiment I had that was running--and we powered up again after the thirty hours or so--was the greenhouse and also the beetle experiment, and those two--actually, it turned out the greenhouse is powered off base block power, anyway, from the mode, and this is kind of a surprise to everybody, I think, on the ground, even to me, that that was the source. So it didn't lose power much longer than it took to get power back on the base block.

The beetle experiment was the only other experiment I had really continually in the flight, and that was in Priroda. It was without power for thirty hours, but sometime in there I moved the beetles from the Priroda block module to the area near the greenhouse and Krystall, and that was the configuration for both of those experiments for the rest of my increment. They were being powered off the base block, even though the modules themselves were unpowered. The nice thing about the Krystall having the greenhouse on its own being powered off the base block was that it provided light in that module, because that module had no lights, of course. No module that's unpowered has lights. And that made it just slightly easier to, for example, pull out batteries out of that area or whatever.

About a week after the collision, proposals came up from the ground as to what we thought of doing an internal EVA using Orlon DMA suits to go into the Spektr module and establish basically an adapter in the hatch interface there, in the hatchway, to allow the power that we had disconnected in sealing off the Spektr module to be--it once again established into the base block power supply system from the Spektr solar arrays. Well, the Spektr solar arrays, there are four of them. One of them had been severely

damaged by the collision. The other three potentially could provide power, and the ground was feverishly coming up with basically a power adapter plug that was built into a hatch that could carry this power from the Spektr module across the interface, through the node, and into the base block.

In that subsequent week we did a lot of work with spacesuits, just pushing them through the hatchways to see whether they would fit. The other concern in that whole question process with the ground was, during the EVA of two people going into Spektr, what would the third person do? It was going to be me at that point. Where would I go? Pretty quickly it became apparent that I was going to have to be in the Soyuz module while they did this EVA internally. That was discussed, and we did a lot of discussion as a crew. The ground came up a number of times, led by Sergei Krikolov at that time, asking us about the practicality of using these suits inside the node and then going into the Spektr module and, in contingencies, going into the Soyuz if we couldn't repressurize the node after the EVA, what we call an IVA, actually, but in a spacesuit.

That kind of went on for about two weeks, and there was some preparation of suits during that time frame, two Orlon DMA suits. Vasily and Sasha did the best suit fit checks in those suits. Vasily had already done one EVA in an Orlon AM suit but not in a DNA on that particular increment, so they both had to do a new series of fit checks in those suits. Vasily also, in that time frame, moved all of the life support equipment for the spacesuits from the airlock in front, too, which is a powered module, and moved that and was going to come up with ways of anchoring it in the node so that they could use it to do this EVA. I should say that there was a lot of misgivings from Vasily especially as to exactly how this EVA was going to go, how it would be done.

Within three weeks, I think, another Progress came up, and that was Progress 235, I guess, I think. 234 hit us, right? The 235 came up. From a human point of view, there was one or two videos and things for me to look at from my family. There was a replacement hard drive for my laptop so that I could do some stuff, and chocolate and stuff, but also there were some EVA tools that were sent up to try and help with this internal IVA.

Once we had the Progress docked, the most important item in that Progress was this interface adapter that the Russians had built so quickly to go into the Spektr hatchway as well as another piece of equipment which was sent up, which I want to mention just because it was such a huge headache for us and was totally inappropriate for the situation. There was some contract that had been agreed to by Energia long ago to send up a huge experiment called MAPS. It's an item that's about the size of a desk, but roughly cylindrical form that just, within a centimeter, passes through a hatchway if the hatchway has no cables. Well, they hadn't reckoned on all the cables that we had there, and so I remember we wasted maybe

two days planning and trying to transfer this particular--and it's full of ammonia, is the point, which is a pretty noxious chemical.

We had to transfer it--they were trying to get it to the docking adapter, I think, was the ultimate goal. No. They wanted to get it to the airlock to take it outside for some reason, but we couldn't see any way. This was a classic, classic case of engineers not thinking hard about what the current configuration is on the station, because this thing was not going to fit past all of the gyrodynes that had subsequently been installed in the Module D, the [unclear] where the airlock was. So we told the ground there was no way, without taking down the gyrodynes, which are critical to the station flying at that point, in Module [unclear] Two to get it to the airlock. And so, as sort of, "Oh, what are we going to do with this thing? It's in the way. It's in the Progress. The Progress is going to have to be de-orbited," we had to get it out of there. We didn't want to have it in the base block.

So we spent roughly a day taking down hardware and taking it all the way through the Krystall module to the docking adapter, which the Shuttle only goes to. This then occupied for the rest of Phase One the docking adapter and has never been used. It is a total lemon. But the Russians have been paid, I think, by--and it's an American company or German company that owns this. It's not a NASA project. It's a private deal, either with Boeing or with the Germans or something, but this experiment obviously earned the Russians some money to launch it. They launched it and fulfilled their contract, but it was just a massive headache for the crew. We wasted a lot of time on that in this same time frame because we had to unload the Progress to get all the other things to the EVA that we were going to do to connect up the Spektr power.

About this time, the commander had a medical condition that brought into question his doing the EVA, so I then was put forward for the EVA. I think about the third or fourth week, I started entering into flight preparation for the EVA. I was being asked questions by our people from the MOS team in TSUP, what I thought I could do, what I needed in terms of training, and I basically, just on the fly, would come up with--basically I felt that I should be in the suit twice, once for a fitting, and second for a practice move-around, then do the real EVA into Spektr module. I think the Russians were pushing me a little bit to try and do it with just one pressurized suit run including the fitting so that they would conserve on the oxygen that would be used up in that test.

But that was all going very smoothly, I thought, and it was while the Flight engineer Sasha Lazutkin was late in the evening one day with a large list of cables, like 100 cables, that he had to disconnect, that passed through the base block hatchway into the mode then lead into Kvant Two, which connected the gyrodynes, which control the altitude of the station. All these cables were going to have to be

disconnected for the EVA day, because all those hatches had to be closed in the node, but these cables, meanwhile, are performing critical functions as part of the station's scheme to keep it in attitude. It was like two days before the planned EVA, he disconnected one cable out of sequence. And this is a long, long list. And this caused the station to have a guidance and control failure.

So then we went into a big slow tumble out of attitude as the gyrodynes spun down. As they spin down and break, the [unclear] in the gyrodyne gets transferred to the station. The station has to spin off in an arbitrary way. That put us into a very heavy power-down mostly because of the ground misconfiguration. The ground didn't spot how bad this particular error was. So we spent probably an orbit or more with everything powered up when we should have been powered down. This was actually a worse power-down situation than after the collision, and the trouble was it was late at night for us when we were to be in bed. It was like one o'clock in the morning when this happened. We should have been to bed anyway, but the pressure to work was so heavy.

The end result of that was, there were times when we learned something very important that's only recently come to light, that the Soyuz, when it's connected to the station power system, requires power from the station to go back to its internal batteries. That's not to say the batteries aren't good. The batteries are good on the Soyuz, but while it's switched over to the station, it needs power from the station to switch back, and because the station was totally powered down in the night passes, we learned about this very fact because, just as we had gone into darkness while we still had some power from the solar arrays but we had no battery power from the station side, the ground had said, "Try and use the Soyuz to talk to us," and it was as we went into the night that we realized we couldn't power up the Soyuz because we had no power from the station side. That was a fairly fundamental lesson, I think, that the Russians are aware of and they see it as a flaw in the scheme of things.

I mention this because there have been a lot of reports in the press about, oh, it was impossible for the crew at one point to ever undock the Soyuz and come home. Well, that was true for a moment. For the time that we were in darkness, that was true, but the rotation and the orientation of the station was such that when we came into sunlight thirteen minutes later, enough power came on the station that we could then go and switch the Soyuz back over to its own internal power.

Anyway, as a result of that power-down and tumble, the ground lost faith, I think, in a lot of things. They realized that they were driving too hard. I don't know where this decision really came from, but from a crew point of view, we were told the EVA to connect up the Spektr power would be performed by the next Russian crew, and this kind of took the burden--and they also moved up the launch, I think, of the next Russian crew a week. No, they shortened the stay of the overlap, and they canceled the flight of

the Frenchman who was meant to be coming up. The whole pressure of the previous three weeks was all geared to trying to reestablish configuration so the Frenchman could come up on time and therefore earn the Russians a bit more money in that regard, but that was agreed by the French, I think, more than anyone else, to delay that flight of that person, Leopold Aharts.

The next two weeks before the next crew came up were pretty quiet. The [unclear] packing. I did my greenhouse work. I did some Earth observations, actually. I did quite a lot of Earth ops and learned to change the camera mags on the Hasselblad pretty well.

When the next crew, the Mir 24 crew, came up, we had tried to get the station into pretty good shape for them and to hand over. Sasha Lazutkin had spent a lot of time trying to get handover items ready, to tell the next crew where everything was, what the things were, and I had spent a lot of time with him doing that. I also--fifty percent of my time was spent just mopping up water. It was like cave diving, going into dark module with full-length suit on--I mean the flight suit on to protect myself from the course of water and mop up the water, either with underwear or used clothes or a form of water sucker that goes into an air bag. But all those problems were a separate debrief topic, but basically mopping up water in space is very tricky because you always get bubbles in with the water that you're sucking up, so you waste the volume that you put the water into, and then you have this big problem of trying to separate, either by spinning or whirling your bag, trying to get the water to go to one end and the air to the other and then squeeze the bags so most of the air comes out, but you always end up mixing it up by the time you've done this. That was really my major activity at that time, was mostly water clean-up. This is all from condensation.

At some point the Russians told us that we had about seven tons of water missing. Some of that probably was not on the station, but a large part of it was. Some of it maybe had already left in previous Progresses. Once the Russian crew, the [unclear] crew, came up, the handover went very smoothly. The two crews overlapped only by a week. I rapidly got to know my new crew, and I learned basically when my commander arrived, Anatoly Soloviev, I was going to do an EVA with him in about three weeks to go and look at the exterior Spektr to see what damage had occurred and to try and find the leak in the hull. They had on board with them in the Soyuz a whole set of scaffolding and poles, etc. That weighed about 300 pounds, but could be assembled on the exterior of the Spektr module attached to various hot points there so that we could build up a framework on which to work and then execute repairs. I was quite interested in that, excited in that.

Wright: Had you met this crew at all before, or was this your first meeting?

Foale: No, this was the first crew I'd actually trained with, and I had trained with them for about a total of twelve, eighteen hours, maybe, in Star City, no more than that, in the December month of 1996, and so I sort of knew them fairly well. However, I knew my Mir 23 crew much better socially before flight, although I'd never trained with them, because they had been in the U.S. while I was training here on experiments.

Once the Mir 23 crew left, we very rapidly had to go into an operational phase whereby we had to move the Soyuz that had docked on to Kvant One, which brought up the Mir 24 crew and was occupying the post that the Progress normally occupies. We had to move that around the station to the place where the Mir 23 crew had just vacated with their Soyuz, which is on the node. The reason for that was twofold; one was because of thermal condition of the station, but two was we could have that Soyuz there so they could do the CVA and then use the Soyuz as a means to get this crew that's doing the EVA out of there if they can't repressurize the station in the event of a failure.

So, for that reason, like the day after Vasily and Sasha left, we rapidly powered down the station into a kind of housekeeping mode. I got a call only a few hours beforehand that they wanted to do this photo survey during the flyaround of the Spektr module. Again, this is a pretty unusual thing for them to do. You don't train for it, but I then went to a lot of effort to try and come up with the various camera schemes, video and film, and practiced getting into the so-called suit so that I could exit out of my seat, which is to the right of the commander, go over him while he's flying, and not kick him, and squeeze up through the small hatch to go into the what we call the BO, the living volume [unclear]. We haven't got a good word for it. It's called the living quarters on the Soyuz, anyway, into the upper volume and then use the window in the blister there to do photography while Anatoly flew around. I was quite pleased to be doing it. It was going to be a great view for me. The others weren't going to get a view like that, but I was very worried that I would mess up the whole thing because it had such little preparation. But that was my role, and we practiced it very carefully before we undocked. I practiced opening up the hatch while we all strapped down in there and then getting up without kicking Anatoly in the face in the suit, and when we undocked, we flew around.

I did exactly what we planned, and we got some very good video and stills of the damage as we flew basically 180 degrees around the station over twenty-five minutes or so. About five minutes before the redocking, I was told to come back down from where I was floating up in the living area, come feet first, not kick Anatoly in the head, and swing to the side and get that hatch closed again for the docking. Then we redocked, and that was the first time that I'd left the station basically in, you know, three months, three and a half months.

After redocking on the node at this point, we then had the Kvant One free, and the next day--it was the next day, this was like day three of Mir 24--we then had to set up the TORO [phonetic] system. That's the system that was used to control manually the Progress docking that took part in the collision. We had to set up the Toro system again to allow for the Progress that had been undocked, 235, to come and redock and occupy that port on Kvant One, again for thermal reasons, to keep the station cool in that region.

And so the next day the Progress came in, and it was very interesting. That was kind of the first sign that we were going to have these computer attitude control error problems, because it was as the Progress came up from the Earth, background of the Earth from about two kilometers, it came in pretty well using the KURS system automatic, but because the station then had a computer failure at about two or three hundred feet, the KURS system no longer would work on the Progress. So Anatoly was told by the ground to go manual, using the TORO. And this was only, you know, a twist of fate, because that was exactly what had put us in the whole collision situation beforehand. But Anatoly was told to do this right when the Progress had already basically nulled all of its closing rates. So it had a pretty stable configuration as it was coming in on its own axis.

It was very pleasing to see the Anatoly was given a chance--he was very pleased to do this--to dock this vehicle from about two or three hundred feet, and he docked it successfully manually, using the TORO. I should add that the TORO, the TV screen, did have a momentary dropout of about twenty feet, but it only lasted about ten seconds. Vasily had experienced one on his penultimate TORO docking attempt that lasted like thirty seconds, and that's where they aborted the docking attempt and pushed it to the side and it didn't hit. That was when Jerry Linenger was present. When Vasily did the collision, we also had a data dropout for about five, ten seconds. We also had then a shorter one when Anatoly did it. So what I'm telling you now is there is a problem in this com link somewhat close in that causes a dropout in the image.

Anyway, that docking was successful. We got the Progress basically opened up again, and we then hunkered down basically to prepare for this EVA, Anatoly and I, and this was going to be in the Orlon M suit, the new suit that Jerry Linenger had used with Vasily one time prior. Anatoly was a new commander, and Pavel was an unflown engineers. They were trying to get to grips with the rest of the station, and there were failures going on like Electron had to be periodically switched out, switched in. I know Anatoly had to work on the toilet urine reclamation system in Kvant Two for a lot of the time. I carried on my water-mopping-up duties, but one of the things I did specifically was to assemble this scaffolding that we were going to take outside with us, and it takes up the length of this conference table, maybe, but I had just enough room in the base block if I cleared stuff out to put it all together and label it.

So over the next week or so, Anatoly and I formed a plan as to how we were going to carry all this

stuff out, because we didn't have any carrier for it. We had to come up with this ourselves, and we worked out ways using Velcro that was sent up, to Velcro it down and put it in order so that we could carry it out.

Anatoly also progressively started to check out the Orlon M suits, and I helped him to a limited fashion in the final stages of the suit preparation. He would gather together all the oxygen bottles, the CO_2 scrubber, etc., and only we had to do servicing, like cleaning out bubbles out of the water coolant system or actually doing electrical check-outs, would get involved with Anatoly on that.

About three weeks into the flight, like September 6th or something of Mir 24, we did the EVA. EVA is a whole topic on its own, but the most notable thing about the EVA for me was, I had the role of opening the hatch and closing the hatch. I was the last person in the Mir Program to close the hatch successfully. I don't know if that's significant or not. I've talked to Pavel about it since then, because the hatch has been broken ever since.

The EVA itself, I consider fairly straightforward. I translated using three tethers, always have two tethers at any one time attached to the structure as I translated from the Kvant module, which was diametrically opposed to the Spektr module. I translated outside the Kvant Two module, which is the airlock, up onto the EVA cranes called the Strella. I then attached some of this scaffolding to that while Anatoly came out of the airlock and followed me, and Anatoly then waited while I translated to the base of the Strella crane, which is about sixty feet. Anatoly freed the other end of the crane, and I then cranked this crane over with Anatoly on the end of it through 180 degrees to the other side of the station to Spektr, delivering Anatoly to the far end of Spektr so he could start his inspection and excavation of the insulation there.

I then basically sat at the base of the crane for most of the EVA, which lasted for six hours, moving him left, right, up a bit, down a bit, using the two handles on the crane. Once or twice I would translate to Anatoly actually at the work site and hold his feet while he would try and dig in inside underneath the insulation. He was using a raisin knife to basically cut away at the insulation. We had a camera with us called Gleesa, and Gleesa was a fisheye camera that had a tape recorder, a fitted recorder built into a hermetically sealed box, and we used that to take photographs--I mean video, basically--underneath the insulation, which was pretty good. It showed the hull to be undamaged in that area even though the exterior panels were buckled and bent there and some of support was bent. Gleesa also was on by accident, actually, as it turned out, but it took some great video of the whole Mir scene, because it was basically hanging from Anatoly, with beautiful views of the Mir against the Earth with this camera. That's in file here at Building Eight if anyone ever wants to look at it, under NASA Five Video.

We didn't find the hole, as I said. We were meant also to establish a cap on the outside of the base

block for a vacuum valve that would allow subsequent removal of the base block, a CO_2 scrubbing system called Vosduk from the Kvant module. We didn't have enough time to do that because the excavation took too long. We ended up not establishing the scaffolding outside, so we ended up leaving the scaffolding tied off on the end of Spektr, some of which has been used since then, but not much.

The only part of the Phase One program we had out there was a dosimeter, an external dosimeter array called the Benton dosimeter, and I pulled that in just before we ingressed the airlock. Ingressing the airlock was interesting in that the O-rings on the airlock looked totally intact. There was no damage there. To me, the airlock hatch looked in good condition. The mechanism opened really well when I opened it up. It was interesting, when I opened the airlock, it opens outwards, and it sort of pulled me out a little bit with the residual air pressure. Even though it said zero on the gauge, it was just enough to pull me out, and that's kind of interesting. Closing the airlock, I did note some resistance in closing the airlock at the first few turns of the wheel. The ground was in a hurry to get us inside and finish up, because we were past our EVA time. But I asked to wait because I wasn't sure of the feel of this lock. It turned out that there's a little what they call a switch [unclear]. It's a little lever that controls the direction of the closing of the hatch or opening of the hatch. I had not moved the lever totally to the closed position, and I just felt it get stiff a little bit, so I opened up the big wheel that closes the hatch all the way open again with this lever in the open position and then moved it hard past a stop, a resistance stop, to a closed position, and it felt better that time, and then I closed it and it felt much smoother. I mention all this in detail because this procedure may have caused the same problem in the subsequent closing of the hatch that bent the mechanism. The hatch closed nicely, and we repressed.

From the EVA onwards, we basically were in a--oh, I've missed out one whole thing here. In between times--that was three weeks after the Mir 24 crew arrived, we did the external EVA, there was the internal EVA by the Mir 24 crew to go into Spektr. Now, that was an interesting exercise on its own. Basically, all the cables were dismantled correctly, the station was in a stable mode when we did the IVA. I had practiced with the commander how to operate the various valves between the Soyuz reentry module and the living module and also the node, so a succession of hatches, two hatches, so that in the event of the crew having entered the Spektr module, coming back out of the Spektr module, not being able to close that hatch, which is a vacuum there, then the only place the crew could go would be into the Soyuz. The interesting thing about that IVA was that the backup plan was, if they can't repress the airlock for whatever reason--and it was considered that this was probably the biggest risk we had--the only place they could go would be into the Soyuz living area, but that hatch doesn't open from the node side where the guys were. So there had to be some way that that hatch could be opened for them.

So what we did was I entered into the Soyuz, I went into the reentry module, closed both hatches, and there was air on both sides of the hatch. They, in their suits, in the node, depressed. They found that as they depressed down to about half an atmosphere, I then opened up my reentry module hatch going from [unclear] up into the BO--that's the living volume--transferred to the hatch going into the node, between the Soyuz and the node, and I opened that hatch, but not opened it because the pressure on my side was so much greater and that was holding it closed, but I opened the docks totally. So it was now a free hatch. The only thing holding it closed was the pressure in Soyuz against the lower pressure in the node.

I then went back into the Soyuz reentry module, and there's only just room for me, really, to kind of float across the seats there, close my hatch there, and I was in radio com with them there, and they then continued the depressurization of the node. The way they were depressurizing the node was they were opening a hole in the hatch that goes to Spektr, and Spektr has vacuum in it because it's got a hole in it. So the air would go from the node into Spektr, and Spektr would kind of fall down rather slowly. The depressurization of the node was still pretty fast, which tells us that we have a pretty big hole in Spektr, nonetheless, probably a half-inch-size hole.

During that depress, the Flight engineer started moving his--what happened? There were two mistakes made. There was one--I don't quite remember it. I don't remember the first one, but the second, which was pretty notable, was that the [unclear] engineer went round about vacuum so that he'd move his hand and he could feel air moving out of the glove past his hand, and his suit wasn't pressurizing. So it was clear that he had a glove leak, because the glove clips on with clips. This is the old suit, not the new suit, so it has only three dogs holding the glove on, as opposed to four. And so both Anatoly and I, we both told him to stop moving his hand. He stopped moving his hand.

This demonstrated an interesting difference between our programs, in that the ground immediately just said, "Well, okay. Repressurize." They repressed to a breathable atmosphere, about half an atmosphere, using station air, not the Soyuz air, from the base block side up through that hatchway. So we're wasting air each time we do this. Then Anatoly got out of his suit on his own, but it's a rear-entry suit, you can open the door, got out of his suit, and he got a spare glove they already had placed in there--very well prepared--and he just stuck that on Pavel's wrist, changed the glove out, and he got back in his suit, closed himself up on his own, and continued the depress right back down to vacuum. That's a big difference. I think if that had happened with Shuttle, we would never have done the EVA that day. We'd have gone through agonies of reviewing the glove leak and all the rest, but Russians said, "Hey, go and get another glove, put it on him, and it'll work."

They did a fairly successful connect-up of all the cables bar one, I think, in Spektr, and they found

two items of interest to me: my laptop computer and some photographs, and that was about it, and, I think, a camera for the greenhouse. We put all that stuff back. They closed the hatch, repressed the node using station air, and I finally was able to come on out, and we didn't have to use any of the back-up schemes whereby if they couldn't repress the node, I'd have had to evacuate the air out of the living volume of the Soyuz, using some commands I have in the command module. They would have then had to open that undogged hatch, just pushed on it and come in, tried to get themselves past the docking mechanism and into the living volume, and then close that hatch, and actually close it, and then I would have allowed air to go in from my section of the Soyuz into their section of the Soyuz, assuming all the valves are closed, and then they could get out of that suit. We also had a spare air pack. We call it a "portable oxygen supply" right at the front. Yes, it's portable. It's two large oxygen bottles. That was also in that area to give them extra air supply to pressurize that module in that case. Didn't have to do that, though. But it was a well-thought-out plan, I think, by the Russians for that contingency.

That was the IVA. The IVA was successful to the extent that it allowed two solar arrays of the four inspected to be connected up, and it also allowed the third one to be half connected up. This substantially increased the power on the station so that there was the potential to power up pretty quickly the module Krystall totally, and this was just the beginning of the drying-out of the station, where finally we could start drying it out. The water, as I say, had collected on all the cold modules in Priroda and in Krystall especially.

What else? A disappointment in that IVA was that the power connection of the solar arrays on Spektr to the main bus of the base block was successful. However, the voltage was not quite high enough in the Spektr module to operate the solar array-seeking mechanism that allows the solar arrays on the Spektr module to seek the sun and rotate. So this meant that initially after the IVA, the solar arrays were not in a good position to get solar energy on them to power the station. So initially we didn't have that power. It was during my EVA outside that Anatoly specifically rotated the solar arrays with a pole, a boat hook, and they moved fairly easily--they're magnetic, but they move fairly easily--so that they would be positioned at a forty-five degree angle to the X-axis of the station, which is the base block, and that would then allow the station to fly in a pretty optimal attitude whereby the sun would illuminate those arrays and the other arrays of the station complex and basically kind of get at least 50 percent of the energy they'd hoped to get for the station.

Because of that, though, we didn't go into repowering Priroda, repowering Krystall after the IVA. We had to wait until after the EVA, where we had repositioned those arrays, to even start repowering the station up. And so I always had the hope that I was going to repower Priroda, I'd do some of the

experiments they had there, but that was forever delayed because we never had enough power.

After the EVA, like September 6th, 7th, then it was only a month or so before I was due to come home, three weeks before Shuttle docking, and we started to seriously start to mop up all the water, and my job was mostly pack and mop up water behind all of the panels in Krystall and Priroda and progressively dry out those modules. And we're talking about balls of water that are a cubic meter in size, immersing some of the electronic equipment. But we did that progress, and we put warm air ducts from the base block, which is always very hot, about ninety-five degrees, and we take the air from there and try and blow it into these really cold modules that are down in the forties. Initially you would actually build up more moisture because you're putting warm, moist air into cold air, but slowly the module would sort of dry up, and once we had the module basically dry, and it wasn't as dry as the ground really wanted it, but we'd report it dry, we then powered up those modules. Well, the ground actually put the power on, taking power from the solar arrays of Spektr to power up those modules.

We first powered up the Krystall, and it dried out fairly nicely, and then the last week before docking [unclear] 86, we finally dried up Priroda enough to power-on Priroda, and that was an amazing thing for me, to see finally all the stations that I could get to, at least, was powered-up finally. And then the final area we had to dry out, which was the hardest, was the docking module where this big thing called MAPS, this big bomb, ammonia bomb, was, the size of a table, you know, and very awkward to deal with. That was sitting in there along with all our food canisters. It was kind of our attic, basically. We then had to try and dry that area out, and that was the hardest and last place that we dried out before [unclear] 86 came.

The packing, I don't think, really deserved any special note. I packed up a lot of experiments that were available to me from Priroda, many of which I hadn't really use fully. C-gel was one, Mim was another. I packed up the greenhouse experiment, but left most of the hardware for subsequent use by--it's never going to be used again, but the hope was it was going to be used in the future by a Russian crew.

Really, from that point onwards, [unclear] 86 docked, and I would say at that point my debrief becomes an [unclear] 86 crew debrief.

Dave Wolf's impressions, I'll let him talk about, but I was very aware that Dave--no one would know what they were getting into coming on board. I didn't feel that the conditions were unsafe to your existence there, in that always the Soyuz had my highest confidence. I felt the Soyuz was a very reliable piece of hardware in that you could always get to the Soyuz quickly, within a few minutes, and close the hatch. We made that even faster after the collision so we could do it in about three minutes, I think. We just prepared better and left it better prepared in general. I always felt that a crew member could be on

board the Mir, and it's certainly a degree of hardship, but basically safe, where their life wasn't severely threatened.

But on the other hand, I knew that Dave didn't know how hard this place was in terms of the moisture, the water build-ups, and the general clutter, having to always move things around on the station. And in particular, I knew he didn't know much about how to handle the station when it was unpowered, when it had lost control. But, you know, lucky for them, him and Andy, that only happened like once, I think, during David's time, maybe twice, and I think only happened once during Andy's time, just before he came back, actually. So really, the station took a turn for the better after I left. [Laughter]

Wright: Well, maybe we should stop there for today then.

Foale: Yes.

Wright: We thank you for your next input, and if you have time, we would like to at least come back for another--

Foale: Well, what I'd like to do is--I've basically given you pretty much a synopsis of the whole flight. If there are any areas that come up now with the others and you want to come back with me, I think that's what you should do.

Wright: I would like to, because you've given us a good overview, and there's certain things we'd like you just to give your perceptions of.

Foale: Good. All right. All right.

Wright: That's what we'd like to do for the next time through.

Foale: I don't know if I covered exercise in the previous one, but there are areas now that are under hot discussion at the moment. Exercise is one of them. Sleep compartments is another. Crew habitability. But I've given you more of the story of the flight, as opposed to debrief specific functions.

Wright: Yes, and we have in your debriefs that--Charlie Brown sent those to us.

Foale: See, there you're going to get more detail on that stuff.

Wright: And then this last time that we come back, if you'll give us one more hour, what we'd like to do is we'll have some specific topics, and you can just give us your perceptions and then anything else you'd like to add at the end.

Foale: All right.

Wright: Thanks.

Davison: When you were on your EVA, for those six hours manning the crank, were you consumed by your job or did you do any sightseeing while you were . . .?

Foale: Oh, I had almost--I had 80 percent sightseeing to do. It was great.

Wright: Those are the types of things that we want to come back and get from you.

Foale: That was just a fantastic experience.

Davison: Your feelings with the crew changing and adaptability and just was there tension or was there--just those types of things so we can get how you really feel. So the next time will be kind of a free-for-all.

Foale: Good.

[End of interview]

C. MICHAEL FOALE (Session 3)
July 31, 1998
Interviewers: Rebecca Wright, Carol Butler, Frank Tarazona

Wright: Today is July 31, 1998. We are speaking with Mike Foale. This is the third and final, as far as we know, sessions with him. Today we're going to be asking him a variety of questions.

We wanted to start by asking you about your preparations for going to Mir. We know that they included a lot of intense and diverse training. We know you have an extensive background in astrophysics, space flight experience that included three Shuttle missions. Looking back now, after being on Earth almost nine months, what skills do you believe served you the best while you were aboard the Mir?

Foale: The most important characteristic that I think I value in myself for that flight was the willingness to undergo something very different and foreign to what I was already used to. It was that trepidation, but interest, nonetheless, to get through it to go and do this strange thing that allowed me to be successful. I think it comes out of a person based on their backgrounds, culture, families, all kinds of things. I'm not sure it's something we could train into a person. However, I believe it's a characteristic of a person who lets them get something out of a really strange and actually quite hard experience. That was by far the most helpful thing for me.

A good example of that is that I was traditionally educated as a scientist. My interest in science started when I was very young. My interest in language, any language, even English, was minimal, and I put little effort into those subjects in high school or in college, and was not forced to either. Indeed, my approach to language as a useful tool to a person was fairly disdainful at a young age.

When I realized that I was going to be sent to Russia to do this job on the Mir, it was quite clear to me that suddenly language is a much, much more important part of this whole experience than I had ever given it that kind of priority in my life before. It was that cold realization that I was going to have a miserable time if I didn't learn the Russian language, it was an intellectual realization, that I then said to myself, in a fairly disciplined way, "You have to got to stop doing all those things you like doing in your free time, that you have been doing," such as physics on a computer, programming, hundreds of hours on the computer, reading science fiction in English. All those activities that I did in my free time as intellectual recreation, I was going to have to stop for the next two years. Instead, I only read Russian.

People have said I am a so-called gifted or I have a high aptitude for language. I don't believe that's really so. I believe it's because I made that decision to put those hours in, and I have noticed that's true of the other successful language students coming out of national office. Specifically, Charlie Precourt, and I think right now Ken Bowersox is going to be a star in language, too. These are people who look as if they're doing it easily, but it's not. It's because they're doing it at home, where they're reading a Russian book before they go to bed. It's that willingness to immerse oneself in the next project, or in this particular

case, the hard business of flying on an international, or in this case, a Russian station, that let me get through it.

The rest of it, as far as technical training, there's nothing unique in this that's different from the Shuttle system. The approach is a little bit more traditional book and college-oriented in Russia compared to all your visual aids and simulators emphasis that we have here in the U.S. But that's more a question of style between the two sides, not related to the individual entity.

Wright: You believe your common sense and reflex instincts, maybe even curiosity, helped the days be successful ones?

Foale: No greater than any other astronaut or cosmonaut. Certainly, astronauts as a group, I would go much further than that- I would say certainly most people who are interested in flying in space, or even working at NASA, already have that basic information and capability to do that stuff.

Wright: How much pre-flight training did you have in the medical field? When we talked to Mike Barratt, he made the comment that you're as good a paramedic as anybody he's met. In fact, he has the quote, he'd let you sew him up anytime. [Laughter] So I thought that was pretty much of a compliment coming from him. Is that something that you learned in preparation for these flights?

Foale: Yes. I should tell you that's one of the areas I found harder. I have never been particularly comfortable with actual operations on living animals. Not comfortable with it. It's not something I relish or enjoy, because I connect too much to the patient. [Laughter] So I have always had a problem, generally, with medical techniques, and I had to steel myself to learn those things, such as doing sutures and sewing things up, intubations for the case of choking and making holes in the trachea, for example, the various drug treatments and electric defibrillator techniques we use for heart attack treatment or other heart problems. All those things were new to me, totally, quite foreign to me as a physicist, but which, yes, I took seriously and tried to steel myself to do in a detached way.

Wright: Apparently, according to your teacher, you did well. Your commitment to language, do you believe that that helped with your adjustment to your new crews? Since you started out with one crew, but yet during the middle of your term there you got two new crewmates.

Foale: Yes, the answer is. Again, it's to do with this commitment to knowing the people with whom you're going to work with. The only way you're going to know them is to communicate with them. When it's a different language, the first thing you've got to do is to learn that language. Then you have to do all the

other things you have to do in the same language situation, which is mix with them, socialize with them, etc., and listen to them. So, language is first and foremost the enabling tool.

Interestingly enough, in the language lessons given by Russian language teachers, who are professionals, who teach Russian language to foreigners, and they are Russian, these teachers come out of a university called the Latrice Mamoomba University of Foreign Languages in Moscow, founded by [Nakita] Khrushchev to export Communism and the Communist principles of economics to Third World countries, in the majority. These instructors are now in their sixties, but they have a very long view of Russian foreign relations to the rest of the world through the students that they have taught.

Though they would teach me Russian in specific areas, such as economics or geography, from text that specifically were written in the Soviet years and are truly propaganda treatises for foreigners, I could read them and smile and they could read them to me and we would smile. We knew exactly that the meaning behind it was a different era, a different culture, even though [N.] Lenin was still on the wall staring down at me in the classroom. It was a different era.

They had such a broad perspective on how Russia had changed, as well as the Russian people were adjusting to the change, that the language lesson with those teachers, in particular, gave me a knowledge of a different culture that I would not have gotten but in a complete liberal arts foreign language course at the university. So for me it was like going through a master's program in the liberal arts.

As part of that, that naturally made me curious and made me able to relate to my cosmonaut friends. Actually, some of my closest friends are not cosmonauts in Russia, who are Russians. I relate to them also, especially the younger people in their thirties who are trying to make a living, keep their families going, etc. And that truly helped me. That's what made me see the positive things that are in Russians. If I hadn't done the language, I would have only seen negative things, because I would only see the difficulties with which I was dealing with the problem, being in Russia, being on a Russian station, and I wouldn't be getting anything positive back in terms of this cultural lesson in exchange.

Wright: As a follow-up to that, other than language, is there another piece of information or advice that you would share with people, that if they're going to work with the Russians, or even any other international project?

Foale: Well, see, it goes beyond. It's not just Russians. It's Japanese. It's Europeans. I mean, basically, an open mind and tolerance is pretty much the name of the game. "Do not be too quick to judge" is certainly the first thing you have to advise. And you have to learn to swallow something that is to you almost surely unpleasant, but smile, nonetheless, while you're swallowing it. That's a metaphor, but

actually when you go and eat another country's food, sometimes you'll be asked to try some foods that you really don't want to eat at all. But you've got to eat it and smile while you do it. [Laughter]

Wright: You didn't bring those recipes back home?

Foale: No, I didn't bring them home. I'm thinking of the little fish with the eye staring up at you out of the jelly for breakfast. [Laughter]

Wright: For breakfast? How was the smell, along with the taste?

Foale: Oh. It's in a little can, kind of wobbles there, and the little fish stare at you. [Laughter]

Wright: Did you find any foods that you liked?

Foale: Oh, yes, there's lots of foods. You can by, at least. I've never been big on caviar either.

Wright: I don't think I'm going to be too keen on tuna fish anymore now that I think about it.

Foale: But vodka is now my favorite drink, my drink of choice.

Wright: Did you have a chance to enjoy that while you were there?

Foale: Not on Mir, no.

Wright: No, not on Mir, but while you in Russia with your friends?

Foale: Oh, yes, a few times.

Wright: The social aspect of that culture, is that something that you enjoyed being a part of, or is it something that's done a lot, or they save special occasions for special events? Tell us about those times when you were with your Russian friends.

Foale: Actually, I'm overall disappointed with the degree to which I and my family integrated into Russian life in Russia. I hope that this is a sign of the early stage of our involvement with Russia in the joint program, but it was a barrier that was not created entirely by us, or maybe even 50 percent by me, because I've already said, I did have an attitude that let me try and cross that barrier.

We issued invitations on a number of times to Russians, ordinary Russians in Star City, to

cosmonauts especially, to come to our house, and they would not accept. It's a very interesting case here. They would not accept especially because of the first two or three Americans that lived in Star City, there had been complaints, general ones, that the living conditions were not the same as those that we are used in the U.S. So an effort was made, a sincere effort, by Star City management, the generals there, to provide new housing to American astronauts coming to stay. What it did is it created an island America. It created something, a little palace out on a field, where there used to be a rather beautiful park, with beautiful trees. That park was leveled and they put up what are now called the American cottages. And that was a park that had existed for like twenty years in Star City. People grow up in that town and they die there. I mean, generations go on. Space business is like a family business for most of those families involved. These towns don't kind of mix around in the Soviet times like we imagine here.

So what happened was that these little American palaces stood up. Actually, they're rather normal townhomes, by American standards. We were the very first family to be moved into them. I could see this danger when I go up there. I asked, why we, a family of four of us, were living in one hotel room for six weeks in the [unclear]. I asked if we could not move into an apartment along with the other Russian families lived. Even that apartment, by Russian standards, is luxurious. It's the sort of thing the generals have, but not the regular people. But what in the end told me, because I was new and I wasn't willing to press the point, but also, when I asked my Russian cosmonaut friends, who I'd met here, I said, "What shall I do?" They all, to a one, insisted that we stay in those cottages. They said, "No, don't try and live in an apartment. Live there. You'll be more comfortable."

What happened was that they had an impression as to what Americans needed. They said, "Oh, it will be too difficult for him. He can't handle the hardship like we're used to." So they advised, their own people, to put us into those cottages and we, Americans, if we didn't think too hard about it, said, "Yeah, I want the easy life." But as soon as that happens, you have created this little island America. For the Russians it is not comfortable. They cannot knock on the door and drop by like they do in the apartments. They don't see you in the hallway fumbling for your key and dropping it and trying to get into your apartment. You aren't having to smell the smells that they smell on the staircase going up to their rooms.

So there's immediately a barrier created. That was the intent by the initial Americans that went over there, to create better conditions, but it also created a barrier that couldn't be crossed. So I believe Americans have suffered more than the other foreign cosmonauts in Star City, as far as being able successfully to invite Russians to their houses.

Strangely enough, Rhonda and I did succeed in having totally Russian little dinner parties with three Russian families, all of whom were of the lowest ranks in Star City and were families we'd met in the

forest. They had already invited to us to their tiny one-room, not much bigger than a kitchen apartment, where three or four of them would live. We had been there, enjoyed their hospitality, and then invited them back. It was the reciprocal action. They were as nervous as can be to come into our house, terribly nervous. They were also terribly curious.

Those houses, for example, were used by couples walking around Star City. It's a pretty area. The forest is there and there's a little lake. Couples would walk around in the evening in the summer and have their pictures taken, because it was the nicest modern-looking Western thing in the area. They would get on our steps. We'd hear people coming up the steps, no one would knock, and they'd be taking their pictures. People would be taking their pictures or videoing them on the steps of our house.

We had old ladies, really old ladies, coming in, like seventy or eighty years old, coming in saying, "Well, I want to see the families that are living in this house." They imagined that four or five families would live in this house. She just wanted to call. She said, "Are you the"--what do they call them? The Russian was [Russian phrase]. "Are you the gateman?" whatever. I said, "We live here." She couldn't believe a family lived there.

Then we had an event where actually the house was broken into while we were gone for a period, by young kids from the school. It was mostly a curiosity thing, but there was also some resentment in the way they broke in. There was definitely some anger to these houses.

Unfortunately, I allowed myself, and I know I wouldn't have done any different, even the second time around, I allowed myself to be persuaded to move into those houses. Since then, as a potential housing crunch looms in Star City for new astronauts, I have told the astronauts who ask me about this, "Don't worry if they put you in an apartment. There is a lot of good to that deal." In fact, in the apartments, too, we've bought washers and dryers and things like that for them, which is way beyond what Russians have. So I mean, it's basically a pretty good life.

But that was a barrier that we created for ourselves and had to deal with the whole time we were there. Only when we had an official function, I never got my cosmonaut crews to ever come and have a party with me, except when it was an official function like when I was going away. When I was going away and I invited the whole base and all the generals and everyone else, then everyone came. But no one would do the typical Russian thing, which is two families together and have some wine and have a meal together. That has been achieved occasionally in the apartments. Only occasionally. Because again, still the foreignness of the foreigner prevents them doing that easily. But it's not so difficult if you are based in an apartment.

Wright: Of course, it's not difficult at all to get to know them up in the Mir, because it's the three of you

and you become very close.

Foale: Well, that's a different situation. That is quite different.

Wright: No barriers there.

Foale: Oh, there are barriers. There are definitely barriers of command and control. My boss is a different boss. The objectives of my program are different from their objectives. They overlap, of course. But more important than anything else, we all know as a crew on board the station--and I've seen this reflected by every long-duration crew member coming back--is that no matter how much we are different in our characters, how we wouldn't naturally get together in a bar or seek each other out on Earth, in space we are terribly respective of each other's privacy and very careful to not cause friction. I was truly impressed how everyone behaved very carefully not to irritate each other and not to offend. No one ever willingly offended, as far as I know. Yet those same people are much less careful on Earth, including myself. The space flight actually, because of the severity of the situation, forces a behavior change that is actually more civilized.

Wright: I guess that's the good news then.

Foale: That is good news.

Wright: The handover time is extremely brief compared to the time that you're up there. Did you receive any special advice from Jerry [M.] Linenger before the hatch closed and you were there? And did you have any special words for Dave Wolf as you let him and came back home?

Foale: Have you interviewed Jerry?

Wright: No, not yet.

Foale: Are you going to?

Wright: We're trying.

Foale: Okay. I'll leave it to Jerry to say what he told me. But for Dave, I was most concerned that he would come into a situation, living on the station, with false expectations. As I say, I believe most astronauts, in fact, most people working in the space program, once they're told if it's difficult or not, they can think about it, prepare for it, and deal with it successfully. But if you expect to go to a Hilton and you

find a little roach motel, you are pretty fed up and angry.

So I wanted to make sure that Dave Wolf understood that he was going to get into something pretty hard and pretty dirty, in terms of cleaning up water and moving equipment around, just doing a grungy job. So I sent a letter or two, actually to the one who he replaced, to Wendy [Lawrence], first. Then I had Wendy tell Dave what I had told her about what the conditions were like on Mir.

But the overall tone of my letter was that, "Though there was a lot of work to be done here that's hard, I still believe the operational lessons that we are going to gain at NASA working with the Russians and seeing how they operate a station that's been in space for eleven years are truly worthwhile. And for that reason, I recommend that the program send you. And, Dave, personally, I believe you'll get a lot out of it, in terms of personal award, in getting through this whole thing. However, day by day you may not think it's so easy or so pleasant."

I think he'll second that that's the overall impression you get. You're very glad you've done it, but it's like getting ready to jump into ice cold water. When you're out of the water you go, "Yeah, that was great!" [Laughter]

Wright: That first step. Do you remember your thoughts the first time that you saw the Mir from afar as you were approaching it?

Foale: Yes. Remember I've seen it twice from afar. The first time was like seeing the great wall of China or something from a distance. Or the pyramids. You don't relate to it. You know you don't have to live in there. It's like being a tourist in a bus tour. We flew around it on STS-63. We saw these people on it. We saw Elena Kondakova, with whom I was very glad to fly with on STS-84 later on. But there was Elena and these two kind of crazy guys waving to us, all excited. We didn't understand each other very well at all. I don't know Russian well. But we had Vladimir Titov on board, who could speak with them. We lingered there for about three hours. They invited us to tea. I remember I liked Elena's voice a lot. Then we went, "Bye," and left. So I knew what it looked like.

Since then I had gotten to know Elena very well, Kondakova, while she prepared to fly STS-84 to take me to the Mir. She had described how she had felt as we flew away without actually docking on STS-63, how disappointed they were, how wonderful it was and how unexpectedly beautiful it was when the Shuttle came up. but how really depressed they were after we flew away. I believe they had a big, big mood depression for a day or two after we flew away. In fact, that's true after anytime a Shuttle leaves after a docking.

So as we saw Mir, I already had a lot of feelings about it. I'd already seen it once before. I now

had Elena with me, and she was just as excited to see her old home. Charlie [Precourt] had already seen it before. So it was kind of like, yes, I've seen this before. There was nothing too unexpected about it.

As we got very close and docked, it looked overall in better condition physically than I had imagined. In the first days that we--in the very first opening of the hatch and travel down the hatchway into the Mir's base block, I was expecting worse and saw something better. I saw less clutter. No, I didn't see less clutter; I saw brighter, more cheerful objects, more visible things, than kind of the dull cellar-like impression I'd had in my mind.

I've mentioned this about Space Shuttle flight, too. Before my first Space Shuttle flight, I always thought getting into a Shuttle would be like getting into a dark, gloomy place and having trouble reading the displays, because it's so dark and kind of gloomy. Real Shuttle flight is not like that. It's like being on the 737 flight deck, light gray, sun streaming in through the windows, and it's great and there's blue sky. It was the same kind of contrast from what I expected, and then what I actually saw.

Going into the Mir living area, I was pleasantly surprised at the cheerfulness of the atmosphere there. It was kind of a warm, welcoming, cozy place, in spite of the masses of cables and equipment and wires that are on the walls. Nonetheless, it looked like a home. So that impression was kind of a mix of feelings, but colored also by previous experience.

Wright: Then when you left, that, of course, was the last time that you'll see Mir. How were your emotions then? [Foale laughs.] Well, you have to assume it's the last time that you're going to see Mir. [Laughter]

Foale: I'm sorry. [Laughter] But I had to say, as I saw the Mir going away, and we were doing a tremendous fly-around, it looked fantastic. I mean, all the guys around me were getting so excited about how great the Mir looked. It is truly a paragon, it's an ultimate in space flight experience to see such a big thing and fly around it. I was going, "Yes, we're getting away from that thing!" [Laughter] I honestly said, "I don't care if I never see it again." [Laughter]

Wright: I think anybody hearing you say that can understand why you felt that way.

Foale: I'll tell you right now, I laugh because I did say that to myself. I thought, "You know, it looks great, but I don't care if I never see it again." [Laughter] But if they asked me today to go back and do a short mission for a month or two there, I'd go. I would do it.

Wright: That's great.

Foale: It's kind of like why women have more babies after the first one, right? You forget how bad it was. [Laughter]

Wright: That's true, yes. Somewhere along we get smarter. The memory starts to get better. [Laughter] Or the kids get older, then there's other reasons why you have--

Foale: It was interesting, generally cosmonauts say the same thing. When they come back, when they're getting ready to come home, they say, "Never again. I will never sign up for this ever again." [Laughter] Then within a few, six months, they're going, "Oh, yeah, it was so great. Times were good. Didn't have any paperwork." [Laughter]

Wright: I understand that you're scheduled for STS-104.

Foale: Yes, the Hubble.

Wright: And a record number of six space walks are scheduled to be conducted.

Foale: Yes.

Wright: Do you feel the time that you spent on Mir and the experiences that you got there are going to be able to help you do what you need to do on this future mission? I know we've talked about the space walk that you did and working with people in space. I didn't know if there was any connection of the learning experiences there that you can take with you.

Foale: I believe what I can give to the Hubble flight is basically nothing extraordinary and not particular to my experience on Mir. I think I have a basic practical knowledge of spacesuits and EVA systems, broadened to some extent by the fact that I did an EVA in the Russian spacesuit, and also broadened a little bit because I did training in Russia and they have a different approach to training EVA.

But of all the EVAs that NASA does, Hubble is the only EVA scenario and the only flight that I truly got respect or felt respect coming from the Russians about what we Americans do in space. They generally discard Shuttle as just being too short, too frivolous, not serious. But when you talk about Hubble to a Russian, they sit up. They are impressed by the fact that we can do so many EVAs in such a short time and do them so intricately, and basically per the time line. This is something the Russians don't do, for good reasons. Good reasons. These good reasons are now trying to carry over to our side, so we don't try and do Hubble EVAs during Space Station. We must not do that.

So, therefore, knowing that what I learned over in Russian is actually the opposite, is the thing that the Russians know they don't do well and what they really respect, I'm prepared to only learn on Hubble. I don't believe I have an enormous wealth of experience to do Hubble particularly well compared to other crew members. So I'm going to go in there and I'm telling myself, "Mike, you can't approach this like you do a Russian EVA." With a Russian EVA or a station EVA, say, I've got some basic skills, I know how to go out. But I'm going to figure this out as I go along. I only need two or three times in the water tank to basically know what the structure looks like and I can do it, because, you know, if we don't get it done today, we'll go out in two or three days' time. That's the thing you can do on a station when you have six months to play with.

On the Hubble, you can't do that. You have got to go out today and do what you intend to do, otherwise you have failed in a specific objective. So, Hubble's a detail flight. It's where we have to pay attention to detail. We have to sweat little things that drive me nuts in ordinary situations. But this is a flight where you have to sweat the details. So I'm actually going to have to change my attitude and my kind of laissez faire approach, and concentrate much more on the task at hand. In that, I see a new challenge for myself on Hubble. So I can't just breeze in there and do it. So I'm actually looking forward to the challenge. It's truly new and different for me.

Wright: You survived the challenge of the Mir and you've been working with the program. You've never stopped working with the Shuttle-Mir Program since you've returned. Would you tell us what you feel are the benefits of the Shuttle-Mir Program?

Foale: Shuttle-Mir has its greatest benefit in that it drew the space professionals in both Russia and America together so they know each other and understand each other, and, therefore, can complete the International Space Station Program. That's the true value of the Phase One Program. The rest of it is all microscopic, I think, compared. We have learned a few technical things about how better to do space station. I'm certainly carrying over some technical lessons that I get quite emotional about, and as does Mr. [George] Abbey and the leadership here, that we feel that Space Station needs to learn a lesson from Mir, in terms of how to control its attitude in the event of power loss, what to do in certain cases if we have too much water condensation, but this is small stuff compared to the overall big win, which is we understand each other to the extent that we trust each other to do the International Space Station together.

Without Phase One, we couldn't do it. We would have to do Phase One. Phase One was an essential step. We'd have ended up doing Phase One-type flights on Space Station in a very haphazard way to get Phase Two done, you know, the International Station. Frank Culbertson said it a few times, that

without Phase One you couldn't do the Space Station. It's because of the way it's allowed managers, astronauts, engineers, all to know each other.

Wright: As we've been visiting with people, one of the common threads that keeps coming out is that there was an enormous amount of accomplishment made in a short amount of time with very few people, and most of them have always, they really enjoyed that fast, furious pace. Do you believe that is one of those character issues that someone has to be able to step right in and be able to run that fast? Was that something that helped Shuttle-Mir Program be the success that it was, that they had the individuals that are involved with it that made it happen? I think of the example that when you shared with us one of the last time, how you found out that you were going to be on the Mir. You happened to be in Russia and you just picked that up and you just went with it and went on. Most people seem to have that feeling that this is what had to happen. You couldn't take lots of time to figure out things. You figured them out quickly and you went on and made the program work.

Foale: I think you're right. But there's nothing particularly unique to the individuals. The Phase One Program and the astronauts and cosmonauts, and people involved in it, weren't specially selected and they don't represent a particularly special group of people at NASA and in Russia. They are people who have been thrust into a moment, into a set of external forces and conditions and have had to deal with it. It's basically an expression of, I think, overall fundamental flexibility that human beings exhibit when forced. And they really have to be forced to do it.

I, for one, I told you, I was very comfortable where I was. I had to go through some big, big mind shifts as to going into this whole thing. That's true of, I think, a lot of the people in the Phase One Program, starting with Frank Culbertson. He didn't want to be the Phase One program manager. I know that. [Laughter] This is a gloomy example, but it shows the strength of this characteristic in humans. When disaster befalls, true disaster befalls people, it's not as bad as we really say it's going to be. It's not all over. People pull out incredible things in the worst moments. It seems like we need the hard, bad moments to pull out the best. People are not heroes if nothing's going wrong. There are no heroes if nothing's going wrong. There are only heroes when things go wrong. And those people don't know that they're going to do it. It's a pretty fundamental, I'm glad to say, quality in human beings.

So a large number of people in Phase One have really felt some pretty big upsets in their lives, especially with travel, being away, feeling awkward and not knowing language, all kinds of situations that we've come across that ordinarily you wouldn't experience if you were just happily in your regular on the U.S. side of the Atlanta job.

Wright: We have enjoyed visiting with you. This is your chance, is there anything else that you would like to add for your history?

Foale: Well, I just hope that you're going to interview me again in about five, ten years, after what we've done on the Space Station and how we're about to go to the moon and Mars.

Wright: We'd like to continue that, as well. I was going to ask you what you're looking forward to, as my final question. So much is out there. Now that you've completed this, what would you like to do next?

Foale: I'll give you my big global picture of what's going on. The Cold War no longer drives the space program, probably never will ever again, even if the Cold War started up again. It wouldn't drive space like it did in the Apollo Program. However, a space flight, because of the Cold War emphasis on excellence and technological prowess, has created a little bit of a myth, or an aura, in the world's imagination that anything to do with space is kind of new, futuristic, the next thing, and good. I mean, in terms of pure value, I guess, whatever. So I think countries recognize now that by putting people up into space, especially when they're internationally grouped together, looks good to everybody, not just the people who are participating, but other countries around. They all admire what's happening. They're pleased. It gives people hope about humanity, as opposed to nations.

I think that basic idea is only going to grow. It started in World War II afterwards with the Foundation of the United Nations, which has masses of problems, as we know, but it has more figurative value than actual true power in its body. It's a shining beacon for the world. I think space flight on the International Space Station will continue, if only for that reason. It doesn't matter if there is no research, people will still want to do it, and governments will still put the money out for it. I won't name any names, but there is a number of governments that I can think of are doing it only because it shows that they are working with other nations.

If you take that argument further, as long as it doesn't cost too much for any one nation, yes, the interest will be very strong to go to the moon and then to Mars, but, I believe, only internationally. It will not be possible for this nation to do it alone, because the political will won't be there. The will will be there if it's with other nations.

So I think you're going to see International Space Station being like United Nations up, as opposed to East or West. [Laughter] From that you're going to see probably a joint mission to the moon to verify equipment that will then used to send a joint mission to Mars. I hope very much it won't just be Russia that will be our partner. I do believe Russia will be the other official partner.

Wright: For you, where do you want to be in all these plans?

Foale: Oh, I'd love to get to the moon. There's a chance, if I don't get too gray, we could get back to the moon in about 2003 2004, if we do a verification of TransHab on the lunar surface. TransHab's the habitation module that we want to put up. It's an inflated structure on the station. But it's also the core of a vehicle that we think should go eventually to Mars and be the Mars vehicle there. But we would test it out and its life support systems on the moon, and potentially put crew members in it for six months in lunar orbit, which is pretty far away from the Earth, in lunar orbit for six months and then land them on the moon and see what all the medical problems, etc., of landing did. It's only a six G, not a third G, which is what Mars is. But that's kind of the idea going around at the moment.

If all that demonstration works well, then go shoot for Mars in about two years after that. The ideas that Mr. Abbey has, Mr. [Daniel] Goldin has, the budget plans envisage asking money for that in about the next year. First significant money for that is the next year. It builds up to a lunar landing in about, as I say, about 2003, 2005. Then a Mars mission maybe five years after that.

Wright: How does this meet with your expectations of what you wanted to accomplish?

Foale: I would like to go to the moon. I'd like to go to Mars, but I've said in other places, right now I'd only do that if my kids were grown up and my wife could go with me.

Wright: Sounds like a good plan. Was this part of your plans when you originally wanted to become an astronaut, to venture as far as to the moon and Mars?

Foale: Oh, totally, yes. I thought I'd have done it by now. [Laughter]

Wright: Well, we're a little closer. So I guess that's what we'll keep working for.

Foale: I thought we'd all have done it by now. I remember I wrote a plan to myself as to how it was all going to go when I was about eighteen or nineteen. I thought sure we'd be going to Mars about now, yes. That when we were thinking that Shuttle was going to launch once every two weeks.

Wright: Maybe with all the cooperative efforts we'll be able to help each other.

Foale: Yes. It's much harder than that. Space flight is hard. You have to remember that a rifle that shoots a bullet at mach two, like an M-16, is a pretty good rifle, pretty good gun. It has a high technology

in the explosive charge driving that bullet. The Space Shuttle goes twelve times faster than that and it's a hundred tons. You then have to deal with the fact that you have all the radiation up there, you're isolated, you have no materials. This is a difficult thing we're doing.

It's because of that energy, specifically that energy of going up to twelve times the speed of an M-16 bullet, that really makes this thing both dangerous and so expensive. It's just to keep putting that much extra speed into it, with the same object, again and again and again in a short time, which is what liftoff is, is a very risky business.

Wright: But we certainly have people wanting to become part of the program. So the desire to be part of this program still lives on.

Foale: Oh, totally, yes. It's all across the world and the nation, across the nation and the world. I mean, lots of people. The trouble is, there's a very famous science fiction writer, who's since passed away, called Robert Heinlein. He wrote some of the very, very best books on young kids, sixteen-year-olds, eighteen-year-olds, wanting to become astronauts, becoming astronauts, whatever reason, however it happened, doing great things, saving the world, the galaxy, whatever. Very exciting stories. He talked about star travel, as well.

But I remember one book where the young kid who's just finished college is trying to get ready, because it's Space Academy, and he talks about how he's excited about the concept of going out into the universe, going out into the galaxy, meeting aliens, etc., and what a strong motivation that is. His drill sergeant instructor in this Space Academy just screams at him and says, "Dreamers will never make it. Dreamers may pay for it, but you need someone who doesn't dream to actually succeed in doing this, someone who understands the dirt and the danger and the fear." It was glamorized in Heinlein's story, but he's basically right. For the times that you're actually trying to do these programs and if you really want to be an astronaut, or you really want to be an engineer building this vehicle, you are having to deal with some really hard, non-romantic problems. It's only when you step back and have a drink and hear the music in the background, then it gets romantic. [Laughter]

That distinction, you have to find a balance between the two. I can't help but be romantic, but I keep telling myself, and my father said the same thing to me, if you get really turned on by your flying while you're flying, you'll kill yourself.
Because you're not going to concentrate on your flying. Because he's an Air Force pilot. It's true.

Unfortunately, during the EVAs on Hubble, I have to be very careful. It is such a beautiful experience that the desire is just to say, "Wow!" and totally kick back and release all of your concentration

you can and just enjoy the moment. As soon as you do that, you're going to screw something up.

Wright: Not a lot of room to fail up there.

Foale: No, unfortunately. I was very privileged, very, very lucky to be on the Mir during that EVA, because I had a pretty easy job once I was out there managing this crane for Anatoly. I could easy for twenty minutes at a time--no, I guess my kind of check cycle was like five minutes. Every five minutes, I think, "Am I screwing something up?" [Laughter] Then I'd go back to really enjoying the moment. I don't ever expect to be able to have that luxury again. I was very lucky to do that.

Wright: I'm sure your experiences will be many in the next few months, few years.

Foale: Yes, I hope so.

Wright: You'll start training when, for your next flight?

Foale: I've already started the Hubble, actually. I've already done a series of NBL runs here in the tank with the crew that were named. We went up to Goddard last two weeks ago. We were in bunny suits running all over the hardware for about three days. Then we have a whole bunch of NBL runs here coming up in September for a whole month, actually. Yes, I'm going to be quite tired.

Wright: It gets you out of the office.

Foale: It's good stuff, yes. Again, actually, I'll tell you one thing, I used to think [unclear] runs and the suit runs here were hard. I don't think they're hard anymore. [Laughter]

Wright: You do have experiences from that stuff.

Foale: Yes, because compared to the Orlon, which is the Russian suit, compared to the Russian hydrolab training in their tank, our training is really easy. [Laughter] This has something to do with the difference in pressures of the suits, and to do with the quality of the training hardware. After a two-and-a-half-hour run in Star City, I couldn't do anything afterwards. I was so tired, just totally exhausted.

After five- or six-hour run in the suit here--and I'd never done one before until just about two months ago; I used to be really apprehensive about it--it was not a big deal, not compared to their Orlon. So I've already seen the biggest highest hill, and I'm going downhill now. [Laughter]

Wright: That's good. That makes the trip a little easier.

Foale: Yes.

Wright: Well, thanks again. We don't want to hold you up. We know we have a busy schedule.

Foale: Thank you, guys.

Wright: We appreciate your time.

[End of interview]