SHANNON LUCID

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Interviewers: Mark Davison, Rebecca Wright, Paul Rollins

Davison: Today is June the 17th [1998]. We're interviewing Shannon Lucid, who is part of the NASA II crew on the flight to Mir. I'm Mark Davison. This is Paul Rollins and Rebecca Wright, helping on the interview. Good afternoon.

Lucid: Good afternoon.

Davison: First, we'd like to let you talk a little bit about your training over in Russia and how that all started. Maybe even before that, if you wanted to just kind of start about talking about your earlier flights, and then when you got selected for this flight.

Lucid: Well, that's sort of open-ended. [Laughter]

Davison: Well, I was trying to start how you wanted to or start where you wanted to. I can narrow it down, if you want me to.

Lucid: You'd better narrow it down. [Laughter]

Davison: Let's talk about when you first found out you were going to be going onto the Mir, how you received that news, and what you did to prepare yourself and your family for that.

Lucid: When I found that I was actually going to fly?

Davison: Yes.

Lucid: We were sent over to Russia, training, and we weren't told we were going to fly. I mean, it was just on the chance. So we were in Russia training before we were told that we were actually going to fly.

Davison: Did you find out by telefax, like some of the other crew members?

Lucid: No. As a matter of fact, Dave Leetsma was over there on one of his trips, and so he told us. Then I sent an e-mail back to my family, but they had already heard.

Davison: Let's talk about the training and how that all got started. I know Norm [Norman Thagard] and Bonnie [Dunbar] had kind of paved the way, and then you followed right behind them.

Lucid: Well, Norm and Bonnie were already over in Star City. So one Friday afternoon, Hoot [Robert L.] Gibson, who was then head of the Astronaut office, called me up and asked if I'd be interested in going out to Monterey [California] to study Russian, with the chance of going to Russia and with the chance of maybe going up on Mir. It was just all very vague. I said, "Well, I'd be glad to." But he wanted me to go on that Monday, and I said, "Well, could we wait just a week?" Because my daughter was getting married on Saturday. So he allowed as, you know, a week wouldn't make any difference. So then we waited a week and I went out a week following when he called.

Davison: Did your training start with the crew that you eventually flew with, or was it just in anticipation of the-this is what the Mir training--

Lucid: You're talking about training in Russia?

Davison: Training in Russia.

Lucid: Oh, see, people always think that you've went over there and you trained with the crew. You didn't go over there and train with a crew. All my training in Russia was with John Blaha. John Blaha and I trained together. We sat in a classroom together. It was just the two of us and the instructor for whatever classroom it was. We just talked to each other all day long and that was it. I mean, we didn't interface with anybody else. Only toward the end did we do just a very few sims with the Russian crew. I mean, we got in the Soyuz and went through a sim. But it was very, very minimal. There wasn't training with a crew like you think here.

Davison: So when you did get notice that you were going to be the second crew member to Mir, did you know who the crew was that you were going to actually be flying with? Was the timing set up?

Lucid: Yes, I knew, but I hadn't met them. I mean, I knew who they were going to be.

Davison: We've heard different stories about the crew being able to work as a team. At least, did you get to do that in those early sims?

Lucid: No. It's very different than training over here. Basically, you're in the Soyuz, you put on your skafonder [phonetic], you sat in the Soyuz, and my job was to be quiet and not to interfere. I mean, that's basically my job. So then we would do that like one afternoon. We did that two or three times. We did one training session in the Mir and we did one training session over in the vacuum chamber together.

Then the second crew that I was with, I had seen Valeri quite a bit in Star City, but I had never seen Sasha at all. I met him for the first time when he came out of the hatch.

Davison: Was your family able to come over in Russia while you were in Star City? I guess it was about fourteen months that you were there.

Lucid: Yes, they came over and visited. My husband came over several times and my kids came over at various times.

Davison: What was their impression of Russia? Were you able to show them a lot of Russia?

Lucid: Oh, yes, we went around. When my husband came, we went to Saint Petersburg. My one daughter came over. Actually, she came over twice. When she came over in the summertime, we made a trip up to Saint Petersburg. Then everybody came over for Christmas, because they wouldn't let the crew come home for Christmas. So my family all came over for Christmas. So we were all there. It was the coldest, I think, it had been all year long. My son also came over in the summertime. We had a good time. I showed him Moscow and all the little villages around Star City.

Davison: When we read your bio, it tells that you were born in Shanghai, China.

Lucid: Yes.

Davison: As a child, did you see a lot of the world? Was your father a missionary or preacher?

Lucid: Yes, I'd been around the world twice before I was five years old, on a boat.

Davison: Did your family get to experience the same things that you got to experience with the traveling? What I'm trying to say is, see Russia, as a missionary-type work, like you were able to do with your father with China?

Lucid: Well, obviously it was very, very different. But I was very happy that my kids had-I call them "kids"; they're basically grown-had the opportunity to come over and see Russia. I thought it was just very interesting to see Russia just as it's making transformation between one type of government to another.

Davison: Let's go a little bit forward, to your flight up to Mir, and the emotions that you were feeling getting ready for this, the docking and living on the station. What were those feelings that you were going through as you approached the Mir?

Lucid: Well, I mean, it was just pretty neat to look out the window and see Mir, and know that was going to be your home, and you were getting close to it. The 76 crew did an outstanding job of docking and opening the hatch. It was great to see Yuri and Yuri. They'd been up there a month before I got there. They acted very happy to see me. I believe that they really were. So as soon as the hatch opened, then I moved over and became part of the Mir-21 crew.

Davison: I read stories that your lab was basically where you did all your work and reminded you, I think you said, of your college days, when you were able to work on experiments and just sit there and concentrate on those. Can you share some of those thoughts with us?

Lucid: Time sort of runs together, but I think it was about six weeks after I was on Mir, then Priroda arrived. Priroda was supposed to have been there before I got there, but it was delayed. It docked. Then Yuri and Yuri and I worked together, and we got it all configured and ready to go as a laboratory. Priroda is where they had a lot of the U.S. experiments. So I spent a lot of time, after Priroda got there and after it got reconfigured, that's where I did most of the U.S. experiments.

Davison: I think one of the stories talked about the wheat experiment that you had, and the growing of that, and how you were able to share that with the crew, and every day they wanted to know how the wheat was doing.

Lucid: Yes, that worked out really nice. Because we were delayed and were staying up there longer than originally planned, then we got to start on using the greenhouse and starting with growing some plants. So we put the wheat in. We planted it. This was not planned. It was not planned that we were going to do this. But everything was there, so the ground asked us to go ahead and get started. So we got started. We got it planted. Then it was really neat every day to go and watch the plants grow. What was really neat was the seed actually went from seed to seed, and it formed wheat seeds.

Davison: One of the stories I heard was through, I think, a mutual friend, was that when you got on board and you found your sleeping quarters-you had brought a Bible from home, and that when you got in your quarters you found a Gideon's Bible there. You thought were going to bring the first Bible on board, and found out that somebody beat you to it.

Lucid: Well, I have a little, a small Bible I always carry when I travel. I brought it up on the Shuttle, so I had it with me the whole time I was there. Yes, I noticed in one of the cosmonaut's cabinets they had a little Gideon's. It was in Russian, a little New Testament that was there.

Davison: Did you use that for working on your Russian?

Lucid: Well, no, that was theirs. [Laughter]

Davison: General [Yuri] Glazkov made a statement that whenever he saw pictures of you in the Mir, you seem like you were always smiling. You always had a smile on your face. It appeared that you were either really enjoying yourself or the crew was really getting along real well.

Lucid: I think it was both. Yes, we really had a good time together. We really enjoyed being there together. Yuri and Yuri were absolutely fantastic to work with. I mean, I could not have picked better people to spend a long period of time with. We just lived every day as it came. We enjoyed every day. We enjoyed working together and joking around together. It was just a very good experience, I think, for all of us.

Davison: Was there a common time during the day when you got together and were able to share stories? Was it mealtime or teatime or anything like that?

Lucid: Yes, we ate all our meals together and spent a lot of time talking to each other over mealtimes. Then many times we did take a small break in the middle of the late afternoon where we'd have tea and cookies together. Lots of times we would have tea and cookies together just before we went to bed at night.

Davison: What about your experiences on Mir, as far as the living quarters? How were those accommodations?

Lucid: Oh, they were just real fine. I put all my personal things in Spektr. I had a sleeping bag. The Russians provided a sleeping bag, so I had that in there. Then I had one of the white collapsible bags that had all my personal things in there, my books and stuff. That's where I kept all my personal things.

Then at the end of the day when Yuri, the commander, said it was time to go to sleep, or go to bed, then I would go into Spektr and just unroll the sleeping bag and tie it off. Generally, we had about an hour in the evening to yourself. That was just real nice. Then I would get in the sleeping bag, go to sleep, wake up the next morning when the alarm clock went off.

Davison: What about communications with your family back home? Were you doing that through e-mail or ham radio, or just the ground passes?

Lucid: It was a combination. The one thing that I knew before I left was that I needed to have some way

of having constant communication with my family, because the reason that it worked for the time that I was in Russia was because I had CompuServe on my computer.

For months, when I first got over to Russia, that was the only way that I had of having any contact with my family, because the phones just flat didn't work. You'd try to make a phone connection and you might try forty-five minutes to an hour to get a connection, and then many times it was so poor, you couldn't hear. So it was very, very unsatisfactory. But my daughter sent me over CompuServe, which she bought, and I installed it on my computer. She had very simple instructions so I could follow it. I put it in on my computer. With CompuServe, I was able to make a connection back home every day. There's only one day when I was not able to make a connection. So that way I was able to pick up e-mail messages from my family. So we kept in contact the whole time that I was in Russia, by using CompuServe. So I knew that that would work.

I had sort of heard that it was possible with a packet system on the ham radio that you'd be able to send up messages. We had just sort of heard that the Russians could do that. So I told Galen Johnson, who was the flight surgeon for the flight I was on, I told him that the most important thing was for me to be able to get messages from my family. I told him that was his job to figure out how to get them up. So I gave him my computer, and it had CompuServe in it. I told him, I said, "You can hook this up in the TsUP. You can hook this up in your hotel room. You can hook it up into any phone system. You can collect my messages every day. Then when you figure out how to send them up, then you can send them up to me."

So he was able to figure out, work with the Russians and figure out how to do that. Then maybe once a week, sometimes if it was a good week, maybe twice a day, and then sometimes there were weeks on end where the packet system didn't work for one reason or the other. But in this way, I was able to get messages from my family, because when I was over in Russia, we found out that was the only way we could get in contact. Then we made sure that each of the kids had a computer, so that they also were hooked in and they could send messages. So they were able to send messages over to Russia, and Galen was able to pick them up in my computer. He was able to pick them up in his hotel room. Then you put them on a floppy and send them up over the ham radio, over that packet system. So that worked out pretty well, and that was the best way of communicating.

Then about every other week, they tried to have it set up so you could have a phone conversation with the family, and those generally worked. Then they tried every other week to set up so you'd have a video conference with your family. They tried real hard to get those to work. Sometimes they worked better than other times. Sometimes we got sound. Sometimes we got picture. Once in a while we got both

of them together. [Laughter] But those were the ways that I kept in contact with my family.

Davison: You think that was important psychologically for any of the crew members?

Lucid: Oh, I think the most important was having the e-mail connection, because in that way you had daily messages, so you felt like you were still plugged in on a daily basis to your family's life. After that, it was the telephone conversations, because they came through pretty good. Actually, the best conversations were those that you were just one on one. When they tried to conference and had a lot of people, then all that happened was people just say, "Hello," and, "How are you?" and that was it. You never got any information passed. Then at the bottom was the video conferences, as far as satisfaction of keeping in contact with your family.

The other thing that worked real well was the ham shack here at JSC [Johnson Space Center]. They have the ham radio club. My daughter and her husband both got their ham radio license so that they could use it. Then when passes were at the right time, they would go over there and they would have lunch. My son-in-law really likes working with equipment, so he enjoyed fiddling with the antennas and doing that. They would go over there together, and Shaney [phonetic] would talk to me and Jeff would work the equipment. I mean, that worked out really nice, and that was a nice way of also getting information back and forth.

Davison: One of the stories I remember hearing was you wanted to try to get a book on board the Progress. She had sent you a series of books or something. I don't know if the order got messed up or what. Could you share that story with us about the different books that she'd sent up to you?

Lucid: NASA was really nice, because they responded to Norm's suggestion after his flight. So they said, "Shannon, what do you need to keep happy for a long-duration flight?" I said, "As long as I have some books, I'll be happy."

Then while I was over in Russia, they said-actually I got a message from my daughter, she said, "We got a call from NASA and they said you can have X-number of pounds of books, but they have to be in the office." It was in three or four days.

So I sent her a note back, and I said, "Just go pick some out. Go to Half-Price Bookstore and just get some things that you think I haven't read."

The only requirement is they had to have a lot of words per page. [Laughter] I mean, we had to make sure we had the most-they had to be sort of dense. Unfortunately, she took that to the extreme. She was an English major in college, so she picked out a lot of English writers that she thought I should have

read. And there was a reason why I had not read them. [Laughter] You know, you make do with what you have.

But anyway, on board she also put on the first in a series of science fiction books that she really liked. I read it and I really enjoyed it. But unfortunately it ended right at the cliffhanger, and then there was no second volume. That was the point where you realized you were just really isolated, because obviously, if I'd been living here, I would have gone out immediately to the bookstore and gotten the second volume. But I sent a lot of e-mail messages with a lot of threats. [Laughter] I told her that it better be on the next Progress. So they worked real hard and they got it on the next Progress.

Davison: Let's talk a little bit about the different experiments that you had on board. If I can use the acronyms and we'll fill them later, just to save time, I think one of those was called the QUEL experiment. The Q-U-E-L?

Lucid: Oh, yes. That was put together by the Canadians. That was basically tubes. There were metal tubes about like this. It had different chemical compositions. Then we would put them in a furnace and heat it up for X amount of time. They had different profiles that they would do for different tubes. The idea was to found out how the crystallization process, as they cooled down, if it was different in a microgravity environment than it was here. But that experiment worked real well. You put them in in the morning, they'd run for whatever the amount of time was, and then it would cut off.

Davison: Talk about another one here. Was it optimized liquid phase?

Lucid: The Opti-Zon [phonetic].

Davison: Yes.

Lucid: That was a real interesting experiment. Actually, on board Mir they have a furnace that, I think, was built by the Bulgarians, maybe. Anyway, it's been on Mir for quite a while. It has the capability of going up to very, very high temperatures. Dr. Smith, I think he's associated with the Marshall Space Flight Center, he had all these samples put together. We would put them in the furnace, turn the furnace on, go through the process to get it up and running, and then we'd bring the samples back, and he's analyzing the samples. There, again, it's another way of finding out how samples solidify in a microgravity environment, what the differences are.

Davison: Is there a microgravity isolation mount was another experiment?

Lucid: Yes. That was also put together by the Canadians, and it worked very, very well. They were just ecstatic with the results that they'd gotten back from it. Also another thing that I think is very interesting, it has worked not only for my increment, but all the succeeding increments. It has worked much, much longer than they ever anticipated or that it was built for.

The purpose of this experiment was to find-as you know, in a microgravity environment, there is always small disturbances to this environment, and scientists always want to isolate and get as pure a microgravity environment as possible. So by putting your equipment on top of this piece of apparatus, like we put the furnace that we put the QUEL experiments we talked about earlier on there, then this would isolate it from any of the impacts that crew movements or things like that, might have. It just worked great.

I think, from my perspective, that's the way to go right for Space Station. Any experiment that is very sensitive to the microgravity environment ought to be put on its own separate mount, rather than trying to isolate, say, like the treadmill from the experiments. But it worked really well.

Davison: One of the ideas on Space Station is to isolate the whole rack.

Lucid: Yes.

Davison: I guess, which is a similar idea, but just a more smaller scale.

Lucid: Yes. The apparatus was about this size. It was operated with a laptop computer, and it just worked great.

Davison: Was this flown up on the Priroda?

Lucid: It came up on Priroda.

Davison: You flew different, other experiments on top of that?

Lucid: Yes. First of all, we checked it out to get its characteristics. Since I was the first one to use it, I activated it and did an engineering check out of it. Then we put the QUEL apparatus on it and used it.

There was another experiment put together by Lewis [Research Center]. It was to see the effects of fluid dynamics in microgravity. So that was also mounted on board the MEM, this isolation apparatus.

Davison: There was another, a candle flame experiment.

Lucid: That was a real interesting experiment, interesting because it had a lot of crew involvement. The

best experiments, from the crew perspective, are the ones that have lots of crew involvement. The experiments that you don't want to have on a space station are something that are just a black box, that you just punch a button and that's it. You want to have a lot of insight where you can work on it, just like you do in a laboratory here on the Earth. The candle experiment was one like that.

Basically, the guys up at Lewis just got together and they decided that what they'd like to do is to have an experiment that would answer all the questions that there ever were about burning candles and about flames in space. So they put together this experiment, and it worked out very, very well. We did it in a glove box, which was built by the folks down in Marshall Space Flight Center. That worked very, very well. So we had a little cage, you put the candles in it, and you would light them. This was all isolated, because it's inside the glove box. Then with videocameras and with still cameras we'd take pictures of it burning.

But the problem was that it burned with a very, very blue flame, and this color was not picked up by the videocameras very well. So I was able to make lots of observations and tell the people on the ground. So from that, then they were able to redesign the experiment just a little bit.

But we found out lots of interesting things. What I thought was most interesting was that it didn't answer all the questions. All it did was pose lots more questions that they need to have answered in the future. But this is important work, not only from the science perspective, but also because we need to know how things propagate in space, in case there ever is a fire or something like that so that we know how to put them out, because flames are different. Fire is a little bit different and propagates differently in a microgravity environment than it does down here on Earth.

Davison: With all these different experiments, was your day filled with things the ground wanted you to do or were you able to kind of control which ones you did at certain times? Did your days change over the mission?

Lucid: Well, how it really worked, the ground would send up what the Russians call a Form 24, and we would get it in the evening. Then we would look at it, and Yuri, the commander, would always ask me if I understood what it was I was supposed to be doing the next day. He always checked to make sure what we had accomplished during the day we just ended. If we didn't get everything done, then why.

Then I would look at the Form 24 and I would see what the ground thought that I was going to be doing the next day. So I would just write down, for instance, in my little notebook I would just write it down, "Oh, tomorrow I'm supposed to be doing the candle experiments," for instance. I never looked at the Form 24 to see, "Okay, it was at ten o'clock they expected me to do it," or something like that. Then I just

organized my own time, just like I do when I work in a laboratory down here on the Earth. That's the only way it will really work, and that's the way a space station needs to operate.

Davison: You mentioned crew involvement experiments were essential for Space Station. Do you feel like it occupied your time so that the time went by a lot quicker? With idle time, you might get bored up there or whatever. But if you were busy, it seemed like you enjoyed it more?

Lucid: I think it's very, very, very important that people have productive work that they're doing. It would be very wrong to send someone up into space with nothing to do. They need to feel like they're productive and that they're doing something worthwhile. So you need to have lots of very interesting scientific-type work for a person to do.

Davison: What would you propose, if you're doing a mission to Mars in a small confined area and long travel time? Do you have any suggestions of what you'd be doing while you're flying the module and keeping busy and actually trying to be productive? Any ideas?

Lucid: Well, I think you need to have productive things to do. I think with a little bit of thought, you can come up with things that a person can do that will be productive and that they will be using their time wisely. Now, you can't think that you're just going to be there preparing. Obviously, you're going to be doing maintenance work and things like that, but you have to have work that involves and engages a person and is very interesting.

Davison: I remember when I talked to Frank Hughes over in training, back when they were doing the Skylab missions, they didn't have a lot of science, and what they came up with was somewhat kind of games for the crew to work with, just to kind of keep them busy, so they wouldn't, I guess, get bored with their time.

Lucid: No, I don't want any make-work, I mean, at all. [Laughter] I mean, I want real work.

Davison: Hopefully, we learned our lesson from that.

Lucid: I mean, I can't think of anything stupider than to be having make-work from the ground. I want real work that's productive, that's you feel like-or else I'll entertain myself. I mean, like I said, if I have lots of books, I know that I can keep busy and happy. But when I was on Mir, I never read during the day, because I should be working. I mean, I should be working every day. And if I didn't have science

experiments to work, then I had plenty to do. I helped Yuri and Yuri all the time, because, obviously, I was living on Mir just like they were, so it was important that I did my share of keeping Mir up, too.

Davison: Let's go back and talk a little bit more about some of the other experiments. What about the force-flow, the flame-spread experiment? Was that part of the candle?

Lucid: No, that was another experiment that was looking at how far flames propagate in microgravity. That was also put together by the Lewis Space Flight Center. They had different materials, different thicknesses of paper. This was also done in the hood-I mean in the glove box. You would just ignite the paper and then, with videocameras and still photography, document how the flames propagated. They also had samples of various plastic tubing that they were doing the same thing on.

Davison: Did you have a similar problem with the color of the blue flame not being picked up with a camera?

Lucid: No, because the paper burned more with an orangish flame.

Davison: A little different temperature?

Lucid: Yes.

Davison: What would you say was your favorite experiment, or the one that you thought was the most productive?

Lucid: Well, see, you can't really answer that question, because then the other PIs would say, "Well, what's wrong with our experiment?" You know. [Laughter]

Davison: Make them work harder. Make it better. [Laughter]

Lucid: I think the experiments that you need to have on Space Station, you need to have experiments that have lots of crew involvement, where you can be intellectually engaged with the experiment, so that you're working together with the principal investigator. And you need to have experiments that-one thing that I thought was really nice on the mission that I was on, I had a wide variety, different kinds of experiments. They weren't all biology, they weren't all physics. They went across the discipline. So I had lots of various types of experiments to work with. I think that that's very important. I mean, for me, I think it would be very bad if you had an increment that was dedicated to only one discipline, for instance. I mean, it was

really nice to have a wide variety of experiments.

A lot of times the ground would say, "Well, you have a lot to do," because what they were counting, you were doing experiments that were working on your own body, for instance, like collecting urine or collecting blood or documenting the food that you went into. See, I don't really consider that as work; that's just extra hassle on your day, and those are unpleasant-type things to do. So you don't want to have a lot of those on board long duration space flight or you don't them day after day after day, where that's all you're doing. They need to be just interspersed among other things.

Davison: What about the data collection? Was it better to have it where it was just videotape, that it was automated and you didn't have to write it down? Did that make a big difference to you, how you were collecting the data and give that to the ground?

Lucid: No. I mean, a lot of it was on videotape and a lot of it reflected on disk, which were brought down. It depends on the data. I mean, obviously there's some that you can't. So it's just important to collect the data in the way that's the best way to collect, that's appropriate for collecting that particular type of data that's being looked for.

Davison: The interaction with the ground, if you had difficulties with experiments and having to change things real time, was that vital in some of these experiments?

Lucid: Yes, but, see, obviously on Mir it's different than like on a Space Shuttle flight, because on Mir we had fairly limited contact with the ground. Our com passes would basically happen every ninety minutes for about ten minutes. Yuri, the commander, always wanted everybody on com, because like he said, on the Shuttle you can talk to the ground anytime, but on Mir, you had very limited periods of time. So you needed to be on com, so if the ground needed to talk to you, you were available. That worked out real nice, because that gave us little breaks all through the day when we were together, and we would have a few minutes of socializing.

But the U.S. then had-at least, once every day I was able to talk with the folks that were in the Russian Control Center, and most of the time it was twice a day. We had maybe five to ten minutes twice a day when we could talk. It worked out just real well, because a lot of times on the ground, if you run into a problem, the first thing you do-I don't mean on the ground. A lot of times when you're on the Shuttle, on a space line [phonetic] mission, for instance, and something's not working quite right, the first thing you do is call up the ground. You don't take time to think about what you're doing. You don't take time to think, "Oh, well, maybe this is what I really should have done or should be doing," and solve your own problem,

so to speak. But on Mir, because you had such limited contact with the ground, if you ran into a problem that you didn't really understand, it forced you to think of what the principal investigator really was after. It just forced you to be a little more on your own and to use your own initiative. That worked out just really, really well.

I think that worked out well for the ground, too, because they knew when they were going to be talking to the crew, so that gave them the majority of the day when they could work and try to contact the people back in the States, and try to get all their work done so that they were ready to talk to the crew. I know it forced me to be a little more disciplined in what I was going to say to the ground and to think through what I was going to say, so that when I told the ground, it was something meaningful and not just something off the top of my head that I hadn't really thought out. So I thought it worked out just very, very well.

Davison: You mentioned different people on the ground. Was there one central point of contact? Did you talk to the flight surgeon or the RIO, and they talked to the PI?

Lucid: Basically I talked to two people all the time. I talked to Bill Gerstenmaier, who is like the flight director, and Galen Johnson. Those were basically the only two people that I talked to. Generally, they worked it so that I talked to one, one shift, and one, the other. One in the morning and one in the afternoon and vice versa.

You know, frankly, it just seemed to me like it was us three and that was it in the world. [Laughter] I know that Bill did an absolute fantastic job working with the principal investigators. He was always ahead of what was going to happen or what he was going to schedule. For instance, when I got started working on the candle experiment, then he knew that I was going to be doing it that morning. I was getting it started and set up. So he had the candle PIs on the loop at the time when I was going to be talking to the ground. I had gotten started that morning, and I'd run into a problem and it wasn't working. So when I got on the loop, I started explaining this to him, and then the PI, who was in Cleveland, was listening in, and he said, "Oh, well, you just need to do," and he told me just exactly what I needed to do. So then two minutes later, I was back in the lab, and the PI was absolutely right, and we were proceeding on. Now, see, if Bill hadn't gone to the extra effort to have the PI on the loop when we were starting a new experiment, then we would have finished up that com pass, Bill would have said, "Well, I don't have a clue what you do." Then all day I would have sat around not knowing how to proceed until he had been able to contact the PIs. Then he would have told them what I had said, which, going second-hand, sometimes you don't get it quite right. But this way it just worked out perfectly. He did that on a number of occasions,

and that just really made things flow very, very well.

Davison: So that would save about one or two days of lost time, if you look at the communications that would have been missing there, and then on to the whole point.

Lucid: Yes. But, see, that was because Bill anticipated a lot of what was going on. He really dug into the experiments and understood them, so that he had the answers when I came up with them. I think one thing, I don't know, maybe it was about halfway through the flight, every time that I talked to Bill or Galen, then Yuri always said, "Well, what did they say?" So I'd always explain to him what they had said. I always told them what I was going to be telling Bill and Galen, so that they were clued in as to what I was doing, what was going on with the experiments.

After I talked to Bill one night, then Yuri asked me, he says, "Shannon, how many people are working there for NASA in the Russian Control Center?" I said, "Well, I don't know. Why?" He said, "Well, there must be a lot, because every time you ask a question of Bill, he always gets right back to you with the answer on it." [Laughter] I thought that that really said a lot for Bill and Galen and the work that they were doing, that someone that didn't even speak the language was picking up with how efficiently and how helpful they were.

Davison: If something wasn't able to be accomplished during the day for one reason or another, by the time you told the ground and it got rescheduled, would it miss a day on the Form 24, or would you pretty much decide your schedule? Or would you wait a day, skip a day, type thing?

Lucid: Well, I just pretty much did what I needed to do. I mean, the Form 24, it was important for the ground to do that, because they needed to work with the Russians to say that this is what was going to go on. I basically just did the day as I could do it.

Davison: Almost like you knew what had to be done that week, so you picked a day--

Lucid: Yes, I just looked at the Form 24 as permission to start in on these experiments. And that is the only way that it would have worked.

Davison: What about the APA experiment, the aniceptory postoral activities? I probably slaughtered that one.

Lucid: Oh, that was-I didn't recognize the acronym. That was just a pre and post thing. I mean, that was

just baseline data collection pre and post. Oh, no, I guess we did. Yes, quite a few-yes, we did. I'm sorry, it was just different pre and post than it was on flight. It was an experiment between the Russians and the Americans, and it was to see how posture changed. So quite a few times, while we were on orbit, then what you would do is you put electrodes on your leg, non-invasive [unclear], to see how the muscles tensed. Then you did a series of raising your arm, while you had your eyes closed and opened, and your feet fastened, just free-floating. Then the data was just recorded.

Davison: Were they comparing your zero-G posture to the other crew members?

Lucid: Well, I think it was comparing to the ground.

Davison: Sounds like one of those ones that you didn't always like to do.

Lucid: Well, I mean, you just did it. You know what I mean. But you didn't have any insight into what was happening, because it was all just on tape.

Davison: What the results were.

Lucid: Yes.

Davison: What about the exercise plan that you had on board? Was this put together by a flight surgeon or modified?

Lucid: No, we did the exercise plan that the Russians had. The Russians had this plan, and I guess they developed it over the years that they've been flying long-duration space flights. It's basically, three days you do sort of different things on the three days. Then the fourth day is an easy day, you do just what you want. I basically just went just down their form and I did just what their form called for. It's basically using the treadmill and expanders, which are like bungee cords. They have different things that you do with it for different amounts of time.

Davison: What time of day did you end up doing that? Was that like after your laboratory experiments were over?

Lucid: No, generally it depended on when the ground scheduled it, but, generally, the way that it worked best, was when all three of us could be exercising at the same time, say like just before lunch. So we would all go off-there were two treadmills on board and there was an ergometer, and so we would be using all

three pieces of equipment. We would all be doing our exercise, and then we'd clean up and then we'd come to base block and have lunch. That's what worked out best when we could do it like that, because then we weren't in each other's way. For instance, if somebody had been in the base block trying to use the treadmill, and someone else was trying to do some useful work, they couldn't have done it. So this way, when everybody was exercising at the same time, was the most efficient way of using the space available.

Davison: Did that raise the humidity level in the base block?

Lucid: Yes.

Davison: Was the system able to keep up pretty well?

Lucid: A lot of the times. It depended. It depended on whether the thermaloops were all working, It depended on whether we were in solar orbit or not. So it just depended.

Davison: So it sounds like the timing of when you did it sometimes was important, even though the ground might have said, "Do it this time." You might have had a better idea when to do it because of your attitude?

Lucid: No, because if you're in solar orbit, you were just there. I mean, that didn't have anything to do with the time of day. If the thermaloops were down, they were just down. I mean, they didn't have anything to do with-I mean, it's because they were broken. No, it was just that sometimes, for whatever reason, the humidity level and the carbon dioxide levels would go up, but it would clear out after a while.

Davison: What about the difference of clothing on board? You're used to flying on the Shuttle flights where the clothing would change every day, and then get onto, I guess, a little bit more restrictive cycle on the Mir.

Lucid: Well, we basically had little cotton T-shirt-like shorts and a shirt. During, I'd say, two-thirds of the flight, there were enough so that we could change like twice a week, like on Wednesdays and Sundays, or what have you. Then I always wore that blue jumpsuit over that. I wore that every day for 188 days. Then toward the end of the flight, the amounts were going down, so we only changed like once a week.

Davison: Seems like it would be a good rotation for the ISS [International Space Station]?

Lucid: Yes, that worked fine. I mean, you certainly didn't need to change every day or every other day.

Davison: What were the things that you missed while you were on orbit? I think one night we read it was like the breeze hitting your face. Was there anything like that that you can remember?

Lucid: Oh, yes, you always miss the changes in the weather. You miss the freedom of just going and doing something spontaneously, because you can't just go out and go to the store. You can't just go out and go to a park, or something like that. You're always within one particular area.

Davison: Is there any kind of training that prepares you for something like that? Isolation training?

Lucid: No. I think you just need to think about it ahead of time so that you're aware of what's going on.

Davison: Mentally prepare yourself for what you're about to do?

Lucid: Yes.

Davison: I think there were a couple other different experiments, and these were probably the ones that you've talked about before, the metabolic gas analyzing system.

Lucid: Well, all I did with that was just check out the equipment.

Davison: That wasn't the one where they measured different things, your body functions?

Lucid: No. No, I think they did that on John's flight. I just checked out the equipment to see that it worked.

Davison: Did you feel like you could feel the muscle loss, or any bone loss, while you were on the flight?

Lucid: No.

Davison: Did you notice it when you got back?

Lucid: No. No, I mean, it wasn't anything noticeable.

Davison: You seem like you're in great health now.

Lucid: Yes, I haven't even had a cold since I got back.

Davison: I think there was another experiment, diffusion controlled crystallization apparatus for microgravity. Is that one that you worked on?

Lucid: Yes. But that was basically, everything was in a packet and they brought it over to Mir. Then three or four times you just took it out and just took pictures of it. So that didn't involve a lot of crew involvement or things to do.

Davison: When you were up in orbit with Yuri and Yuri, when they were doing a lot of the maintenance, were there activities that you got to get involved with? I think, [C. Michael] Mike Foale volunteered one time to wipe the walls down with all the moisture. Was there anything like that that--

Lucid: Oh, yes. Whatever they were doing, I helped out. We were working late into the evening once, just getting everything liveable, and they were both saying, well, the journalists and everything always say, "What do you do in your free time?" And they were commenting, "Like what free time?" Because people just don't realize how much overhead there's involved in just daily living activities that you needed to do. So, yes, whatever they were doing, I would help them out and we would work on whatever.

At first, whenever I was doing things with the tools, I would tell Yuri, "Okay, I've got the screwdriver, because this is what I'm going to do." Finally he said, "Shannon, why do you always tell me what you're-just go do it." Well, I just sort of thought, being the commander, he'd like to know if someone were taking panels apart or whatever. [Laughter]

Davison: A courtesy-type thing.

Lucid: Yes. He said, "Just go do it." [Laughter]

Davison: In your mission, it seems like the vehicle worked fairly well during the flight, as opposed to other missions. It seemed like you were able to get a lot of science accomplished. Were they busy keeping this vehicle up and running pretty much?

Lucid: Yes, they worked all the time, keeping it up and running. I mean, we were always doing maintenance on one system or the other. I mean, there were times when part of it was a perception that NASA didn't really know what was going on, because I know we were down to just one electron for a long period of time and the oxygen levels were low. I mean, supply. I mean, I was thinking, "Well, do we have a limit? Does anybody care that we had like eleven days left or something?" Afterwards, I was talking to Bill and Galen, they said, yes, they left the TsUP and they said, "You know, there's just X amount of oxygen left and no one seems to be all that concerned about it. It's the weekend and no one's even working on it." [Laughter]

Davison: You always have the candles you can burn, right? Oxygen candles?

Lucid: Yes, we were using those a lot.

Davison: What do you think was the most memorable experience on your flight that you can look back and you'll always cherish?

Lucid: Well, I think when I look back, what I think most about is working with Yuri and Yuri and being with them. I think that makes a difference between having a great flight and not. It's the people who you work with. But that's true of anything in life. What you really remember are the interactions that you have with the people. So those are the things that will stick with you and stick out and that you'll remember.

Davison: You've been on several Shuttle flights before and gotten to know the crews there and became friends. Was this friendship different because it was longer and closer confinement, or was it very similar? How would you compare it?

Lucid: I think it's very similar, but, obviously, when you spend a lot longer time together, it's a much deeper experience.

Davison: What about the Russian language barrier? Did you seem to get through that? Were you able to tackle the Russian language?

Lucid: Well, Yuri and Yuri, at that time, didn't speak English. Now that they're training for International Space Station, they're learning English. But we never spoke English. I mean, they didn't speak English. So we never used English; we used Russian. We made a lot of jokes about it. Yuri, as a joke, said, "Well, we're developing a new language, a cosmic language." [Laughter] And there was a fair amount of truth to that. I mean, because both Yuri and Yuri very rapidly got to understand how I was talking. I mean, if a Russian teacher had been listening to me, they would have stuck their hands over their ears. But I got the point across. And I do like to talk, and I talk all the time, and I talked all the time when I was up there. They were both very, very good. They never said, "Oh, Shannon, just be quiet. We can't stand to listen to your Russian anymore."

Yuri Rusichev [phonetic] had really a great ability, what a linguistic would call restorative ability. He always knew what I was saying, and I know that a lot of the times I wasn't saying anything exactly correctly. But he was always able to understand what I was saying, so it was never a barrier as such.

Now, granted in a year you don't have any depth of knowledge in the language. So there were

times when you would really like to get into a more in-depth conversation on topics and you'd very rapidly come up to the limit of what you could deal with. But I know, before I flew, I wanted to make sure that I had a dictionary on board, so I made sure that one got up there. I put it up in the base block. But we only got it down one time. I mean, Yuri was trying to explain to me some holiday in the Russian Orthodox Church, and I just couldn't get it. So we started looking in the dictionary, and he couldn't find it in the dictionary either. [Laughter] But that was the only time. It was just easier to say something in a different way than trying to use a dictionary, so we never used the dictionary.

Davison: So was it body language or hand signals sometimes, or just able to work through the words?

Lucid: Well, a lot of times I would just take a English word and pronounce it like a Russian word, and put an ending on it, and that worked. You'd be surprised the number of times that worked. If they didn't understand it, then I would tell them that they ought to go to Russian class. [Laughter] We had a whole list of words that they knew by the end of the flight, that were sort of made up. As soon as the new crew got there, because Valeri and Sasha showed up, I was with them the last month, then that first evening Yuri said, "Now, these are the words that you need to learn, because Shannon uses them all the time." [Laughter]

Davison: It was an honor to listen to all your stories and your experiences on Mir. I was wondering if Paul or Rebecca might have some questions if we have time.

Wright: I have a couple, and they're totally not related. First one, did you, at any time, on the ground or in the air feel like people were treating you differently because you were female?

Lucid: No, I never did. Before I went over-maybe I shouldn't say this on tape, but I had heard that the Russians-you know, what I mean, they maybe would see if there's a difference between males and females. But I never ever experienced that. I never experienced that in orbit, either, at all. I just always felt like I was just being treated as an individual, as myself.

As a matter of fact, after I'd been on orbit for a long time, one evening we were talking, and Yuri and Yuri were talking about something. They were talking about something about Russian women and what they were doing or something. I said, "Now, you guys, that's not the way that you are, and that's not the way you're treating me." They said, "Oh, but you're an American, so it's okay for American women to do." [Laughter] I know, it was a conversation that came up, why weren't there more females in the Russian Space Program, etc., etc. That's how we got into it.

But, no, they never ever treated me any different in any way.

Wright: I remember reading recently about the deorbiting of the Mir, and that they can't bring everything back that's there. I understand that they're thinking of leaving the books. Do you have some favorites that you didn't get to bring back?

Lucid: I brought back a few books. Actually, I left a lot of them up there, most of them. Obviously, I couldn't bring them back. But I left them up there, and I thought that'd be real nice, because I thought the other guys would enjoy reading them. But then they were all in Spektr, so they were lost when they lost Spektr.

Wright: Maybe you could take credit for establishing the first library in space.

Lucid: Well, actually, the Russians have a fairly extensive library up on Mir, because over the years, there's lots and lots of Russian books that have come up. Behind one panel was just full of books. There were even a few English in there, because the foreign astronauts have brought up, had some books up with them. But I did bring the most English books up.

Wright: Shall we expect a top ten list of Shannon's favorites that she read while she was doing eighty-eight days in space? We'll be looking for that.

Lucid: [Laughs] Well, I'll tell you, like I said, my daughter, being an English major, she picked out a lot of English authors. A lot of the older ones. They were good, etc., but after a period of time, you do like to move beyond the seventeenth century, you know. [Laughter]

Wright: What a contrast. You're floating in space and you're reading seventeenth century literature.

Lucid: Yes, but now that you brought that up, see, I thought that was just really pretty remarkable. It really sort of brought home the power that authors have. Because here, for instance, Dickens, for whatever reason, I never read any Dickens books before, so she had a couple of them on board. So here I was, I was reading *David Copperfield* and *Bleak House*. I thought, "Wow, here was this guy that lived in a totally different era than we're living, and it had never ever crossed his mind that his book would be being read in a space station, by an American, on a Russian space station." I mean, that would have just absolutely blown his mind, that the words that he penned way back there in England, I was reading. I just thought about that a lot, about the power that authors have and his ideas and his story was transcending the centuries,

transcending culture, etc., etc.

Wright: Well, I'll watch for the list. I love to read him, but I never get time. I don't think I'm going to go to the Mir, but that would be such a wonderful opportunity to have that time with a book and it's so comforting.

Lucid: Yes. No, it just really is. I can't imagine anybody doing it that didn't like to read.

Rollins: What made you decide to become an astronaut?

Lucid: Oh, it's something I'd wanted to do ever since I was a little girl. See, that was a long time before there ever was such a thing as a space program. How it came about was because I was just real interested in the American West. I was interested in exploring, etc., etc. When I was a child, then I thought by the time I grew up that the world would be explored, so what would be left for me to do when I grew up? [Laughter]

Then I read about Robert Goddard and the rockets that he'd been doing out in New Mexico. I started reading a little bit of science fiction, and it just sort of clicked. Well, you can go explore the universe and that wouldn't get used up before you grew up.

Rollins: Did you actually start, at a very early age, working towards an education that would make you eligible for the--

Lucid: Well, not as such, because there was no such thing as an astronaut program when I was a child. But I was very interested in science and I knew I wanted to go into chemistry.

Wright: I'm glad the frontier was there for you to explore.

Lucid: Yes, it worked out really well.

Davison: It's been a great honor to sit here and visit with you today.

Lucid: Well, it's just real nice being here with you. I hope your project goes well.

Davison: Yes.

Wright: We do, too. We hope we at least touched something that you haven't had a chance to talk about before. If not, we're glad to have what we have, so, thank you.

Lucid: Well, it was just real nice being here and talking with y'all.

Wright: Thank you.

[End of interview]