DAVID A. WOLF

June 23, 1998

Interviewers: Rebecca Wright, Paul Rollins, Mark Davison

Wright: Today is June 23, 1998. We're speaking with David Wolf with the Shuttle-Mir Oral History Project. Rebecca Wright, Paul Rollins, and Mark Davison.

Good morning, and thank you again for taking time to visit with us.

Wolf: Thanks, Rebecca. We need to save this information.

Wright: Well, we know you have so much after your duration, so we're going to try to help you find some of the highlights that you would like to have on the record. We know that you've only been home about five months, so how are you feeling physically?

Wolf: Five months now. I'm, I'd say, 80 or 90 percent back. The delay in coming 100 percent back is not just from space flight, it's the busy life that comes with completing a mission like this. In fact, the mission just really ended, I'd say, in the last few weeks. It doesn't end when you land. There's still a lot of mission to go, both scientifically, public affairs-wise, transferring the engineering information and science information to the engineering and science development teams. So it's a very busy job for at least four months or so after landing.

Wright: How about emotionally? Are you being able to be detached from being on board Mir for that long?

Wolf: Well, just as the mission doesn't end when you land, the mission doesn't start when you launch. We've been gone almost two years, the people that do these missions, and there's a lot of relationships to reestablish, your house, various equipment. I have an airplane that needs a lot of work now, and it's two years of chores all saved up and trying to, one by one, get through those. You can't go see all your friends and family all at once, so there's a certain emptiness there, that you need to start reestablishing relationships that have been years delayed.

Wright: I guess time may have felt like it stopped on the Mir, but it certainly didn't here on Earth, did it?

Wolf: That's right. In fact, that's interesting. The housing developments are much bigger. There's new stores and restaurants, and it's kind of exciting stepping out of the time machine back to Earth and seeing how fast our society progresses, and it really strikes you when you've been gone for a few years.

Wright: Although, as you mentioned, you started a couple of years ago preparing for the flight, right

before you launched, the time was filled with discussion and concern about the risk involved with placing another American on Mir. Saying yes to go for that mission reflected a tremendous amount of trust that you had in NASA. Could you tell us about some of the factors that helped you make that decision professionally?

Wolf: Of course there was a lot of discussion on the safety and whether we should continue the Mir mission, and it came to a focus at the beginning of NASA's sixth increment. That was the increment I was moved up ahead to go on because of changing requirements that all the people on the mission be Russian spacesuit EVA-capable, and that narrowed the size range. I had to replace Wendy [Lawrence].

But the issue of Mir safety, I had studied the systems for quite a long time. I had discussed all the failures with the people that experienced them and knew most about them. I had a good plan of action should such similar problems occur again or any other such problems that were anticipated, and I was extremely comfortable with the mission as a result of the training and the closeness to the issues, and I think it took a while for the rest of our public and government to learn enough about it to also become comfortable.

There's always some inherent risk, so it put our leadership, and I do mean leaders, Mr. Abbey, Dan Goldin, and Frank Culbertson particularly, in a tough spot, because here they had to say something which is inherently never fully safe that it's safe enough. So a problem can always occur, so I applaud their leadership in this. I also applaud the good questions that people like Mr. Sensenbrenner and other critics of going up brought forward, because if we couldn't accurately or well address those questions, which were well placed and well thought out, then we really didn't have any business flying, and I thought the questions were very well addressed. So technically I felt it was safe enough, particularly with the great benefit that history showed we did gain by the next two increments, eight more months of flying, some of our scientifically most productive missions on Mir, history showed that it was the right decision. But those were good questions and we had an obligation to answer them.

Now, on a more philosophical level, it's easy to be good partners in this case with the Russians when things are going easy, but it's when things are difficult that we really can show what good partners we will be. This went a lot for building the trust and mutual respect that the International Space Station Program is built upon.

Wright: We've talked about the leadership part, but personally did you have a lot of convincing yourself to do?

Wolf: Not at all. Personally, I was sure I was going the whole time, and I never had one moment of second thought whatsoever. I did investigate the issues closely. I would never do a suicide mission or even where risk outweighed the benefit. That would have been bad for our agency to do. That would have showed poor judgment. But I carefully went through the issues, and I was absolutely comfortable stepping through the various scenarios and issues and the responses. I never had a second thought. In fact, I became more convinced that we should continue, the more familiar I became with the details of the issues.

Wright: Once on board, your challenge included working closely, continuously with your international partners. How is this different from working closely with the American partners that you've been doing for years?

Wolf: There is no question Russians work different than Americans, and they relate to each other differently, and there's a more defined one-way communication from mission control to the cosmonauts and then down the hierarchy. Clearly, I was the third of a three-man totem pole, at the bottom, and they are strict all the way through this chain of command. They don't tolerate much questioning back the other direction, whereas the American system encourages questioning the other direction.

For instance, I bring up an issue, and I thought I was doing a good thing to bring up something, and I was met with, at times, disdain or very negative response to this, whereas in the American system I would have been met with such negative response had I not brought up the issue. There's a number of cultural issues like this that can lead a person, one American with two Russians a long time, to feel more and more upset or nervous, you might say, and I recognized these were going on, partly with the help of the earlier increment American crews debriefing with me, and I realized this was a natural part of working with the Russians. In fact, it would have been patronizing had they not treated me difficultly or harshly or firmly, because that meant I was a part of their team and accepted on the team. Had I been treated lightly or like an American, it would have showed me that I did not succeed in becoming part of the Russian team and a cosmonaut.

Wright: What were some of the situations or instances that happened that you knew once you were aboard that you had become part of the real team?

Wolf: The Russians don't hand out thank-you's very often or pats on the back for required or expected work, whereas an American will say thank you even when another crew member does something that was on the schedule and required. If they did normal work, we'll say thank you. So I wasn't hearing "thank you" very much, and I was initially thinking that I'm not doing right or not doing good. This turns out not

to be the case. It's the way they communicate.

After the space walk-this is four months into a four-and-a-half-month mission-after the space walk, Anatoly looked at me and said, "Good job." That was all it took to make it all worth it, and I felt I had been on the team. Although, looking back, I'd been on the team all along, but it's hard to feel it until you've understood this cultural barrier and difference.

Wright: You walked with two very experienced space walkers. Can you describe what it's like? Now, you were truly in space when you were doing that.

Wolf: That's right.

Wright: Can you give us some idea of what that was like and what you were feeling when you were there?

Wolf: When I was nine years old, I saw Ed White do the first American space walk, and it was that moment that I decided I'd like to be an astronaut and, in fact, I'd like to do a space walk as an astronaut. It was thirty-one years later that I did it. It was worth every minute of the wait. But I never dreamed it would be from a Russian spacecraft, in a Russian spacesuit, speaking Russian with a Russian who had been out sixteen times, the most experienced space walker in the world, and that's what Anatoly [Y.] Solovyev is. So it was a real first-hand lesson from the number-one guy in the field, and that was a privilege. I helped Pavel and Anatoly do five space walks from an in-cabin point of view, so I felt very ready to go.

Finally I got to do one. It was a real highlight. Clipped on and opening the hatch and pushing yourself free is the highlight of a person's life. You look back at this space complex and the Earth, and it looks like two spacecraft flying in formation with each other, and you get a real perspective globally of what's going on here and what we've accomplished as a society. It's just awesome to see this panoramic view, much wider than you can see through any window, and in essentially a personal spacecraft, but pretty quickly you get your attention refocused to the job at hand and the details involved with that.

Wright: What were some of your duties while you were there, outside?

Wolf: The primary goal of our space walk was to take an instrument called a spectroreflectometer, which is a hand-held, fairly large instrument which measures surface properties of the Mir in various locations, the goal being to understand how the surface coatings, which are very critical to the thermal properties of the Mir, have withstood the long-duration exposure to the space environment so that we can develop better coatings for the International Space Station.

Wright: That wasn't your only EVA, is that correct?

Wolf: That was the only one I've done.

Wright: And looking forward to doing another one, I'm sure, at some point?

Wolf: I absolutely would like to do that.

Wright: Another unique opportunity you had was kind of un-space related. I understand you exercised your right to vote while you were in space.

Wolf: [Yes, I,] Voted from space, which demonstrates that space is becoming a place to live and we have to pay attention to people's lives on the ground, not just voting, but how do they handle banking and their home staying in repair and their lawn cut. There's a whole set of issues when you're drawn that far away, how to handle life, because it has to go on.

Wright: It must have been a special thrill. At least you know that your vote was cast and it was counted and every vote amounts to the total.

Wolf: That's right. [It's our choices, made by voting, that make this country great.]

Wright: One of the other concerns when you were getting ready to launch is that the astronaut going from America would be fixing situations on Mir. You'd be busy doing other things, other than scientific research. Could you share some of the accomplishments that you felt were made during your increment?

Wolf: Each increment had its own character. You know, we had a fire on Jerry Linenger's, a collision on Mike Foale's, and the whole associated repair work and response work to that. On NASA 6, I would characterize it as long-term very hard work, and by that I mean nine in the morning till midnight, essentially every day of the whole mission. There were a few breaks, afternoon on Christmas, one or two Sundays I took the afternoon off. But long duration very hard work, and this was because the two Russians I was with, Anatoly and Pavel, were determined to bring this spacecraft up to snuff, top working order, and I wasn't going to let them work any harder than me, and that meant taking another job off the job list at ten at night, and this was an infinite job list. There was also a full science program, eight, nine hours a day, I would say, and so between that and the job list, it was an extremely interleaved day of scientific work and systems, both maintenance and handling, work.

Wright: Was there one scientific experiment or part of your research that stands out as a great accomplishment from that increment?

Wolf: We did thirty or so different experiments. My personal favorite is the tissue culture, where we can use zero gravity (or simulated zero gravity to some extent on the ground) in our rotating tissue culture vessels to allow three-dimensional tissue growth, where in gravity tissue is restricted to a surface and we really cannot obtain, for instance, the growth of a human cancer tumor in three dimensions. The three-dimensional [spatial freedom combined with ideal fluid dynamics allows assembly of living cells into] tissue, including cancerous tissue, is critical for [obtaining an accurate] genetic response or [for basic] research purposes, or even pharmaceutical production purposes. To function properly [the tissue needs to be permitted to gently grow in 3 dimensions, as it does in the womb.] The three-dimensional spacial [orientations relationships of] cells, as [they form] a tissue, is [ideally achieved in microgravity.] , and we demonstrated these principles in space quite clearly.

We [also] learned some ways not to do it. We had bubbles in our tissue culture vessels that we need to learn how to get rid of. But one of our goals of Phase I, Shuttle Mir, was to alleviate risks in the International Space Station Program, both scientifically and system-wise. So we're busy turning those lessons into engineering design changes so that we get a better product on the International Space Station. We grew breast cancer and nerve tissue and kidney tissue and lymphocytes on the Increment Six and Seven missions.

Wright: Will you be able to follow what happens to these results on Earth?

Wolf: In fact, after we talk here, I'm going to go over to the laboratory where the samples are being analyzed and look at that, and it's particularly fulfilling to me. Before I was an astronaut, for seven years I worked with and ultimately was the leader of the team that developed this equipment, and here, eight, ten years later end up flying with the equipment, so I consider this one of my long-term interests in space. There's no question that the ideal environment to do tissue culture and [unlock secrets of] tissue engineering, is in space, and I take it as a personal responsibility to see it come out right.

Wright: How was that, for you to see one of your inventions up in space? I guess if something didn't work right, you were able to fix it.

Wolf: It did help in terms of understanding that particular gear, but we're really well trained across the board by the time we go up.

Wright: Can we talk about your training? I know you spent quite a bit of time in Russia. Of course, you were trained here as well. Can you give us an idea of some of the highlights and some of the other areas that you were involved in?

Wolf: What was striking about training in Russia was not the differences, but the similarities to the U.S. program. In many cases there seems to be a universal effect here where, to achieve a certain type of training, ultimately you settle on a similar path. Of course, it was all in Russian, and that's the first trick to get past, and toward the end I didn't even notice we were in Russian. In fact, I preferred it, it had been so long since I spoke much English. I think it's a nice language.

The training was long and intense. We went north of the Arctic Circle, very serious survival training, both in water in the Black Sea and in more than forty degrees below zero outside for days. That's excellent for camaraderie and learning how people respond under stresses, not just to learn how to live when you land, if you happen to land in such a region, but it has other side benefits, perhaps more important, to learn how to get through the next hour, hour by hour, and stick to the task that's very difficult. [t is also important to recognize stress in other crewmembers and help them get through it.] [This is all] transferrable to a long-duration mission.

The training accelerated a lot in the last month because suddenly I was going flying in a month or so instead of six months or five months. I was a back-up, and that was invoked very late in the game, and I felt full of energy and ready to tackle that. In fact, it was like a mission, we're going to pull this off and make it happen, and I put everything else aside and just honed in on making that mission work and picking out what I needed to learn and what I could leave to learning in orbit.

That was very fulfilling, to actually exercise that back-up position. I felt very good about it, and I took seriously the role of back-up. Although you don't really think you're going to fly, you have to pretend that you are, and I think that it shows that back-ups do fly occasionally. In fact, Andy had to do it, too, on the next increment. But he had a little more time than I had to know he was doing it.

Wright: The intensity of the training also involved all the EVA Orlan suit.

Wolf: That's right. We squeezed a whole EVA program that might take six months or more into a month, or three weeks, actually, which took basically morning through evening,[including weekends,] in the water tank. Almost every day, in laboratories and pressurized suits and vacuum chambers or in the classroom.

There's a funny story, in fact. Frank Culbertson, our Phase One leader, came to Russia now and then and we all met with him, and this was at the time I was told I was going to go early. I had no idea this

was coming, and I thought I was going to a standard meeting one evening in Russia, and I'm walking over, and I'm going over in my mind how to delicately broach the topic that I felt like I was on top of the step and going to make the training fine through the summer toward my increment, the last increment, and I was going to delicately broach the topic of maybe we could squeeze in EVA training over that five months. I hadn't come up with a good way to break it to him that I'd like to do that, or make the request.

And Wendy comes out with an odd look on her face. She was in the meeting before me. That's funny. Not a really terribly sad look, but it was like, "Well, you know, I'm a military officer and things happen. Look."

I go in, and Frank says, "Sit down." That can't be good. And he goes, "Dave, we've got to know by tomorrow at noon whether you can fly on the next increment and launch in maybe five or six weeks from now, and on top of that, put the whole EVA training course in your program before that." What really went through my head was, "Yes!"

Wright: Frank solved the problem.

Wolf: That's right. So I was sure I was going to be able to pull it off, whatever it took, if the system could digest it, which it did very well. The Russians were very good about coming up with a plan, and it was based on utilizing prior EVA experience I've had, not in space, but I was EVA-qualified in the U.S. suit. I was EVA crew member had we needed to do one, on my prior mission, with Shannon Lucid. and I had a lot of time under water testing ISS, International Space Station, assembly techniques. So I was always interested in that and put a lot of time into it.

So, that combined with the Russians' willingness to utilize that experience to just essentially put the deltas in, the differences, learn their suit, carefully, made it work, and it was very comfortable, no corners cut, by the end of that three weeks, except there was a lot of rough edges cut on my body from wearing out against the suit.

Wright: But those days became even longer in your training, due to the [unclear].

Wolf: There was all weekends and into the evening, nine, ten at night, essentially every day and all day Saturday and Sunday for those four weeks or so, and then back in the States almost as hard, certainly as hard, considering you have to get ready to leave the world for a while. So those were extremely busy days, but I was on a mission.

Wright: Any time off in between the time that you left for Russia and the time--

Wolf: Well, I guess I can tell you now. I snuck a little vacation in. I met my girlfriend in Florida. I couldn't tell anybody where I'd be, or else it would get filled up with calls and time, too, so I diverted to Ft. Lauderdale, where she flew in, and we spent three days before I continued on, and I kind of masked that in the travel to some degree and had three days (about three weeks before the launch) just to walk on the beach.

Wright: Was it easy or hard to separate yourself during those three days? Could you let go of what was in the past?

Wolf: Never did let go. Things were happening too fast on a mission. It was more of a time just not to pile more on for three days and digest what was happening. Of course, it was the topic of my thoughts and conversation. So, no, I never lost it. We know it takes four or five days on a vacation until you really leave work, right? And that never happened.

Wright: But at least you had, like you said, no more work piled on top of it.

Wolf: It still felt good.

Wright: I'll bet.

Wolf: I felt great in those days. I had never felt more like-the agency I always wanted to work for was now putting its trust in me to make something happen. I felt very good about the team, the whole team, and I have never felt better than I did in those days. [Still had to remain objective, however, that we were all doing the right thing.]

Wright: Ready to go. Wendy Lawrence became then not necessarily as your back-up, but part of your support team. Was she able to give you information and some advice, or how did she help work with this mission?

Wolf: Wendy was still a critical part of the mission. In fact, I could not have succeeded at this without her. She still went up. She knew more about the planning of the transfer and placing gear and what all the gear was than I did, of course. Although I was a back-up, she knew [this mission] better than I did. So she went up and just made things work fast up on board and got me organized and off on a great start. So it's a misnomer to think Wendy wasn't on that mission.

Wright: Did Mike Foale have any good advice for you as he went through the handover?

Wolf: Well, handovers are very important. He had a lot of good advice. He showed me how to work the toilet properly [along with a myriad of critical information].

Wright: I'm sure that's essential.

Wolf: Really, the advice we went through was everything from how to work with Russians and their operations technique, which we had not simulated on the ground. In fact, I had never even really met the two I flew with, only at a distance at a party or so, but never done anything together. And he had then been in space for three or four weeks with them, and he gave me a lot of hints on how to get along well, which were very useful, things like, "You have to be present at every communications pass. These guys want you there, and that interrupts about every hour of your work for fifteen, twenty minutes and makes it hard to do long-term work such as tissue culture." I never dreamed that if I was in the middle of an experiment that I would have to put it down or even put it away and save it and then go to a comm pass, and that was what was expected up there, and we never did fully work through that problem, and that's something that we're working with on ISS operations.

Wright: Would you describe just what it felt like when you were in the Mir and the hatch closed and your only chance to go back to Earth at that time--

Wolf: I can tell you exactly how it felt. It was exactly-I hadn't had the feeling in many years, since I was a little kid, and it came back instantly. It was like when I went to my first summer camp and there's my bags, and there's the station wagon driving away with my mom and dad, and it's just time to take what you've got and go make it happen. It's an excitement. You don't know what's about to occur, but you know it's going to be exciting.

Wright: Of course, the big difference is that if you really got homesick at camp, you could have called Mom and Dad. They might have come back to get you, but--

Wolf: It didn't feel that way then.

Wright: Of course not.

Wolf: It felt about as possible to do that then as it did to say, "Well, I'm coming home in the Soyuz tomorrow," at NASA.

Wright: How fast did the months go? I know your days were busy, I know they were long, but did it seem

at the time like that?

Wolf: The time went about as it was. I wouldn't say it went fast or slow. It seemed like four and a half months. It seemed like a long time, although I mentally had moved to space. That was my tool for lasting the time, and, "Some day I'll move back to Earth." I didn't feel like I was moving back to Earth until the Shuttle launched to come get me.

Wright: That was your signal.

Wolf: That was the signal that you're really highly likely going to come home soon. And then I started thinking about Earth thoughts and driving to the Stop and Go to get coffee, and, you know, all the Earth thoughts. I let them flood back in. But until then, I didn't let them. This metal house and processed air was my world, and that was what I was living in.

Wright: This is the farthest you've ever been away from home at Christmas. Did you celebrate in your own way while you were there?

Wolf: Christmas and Chanukah we celebrated. Couldn't light the candles, but it was a nice time. We slowed down a bit in the work, actually took some time off. Special communications periods. But I kind of felt like I do at Christmas on Earth. I'm ready to get the world moving again and back to normal activity.

Wright: I remember reading in one of your letters that, "The little things mean a lot up here." Have you appreciated those even more now that you're back on Earth?

Wolf: I'm trying to hang on to that. Although humans, I guess, always revert to the level they're at, the little things-I'm starting to forget all these little things that seemed so important when I first came back, although I'm going to hang on to many of them. I still like pulling my car up and getting out and getting a coffee at any of these Stop and Gos, and I try to do it slowly and enjoy that time in that and all the things like that.

Little things do mean a lot on a long-duration space mission. Like I felt, for example, that movies had much more impact on me, surprising impact, where you see all these people interacting and interacting with Earth things. Movies that I've watched again since, that I watched two times or three times in space in little pieces in the cracks of my time just absolutely impacted me, and it was really fun.

Wright: You saw them, I guess, in a completely different way because you--

Wolf: Different way. Your brain has this open thirst for Earth images and relationships, and they just seem to magnify in intensity.

Wright: Have you been to movies? Have you had time since you've been back?

Wolf: I've not been to a theater, but I've watched a number of videos.

Wright: Well, it will be interesting for you to go to the new-unless you've already been to the stadium seating with the--

Wolf: I've heard about that. That's another example of how the world has changed. Suddenly I hear these new theaters with big, comfortable chairs, and there's many things like that I need to try on this new Earth that has grown in the two years.

Wright: Have to find another three days and fill those up. You are an astronaut, an electrical engineer, doctor, inventor, flight surgeon, aerobatic pilot. Were any one of these areas more important, of expertise, while you were up on the Mir, or was it a combination of all of these talents that helped you get through those four and a half months?

Wolf: Well, when you talk about training for a space station mission, that kind of training starts when you're eight or nine years old and take your first lawnmower apart and can't get it back together, maybe. It takes a life of handling tools and handling equipment of all kinds, whether it's medical equipment or airplanes themselves or mechanical equipment or the pipes in your house. So I think it's the kind of person that gets their hands into the gear that does well, and it's not something that can be trained in an hour class or two-hour class. A few things can, but you don't know what you're going to run into on a long-duration mission like that, and you just have to have a bag of tricks in your head.

Wright: How well were you able to communicate with those that you want to communicate on a--

Wolf: Communicate with who?

Wright: With whomever you would like to on Earth.

Wolf: We had adequate communication. E-mail worked good. The flight surgeon takes on a new importance in a mission like this. They do more than what would traditionally be considered flight surgeon work. They are your alter ego. They're yourself on the ground, and they know the people you need to talk

with and communicate with, and they're the gateway to you. Chris Flynn [phonetic], my flight surgeon, distributed the information out. He answered people without letting it all come to me as appropriate, and this takes a long relationship before the mission. He has to know you and your family, and you have to know him, and he's under a similar stress as you are on these long-duration missions. In fact, the whole ground team is.

In fact, we're flying one more mission, and that's ISS, and we're going to fly it for twenty years. It's one twenty-year mission, and this is very hard on all the operational teams as well as the people in space. So anyway, the flight surgeon becomes an integral part of that. The people in Mission Control, the ground teams, are on the mission with you, and-I forget where we were leading with that.

Wright: We were talking about the communication and how--

Wolf: Oh, communications. So E-mail was a critical part of the communications. I honestly felt it was better than the real-time audio occasionally with audio-video because it never failed that the phone would ring, you might say, at the wrong time, when my hands were full, I needed to be doing something. Whereas e-mail, you can answer it and send it when you want, edit it until it means what you like. Again, the e-mail, similar to movies, had more impact to me. I could fell the people's words. I liked the e-mail the best.

Wright: Is there a sense of privacy with the E-mail as well?

Wolf: Oh, I knew a lot of people were reading it, but we were still pretty candid with each other.

Wright: How about the communications among your friends in space? Did you all have time where you just visited about everyday things like conversation that you would have here if you were at home?

Wolf: Yes. We had all the spectrum of political, philosophy, just fun and jokes. We had the whole spectrum of communications in space. I found that my Russian was excellent for technical areas and operational areas, it was pretty good for simple philosophical issues and talk, and it was bad at jokes. I couldn't understand jokes, but then, again, I don't understand jokes in English too well.

Wright: Were you able to share anything about America and American culture with them that you felt they had not understood or didn't [unclear]?

Wolf: There's a lot of misconceptions about American culture that Russians or any other culture have, and there was a lot of misconceptions I had. And we knocked those around pretty extensively.

Wright: I have one more question for you, and then I was going to ask Paul and Mark if they have any. But I want you to explain a quote from your mother, who says to remember that "normal" for David isn't normal for most people.

Wolf: Everything seemed perfectly normal to me.

Wright: Are you not going to speak for your mother?

Wolf: She's had fun with all this. I know she has. She's turned out to be a pretty good spokesman, I think, when I've reviewed some of the videos, and the media has been interested in her. She's been real supportive, and so has the whole family about all this and made it extra fun. In fact, this is no fun unless you can share it with friends and family and all, and so it's, in that sense, enriched my life.

There's another paradox, in that when you go to Russia for a long time to live and then into space for a long time, people think, well, what does this do to your relationships? Do you get distant or whatever? And you do miss the people and need to catch up, but it actually brought me closer. I established relationships with people, for instance on e-mail, that I might not have talked to at all for those years. We had a fair amount of conversation, so it's actually brought me closer to a lot of people. Now the problem is keeping up with them all.

Wright: I know your days just continue to be full, but I think that may be part of that "normal" that your mom was talking about, that your days are always going to be full.

Wolf: They do seem to really fill up. I was talking with Chris Flynn yesterday, and he's a psychiatrist, and that's helpful in all this, and we were talking about priorities and the difficulties and how little time I have to get my gardening together and my bushes right, and that's really my first priority right now and get the back yard right and in order, and he says, "Well, what's in the way? What's happening?" And I went over a few things that seemed to me to be pretty usual items. He says, "Well, these are all big projects," and I thought they were just some things that needed to be done in the next month or two, some scientific goals and some work goals and all. And maybe that's what my mom was talking about. I kind of like projects, although it seems that most astronauts are that way. Jim Voss, you know, built his own airplane, and we just like getting our hands in all the way to the shoulders, I guess.

Wright: Keeps everything busy at the same time. Paul, you have a question?

Rollins: You keep mentioning about when you were nine years old and decided you wanted to be an

astronaut. Did you announce to your parents then?

Wolf: Yes, absolutely.

Rollins: And then did they help you?

Wolf: Well, before I wanted to be an astronaut, until that moment, I wanted to be a garbage man, because Mr. Peacock, our garbage man, let me run the garbage truck-it was an old-time thing with big levers-and let me help him, and before that they said, "It's okay if you want to be a garbage man, just so you're the best one."

And when I announced I wanted to be an astronaut, they were cautious about over-encouraging me. They said, you know, "Not many people get to do that and don't be too disappointed if you can't." And I didn't get too caught up in that. I always wanted to be one, but I realized you had to become something else first and do well at that and that the odds were low and you needed to follow your interests in any case. So wherever you wound up, if the musical chairs game knocked you out, that you'd be happy there. So that is a caution.

But I did realize that anybody can work at NASA that does well in their area, and I ended up working at NASA for seven, eight years before I was an astronaut. It had its ups and downs, then, too, but overall it was a great place to work. So it's certainly true that anybody who has a strong desire and does well can work in the space program, and a lot can fly in space.

Rollins: Thanks for joining us today.

Wolf: Thank you very much. I'm glad that you are interested.

Davison: I have a couple of questions. They're not really related, so pardon me for jumping around. You've mentioned in your discussions your enjoyment of mechanical equipment. Would you share a few stories of your involvement in some of the repairs on board Mir that [unclear]?

Wolf: Sure. The first day, after the Shuttle left, I notice Pavel cleaning up in rags and sopping up a large amount of condensate on the heat exchangers to the electron unit. This is a cold area. We had troubles; in fact, a complete failure of the condensation-removal system, which is part of the air-conditioning system. And we've got large condensate globs, bowling-ball size or beach-ball size sometimes, of fluid and water behind panels starting to track down the structure and into the wiring. I saw Pavel with a makeshift device trying to suck it up and sop it up, and I noted it took him four, five, six hours that first day of the mission.

I was trying to think of how I could contribute here, and I'd just met some new guys, and I went up to them and I said, "You never have to do this again." He looked at me kind of funny. I said, "I'm doing it. Don't worry. You've got better things to do up here than sop up condensate," and this is kind of gooey, slimy, ice-cold fluid. I didn't realize what I was getting into, because it took anywhere from four to eight hours a day, the rest of the mission, every single day except a few. Nevertheless, I think that went a ways to them putting me on the team because I was going to-there's no small or unimportant job on the Space Station. All of it has to get done, and that was the best thing I could come up with to free up their time for what they're better at and be part of the team.

My dad told me, when I was an intern in the hospital, he said, "When you don't get along with the resident or any resident, remember, in all cases, your job is to make their job easier and do all you can do to contribute to it." So even times when we had our interpersonal differences or whatever, I'd say, "And I'm going to show you just how much I can help you up here."

Davison: The other question or subject was when you were in Star City, earlier you talked about relationships that you were able to develop. Can you share some of the friends that you made and maybe some [unclear] in Russia?

Wolf: The Russians are very warm people and are very pleased to have you in a part in their culture, particularly if you put an effort into their language and mix it up with them. They're definitely [unclear] so they like to mingle and mix, and I did that. That happens to go well with my personality. I like doing the same. And it was a good language lesson at that. So I have many close friends in Russia right now. I really like going back there and visiting, and I feel like it's another place I live, like maybe your favorite vacation town or place you've been a lot to.

There was a girl that was somewhere between a girlfriend and a friend for me. We spent a lot of time together, me and her daughter. She was divorced, psychology student, about twenty-five years old. We went around Moscow every weekend and just spent days running around the town, and she showed me the area, and we just had more fun all the time. Again, I've had to break off relationships-things just can't work after you've come back to America-and move on with the new relationships, and I don't mean just her. There's the great friends I've made, the girls in our NASA office. They're extremely talented Russians, and I just miss all of that.

Wright: Well, we hope you get a chance to go back there on additional business and your career just keeps going in the direction you want it.

Davison: Where do you go from here?

Wolf: That's a good question. I'm on the EVA team mainly concerned with joint Russian-American space walks in which Russians will be in U.S. suits, Americans in Russian suits. Mike Foale and Jerry Linenger and I were the only three to get the luck to go out in a Russian suit. Jerry's left, so it's Mike and I. So we're putting that information into our space walk system and concerned with building and construction through EVA techniques of the Space Station, ISS. So I work mainly with that, with the scientific teams, putting together their experiments for ISS. And we've talked a little about going flying again. Of course, that's my job and what I want to do as long as I can. But there's no hurry. There's a lot to be done on the ground, and I think a year, maybe a little more, of transferring this work. I want to get back into tissue culture.

Wolf: There's some things I saw happen up there that we can exploit and then train, perhaps, for a short mission next would be nice. I'd hate to get jerked away from the house and the country again in the short term just as things come together. In fact, I think it takes years-I know it takes years in my case, at least a year, to get back to approaching normal life. In fact, it doesn't do any good to achieve normal life and then leave it again. You have to achieve normal life and live in it a while. So I think we're going to find that people who have done long-duration missions will need a short-duration mission after a break and let their lives settle out. I don't think it's our philosophy that astronauts should not have a life or a personal life.

Wright: Well, good luck with yours.

Wolf: And I'd like to go again for another long-duration mission, of course, on the ISS.

Wright: Well, we wish you luck and hope you achieve that.

Wolf: We have a great space program, though. It's not often you build a new space program, a new space platform, a new space system, and this is a neat, rare time in NASA history that we all get to go through it. So it's going to be fascinating.

Wright: Are you looking forward to working with additional international partners?

Wolf: That really sweetens the program, to have all these seventeen, eighteen countries involved. It's very international and a lot of travel in that sense, but that can work as a very positive--

Wright: Your language list will increase as well.

Wolf: What's interesting is I don't know if we'll learn other languages, but almost everybody has learned Russian. You know, these international partners, in many cases, have already flown their astronauts with them on the Mir, and it's odd sitting and talking with a Chinese guy in Russian or talking with a Frenchman, Jean-Loup Chretien, for instance. He and I actually prefer speaking in Russian as opposed to either French or English. The Italians also. So, in a sense, Russian has become a central language, although English is the primary language on the International Station. So we get a choice of languages, usually Russian or English.

Wright: Well, it's nice you have a back-up. It's one you didn't expect, but it's--

Wolf: That's right. Some things are better to be said in Russian. Russians have words and expressions that we don't have.

Wright: Such as?

Wolf: Well, we don't have a word as good as *olbaldenya*. If you say to a girl that's what she is, it's better than beautiful and likeable and all that, and we don't even have a word that good.

Wright: Okay. Well, that's a good example. Is there anything else that you would like to add for the record? This will be kept in the library for future researchers and historians to review, and if there's something that you'd like to add at this time, we certainly would welcome you to do that.

Wolf: Well, history will really show what this program has meant. It's hard for us to digest it and analyze it up close. There's been a lot of controversy, a lot of criticism, and a lot of support, but overall, I've not seen our public as interested in space at any other time since the earlier days in Gemini, Mercury, and Apollo. So there's no question to me that people are very interested in what's going on.

If I can make a prediction, you might say, of where we may get into difficulty that the historians will pan out later, is that space is now not a singular spectacular event like stepping on the moon, although we will step on Mars one day, and that will be a spectacular event. But the Space Station ISS is a long-duration scientific platform, and science achievements are made in many small steps tied together. It's rarely that, "Eureka! I've got it!"

Public interest is a little harder to capture and hold in these long-term small steps, successes, failures, success, ten failures, in the lab. And it will be a challenge for us to keep the public interested long enough in the long laboratory work to let us make the discoveries that allow us to exploit space to its fullest, but, however, the benefits actually outweigh, I think, the singular spectacular events that we've

made. Not to diminish them, but are every bit as important-the new processes, materials, tissue culture, tissue engineering secrets that will be transferred to Earth-based tissue engineering. We're seeing a new society, it's my prediction, that will find interest in this long-term, day-by-day research in the lab, incremental, and we'll see if that turns out to be the case.

Wright: Thanks again.

Wolf: Thank you.

[End of interview]