WILLIAM D. "BILL" REEVES

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Interviewers: Mark Davison, Rebecca Wright, Carol Butler

Davison: Today is June 22 [1998], and today's interview is with Bill Reeves from the flight director's office. I'm Mark Davison, and Rebecca Wright and Carol Butler are assisting in the interview.

Good afternoon.

Reeves: Afternoon.

Davison: Bill, we'd like to get you to talk to us a little bit about your first encounters with the Shuttle-Mir Program on your early flights that you did from the flight director's office.

Reeves: Okay. You just want me to ramble on?

Davison: If you want to talk about [STS] 63, the "Near Mir."

Reeves: Okay. I got involved with the Phase One Program at the very beginning. There was a group of people out of our office in the nucleus of the Phase One Program office that had done a lot of work a year or so ahead of time, and they were beginning to set up the Phase One Program. A lot of negotiations were going on. But then I got assigned to the Houston consultant group for STS-63, which was the first mission of the Phase One Program, which, you know, was where we flew up to the Mir, but we didn't dock with it. We flew within thirty feet of it.

They assigned me to head up the first consultant group that went over to Russia, to their Control Center, to support from their Control Center, real time. At the same time, there was a group of Russians that came over here, Russian flight controllers, that formed a consultant group that was in our Control Center. So we had come up with that concept in the planning to have a resident team in each other's Control Center, just in case something came up, you'd have this on-site face-to-face, you know, sit across the table, over the drawings, kinds of discussions, because we recognized early on that the language problem between the two countries was going to be a unique problem that we had to deal with in both Phase One and in International Space Station, and which was why it was so beneficial to do this in Phase One, is to get our arms around this problem.

So we had to set down all the groundwork, pick a type of expertise we wanted on the consultant group, the size of the consultant group, the number of interpreters we needed, what kind of resources we needed when we were over there. So we started all the early negotiations on office space over there, what equipment we needed, what access to voice loops and what access to data, if any, that we wanted from their Control Center, and worked all of the preliminary details, put all that stuff in place.

Then we had some early simulations that we set up, where we actually physically exchanged consultant groups and set up simulations like we always do for Shuttle flights, but we involved the two Control Centers through the interpreters, and we went through an exercise or two before we actually got to the actual mission, all of which turned out to be exactly the right thing to do. It was a wonderful exercise.

I remember my first trip over there. I can't remember the exact date. I'm not very good with dates, but I remember going over there for the very first trip. We were all kind of feeling each other out, because, you know, there was this-we didn't know what to think of each other, or there were all the perceptions everybody grew up with. I, especially, had a unique problem in the sense that, you know, I'm a child of the fifties and sixties, and grew up back when the Russians and the Americans weren't exactly on speaking terms, and so it was really fascinating to be able to go over there and meet the people and get to know them, and get to see all of the things you'd always read about.

So we got over there, and this was in an era when they were still having shortages. There were some local economy problems and whatever, but it was nothing we couldn't deal with. As far as the space agency folks were concerned, or the people at Control Center, at their Control Center, they provided for us any way they could. I mean, anything we wanted, they would give us. Very helpful, and set it up.

We did the simulations, as I said, and then when the actual mission came, I took a consultant group of four people besides myself. Actually, there were five, counting-there was a safety person, we took one rendezvous expert from the flight control world here, we took a timeliner from here, and a communications expert. Then there was the safety person, and then there was a Phase One Program office rep, and then I was the lead of the flight control consultant group. We just picked that kind of expertise by just trying to think of, "Well, what kind of problems might we think we'll run into?" I mean, obviously, we couldn't take a whole flight control team over there, just from a pure economics standpoint.

So we settled on that group of people because we thought, if we're going to have any problems, they're going to be in communications or they're going to be with the rendezvous in the fly-by of the Mir, or they're going to be timeline problems, just getting everything synced up timeline-wise. So that's the expertise we settled on, which turned out to be exactly the right thing to do.

In my background as a flight director, we have a working knowledge of all of the systems on the Shuttle, so I figured what we didn't have with us, I could accommodate, plus being able to call back over here for support. We positioned ourselves in their Control Center about a day or two before launch was scheduled, to get everything in order, and then I believe, if I remember right, the launch got scrubbed for one day. I can't remember what the reason was, whether it was the weather or some minor problem, but they did scrub the launch one day, so we had an extra day to get ready. And we launched. I don't know

how much detail you want me to go in on each flight.

Davison: No, that's great. Go ahead.

Reeves: We launched, and, lo and behold, on the very first one, on the launch, we had a leaking jet. One of the thrusters on the Shuttle was leaking propellant. And right off the bat, that was a problem, and the Russians didn't know what to think of it. They were very concerned about their vehicle and contamination on their vehicle, and if we couldn't arrest the leak, they didn't want the Shuttle coming too close to the Mir, because they were concerned about horizon centers on their return spacecraft, that if it gets contaminated, they have problems. Not to mention other corrosive effects it might have on the Mir itself.

So they were obviously extremely concerned about it, so right off the bat, the consultant group got immediately involved, on both sides of the ocean, in trying to explain to all of their experts and managers over there exactly what was going on. I sent back over here for detailed drawings of thrusters and valves and tank systems and the plumbing and all that. I sat down with their managers and their experts and went over the drawings and went over the explanation of how we were going to stop the leak, and that by the time we got to the Mir, there wouldn't be anything leaking.

They were very, very sharp and astute, and started talking about, "Well, okay, if you close off a propellant manifold , which means you isolate the jets so they don't leak anymore, what kind of control have you given up? What kind of exposure to the next failure have you caused? Is there a chance the Shuttle could get in close to the Mir and one more failure could cause it to go out of control, and there could be a collision, or whatever?" So they asked all the right questions, and they made us go through all the right wickets and we explained all that stuff. It was just a daily grind to show up at work and to go find the right guys and sit down and talk to them, and just beat on it and pound it flat, and to make sure that all their questions got answered. We were constantly on the phone back over here and on the voice loops back over here, talking to the experts, getting information and relaying to them. So we were intimately involved in the decision process.

There was another lesson we learned in all of that exercise that was invaluable for the rest of the program, in that by being face to face, you could be in an explanation with them on something and you can tell when you are not communicating, just by the expression on their face, that something is still not right. Whenever you would get to one of those points where you knew you weren't communicating and you knew you weren't getting the message across, you'd just start backing up. Of course, we're dealing with all of this through interpreters. And you know what the problem is, is that there's a single word somewhere that's not coming across in the translation correctly. What it means to us means something entirely different to

them. So you'd have to start banging away on the translation and the interpretation until you found out what this problem is.

Of course, throughout this entire process, the other experience that was taking place was this relationship that was forming, this mutual respect and trust of each other, and you know, "Are you just feeding me a bunch of stuff, or do you really know what you're talking about?" kind of thing, you know. And if you kept proving, with data, hard data, everything you were saying, you could just see the trust building up and the confidence level go up. Then you'd solve the translation problem and you'd get it down to where you'd realize that now they understand. They understand me and I understand them, I understand what their concern is. It was as much a communication problem the other direction, too, is trying to get them to communicate what their concern was, and exactly and very specifically what it is.

So we did that, and we did it daily, and I remember, I mean, right up until the very end, before the decision was made to allow us to come to thirty feet from the Mir, we had established a time, a go/no-go time. We were going to have a big conference between the flight directors, between the two Control Centers, where they would have a conference on the loops and make the final go/no-go, and we knew when that time was.

I remember going down to Vladimir Soloviev's office, and several hours before that, I said, "I want to set up a meeting with them and go down and make sure that there isn't some question that hasn't got answered." Because it was still obvious to me that they had not made the decision at that point in time to allow us to come on in, that there was still some concern, whatever it was.

So we went down there. They had all their experts in the room, Vladimir Soloviev, Victor Blagov, Uri Antoshishkin, who's an Energia expert that was there, and all of their systems experts and safety people were there, and we went through the whole thing one more time. And it was interesting, in that one session, they all sat there and they looked at me and they said, "We understand what you're saying, but what about the 180-gram snowball?" And I'm sitting there with this blank look on my face, and I said, "What are you talking about?" And that was their exact words. They said, "What about this 180-gram snowball?" I said, "I don't know what you're talking about." And they said, "Well, the 180-gram snowball in your fax." I said, "What fax?"

We had set up a system of fax messages back and forth to relay transmissions, and all of the faxes that came in were supposed to come through us before they went to anybody. This one fax had been sent from the U.S. side over there, where they had done a worst-case analysis to say, even if everything didn't stop the leak and it kept leaking, and you took an engine bell of an RCS jet and packed it completely full of ice, you know, the propellant built up and froze it, and it got completely full, it would only weight 180

grams, which is roughly a half a pound, or a little less. It was a ridiculous worst-case analysis, but somehow that fax got through the system and it went directly to them, and I never saw it, and I'm sitting there caught cold here two hours before the decision, you know, with this thing. They said, "Well, you know, this piece of ice could form in the jet and it could come loose and all of a sudden this big chunk of ice could hit the Mir." And I said, "Oh, no, it's not going to happen." And I said, "You've got to give me time to go figure out what's going on here and explain this."

So we broke up the meeting and I got on the phone with everybody and found out where the thing came from and what was behind it and everything else. So I remembered grabbing my interpreter, who, by the way, is another story, and a very important part of Phase One. His name was Boris Goncharov. I grabbed him, and I said, "Boris, we've got to go back down to Victor Blagov's office and convince them that there's no such thing as a 180-gram snowball."

So I went down to Victor Blagov's office, which is a very small office, and I went in there with Boris, and I told Victor, I said, "Victor," and Victor and me, by then, had already established a rapport. I said, "Victor, we're not leaving this office until you're convinced that there's no such thing as a 180-gram snowball." He said, "Okay." So we went through the whole thing.

By the time I got started in on the explanation, Valeri Ryumin opened the door and he came in, and I said, "Good. Got both of you right here at once." And so I pushed the door to, and I said, "We're going to have this discussion here and we're going to be convinced." And so we went through it one more time, and they looked at me and they said, "Well, okay. We're convinced." And that it's a non-issue. And so I went away and went upstairs.

Of course, all this is happening in their Control Center, and I called back over to the management console here and told them about the conversation that just happened, and they said, "Well, we're still coming up on the go/no-go decision here pretty soon." Then later I was just walking down the hall, by myself, in their Control Center, just took a walk and I walked past the shift flight director room, which is an office that they have for their flight directors when they're not on console, to work. Victor Blagov, who was their head ops guy that we dealt with, came out of the office, and he told me, he grabbed me-and he speaks fairly good English. Between my broken Russian and his broken English, we can carry on a conversation. And he says, "You know, we're getting very close to making a decision, and we're going to allow you all to come to thirty feet." And then he just grinned at me.

So I went back upstairs and he went into the Control Center. So I called back over and told them what he had just said, and then right after that, they made the agreement and everything was agreed to, and they went on. And so we flew up to thirty feet, and it was a total success.

But with that particular problem, we couldn't have picked a better scenario to start the Phase One Program, because it was the whole process of both flight control teams, all of the managers, all of the technical people, all of the program people, that really got exercised and really came together on a problem that proved that we could work together and that we were all shooting straight. It was a wonderful, wonderful exercise that set the stage for the rest of the program.

I mentioned this, and I'd like to mention Boris Goncharov, because he was such a key element in all this stuff. My very, very first trip over there, you know, we had a company that we arranged all of our interpreters through, and they had some interpreters resident in Russia that they hired. Boris Goncharov was a Sneemosh employee. Sneemosh is the company that runs the Control Center. He's a research scientist for Sneemosh, who spoke good English, and he was moonlighting with this interpreter company.

So, my first trip over there, he was assigned as my interpreter. Well, when I got over there, I mean, an unbelievable friendship formed. Our personalities just meshed. We became best of friends just in a matter of hours. He was an invaluable asset, because he was an employee of Sneemosh, he had access to anything over there. He had no qualms about-he knew everybody, everybody knew him. He was a real popular person, both with the Americans and the Russians. And it was the right personality, the right intelligence, at the right time. Unfortunately, he got cancer and died about a year or two later. So I think we got through two flights, two or three flights, before he died. It was a big loss to the program. He was a major asset to the whole exercise. I mean, he opened doors that would not have been opened to us otherwise, I don't think. Maybe they would have, maybe somebody else would have done the same job, but it made it so much easier, and so it was a good deal.

So, anyway, we got through STS-63, and the one thing that we learned by 63 was that we had done the right thing with the consultant group. The consultant group had cemented its place in history and it was going to happen from then on, and that was the right thing to do. We might vary the mix of it, depending on what the mission is, you know, but we were going to do that from then on. So I went back over with STS-71, as lead of the consultant group again, for the first docking mission, and I took that group over.

Davison: Was it the same group, the same group of people?

Reeves: No, it was a different group of people. I was the only one that was the same group. We did some other planning where we found out that one of the most valuable people on the consultant group was a timeliner. And so after we came back and debriefed from STS-63, we realized that it would be very beneficial to take the lead timeliner on the next Phase One flight and have them go over with the consultant group on the flight before, because that way they would learn how the timelining was done with the

Russians, they would actually meet with the people that they would be talking with over the loops and over the fax machines and working with in subsequent flights, and so it was a training ground for our timeliners, or our FAOs, flight activity officers, and it worked extremely well.

So we started doing that, and then we would vary the mix of other experts, depending on what we were doing. Obviously, on the second mission, we had done a successful rendezvous. The rendezvous didn't appear to be that much of a problem, so since we were physically docking on the next mission and we were going to be exchanging atmospheres, you know, we said, well, if you try to predict problems, that could be a big problem-the atmospheres, or leaks with the docking mechanisms or the mechanical systems. So we took those kind of experts over there and we didn't take the rendezvous people, because we thought we had our arms around that pretty well.

So I went back over with STS-71, and, of course, we did a successful docking on 71, and all that went well. In the meantime, I had gotten assigned as lead flight director for STS-74, and so I was already doing what lead flight directors do to get ready for a flight. And 74 was the one where we took the docking module up. I had made several other trips to Russia as the docking module was being readied and built-it was a piece of Russian hardware-and had seen the hardware, and so during that mission I was here in this Control Center, but talking with all the people that I had gotten to know so well over the previous two missions. We carried the docking module up and put it on the Mir. A very successful flight.

I worked every Phase One flight except for this last one. I was supposed to go to Russia for this last one, but didn't get the visas and things. We didn't get all the documentation that we needed, and so I didn't go and I wound up getting sick and getting this cold, and I didn't even get to work it from over here, so I missed the whole thing. But that was the only flight I had nothing to do with on the Phase One Program.

I was lead flight director on STS-81 as well, which was another flight to the Mir. I was a Phase One representative on STS-87, I think it was, where I went back over and represented the Phase One Program over there. So I got my share of it, and wouldn't have missed it for the world. It was a great program, absolutely the right thing to do to get ready for International Space Station.

You've heard Frank Culbertson and myself and many other people in other interviews say over and over and over that you can't imagine going into the Space Station with the Russian involvement we have without having gone through the Phase One Program. It's going to make it go a whole lot smoother. We're taking all of the lessons learned from Phase One Program and applying them to Space Station.

We're building different facilities over in their Control Center now to support what we call the "Houston support group" now, as opposed "Houston consultant group." And that's because it's on a more

permanent basis now than in Phase One, the space station we were docking to was a Russian space station. We had no ownership in it. Our only involvement in Phase One was while the Shuttle was actively involved in going up there. International Space Station, we'll be involved in all aspects, including the station itself, so we have continuous ownership in the station, and so we'll have a continuous presence in Moscow.

Davison: Let's back up a little bit. You talked about, early on, when you went over for the first flight on STS-63, that you did some simulations. Were those prior to that flight that you did the sims?

Reeves: Yes. The simulations, as we know simulations, was a totally foreign concept to them. They don't do simulations the way we do simulations. They don't have a simulator for the crew to get into that is coupled to the Control Center and transmits data and they have real-time exchange between the flight control team and the crews during their training, getting ready to go. They don't do that.

They have simulators, but all of their simulators are out at Star City, where they train their crews, and it's between the crew trainers and the crew that go through the simulations out there to learn the vehicles and the procedures. Flight control team, the ops people, are at their Control Center, which is in Korolev, which is some thirty miles away from Star City, and they are busy day to day supporting a space station that flies 365 days a year, for twelve years, so they don't have to simulate anything. They already know what to do. I mean, they've been doing it for twelve years, and they've been launching Soyuzes and Progresses and things, and docking them to the Mir, and so they all know it.

So they get their training of their new people through OJT, or on-the-job training. They just bring them in, they learn, you know, and they weren't really getting that many new people anyway. It was mostly the same people that had been involved in the program for twelve years.

So when we came in with the way we do business, which is the crew training and Control Center and everything is at this one facility here in Houston, we couple the simulations to the Control Center, and there's an exchange, a real-time exchange, between the flight control team and the crews, and that's all part of the training process.

Well, we wanted to do the same thing with them. Well, they didn't understand it. Number one, there wasn't any way to hook the Mir simulators into the process, and this whole thing of scripting a simulation and going through a rehearsal of what we were about to do was just something they didn't do. So there was a learning process that took place on both sides, and we had a lot of struggles with that, but we got through it, and it proved to be very beneficial. Once they got into it and everything, they really liked the idea, and it helped iron out a lot of the integration problems we'd have between us and them.

Davison: You make it sound like it was a compromise, that you had different ideas. Can you talk about what the final product ended up being? You talked about some of the communication links between the centers.

Reeves: It was a compromise process. In fact, everything we did with them was a compromise process, and you always found the middle ground. What we did was, we'd set up a script for a segment of the flight, like rendezvous and docking, an important part of the flight, and we would put our crew in the simulator, in the Shuttle simulator, and we would crank up the Shuttle simulator and couple it into the Control Center, and then we would connect the two Control Centers via communication loops and voice loops. They would have a flight control team in their Control Center, and their training people on that side had met with our training people ahead of time and set up these scripts that we would follow. Of course, the rendezvous and docking was per the flight plan, the way we were going to fly the flight. But then they would script the sim to talk about what failures the training people were going to put in to exercise the flight control teams on both sides, and the management teams. Of course, only the training people know what those are, but their training people knew about it, our training people knew about it, that they'd throw a failure in, and then both sides of the ocean would make the process work to figure out how you'd go through it.

The only difference was, their flight control team wasn't sitting there looking at data from the vehicle like our flight control team was sitting here looking at data from the simulator. It was what we call a "paper sim" on their side. And we do some of those. We do some paper sims, too. It's a desktop sim where you mentally walk through it. You're not looking at real data, but you know what's supposed to happen next, and you what-if, and say, "Well, if this doesn't happen now, what would you do?" So it was done kind of verbally, but it was a very good exercise.

Davison: You mentioned the communication loops. I've heard different stories about the reliability of the phone systems. Were you all using the phone system, or something else that you had set up independent for this?

Reeves: We put in our own network between here and there.

Davison: That was [unclear]?

Reeves: Yes, we put in a phone system that we could rely on and use and we put in a set of voice loops, which is just voice circuits between the Control Centers, and we had a certain number of those and then you allocate each one for a certain function. But in addition to that, we had these phones, regular phone

lines, that we had certain ones in certain places over there. Plus we had a fax, our own fax system in, dedicated fax line, for reliability reasons. It was one of our main links to their Control Center. And now we've expanded that to e-mail capability and Ethernet and all that for Space Station, that we're putting in for that.

Davison: Did the training team anticipate simming the leak for the RCS jet, or did you do anything after that?

Reeves: No, that one wasn't simulated. There was another leak simulated, though, but it was an insignificant thing. In fact, it was done on one of the sims when I was over there. The Shuttle has APUs, or auxiliary power units, for hydraulic system power to control the air surfaces on the Shuttle when it's flying like an airplane. We only use them for ascent and entry, and there was some little catch bottle in one of the systems that catches fluid when it's sitting in a 1-G environment on the ground. Sometimes you get leakage into the system and it catches in a little catch bottle, and that bottle was leaking hydraulic fluid once we got into the vacuum of space, so we dealt with that problem, and it was a leak.

But that was after the 63 problem, so they were attuned to leaks, and they were interested from the standpoint of what all can leak on this vehicle, you know, and what all we should be worried about. You know, we have water dumps and we have waste dumps and we have all the propellants and the hydraulic fluid, and then all of the tanks for oxygen and nitrogen that can leak overboard. You know, it's possible to leak overboard. So we had to go through what the effects of all that would be if we had any of those leaks.

Davison: You mentioned the Houston consultant group. Did that team or group stay together through each one of the flights and then transition to the Houston support team, so they were always there every time we had a Shuttle docking mission?

Reeves: Well, there were two facets to the support team in Moscow. You're talking about in Moscow?

Davison: Yes.

Reeves: There was the Houston consultant group, which was the flight controllers that went over to support the Shuttle flight to the Mir whenever the Shuttle was coming up there. In addition to that, there was a support group in Moscow that was mostly made up of life sciences-type people, but some systems people and ops people there, that their role in life was to support the astronaut-on-Mir program, which was the whole reason for the Phase One Program, was putting a person up there to do science. And so that was a permanent presence in Moscow.

Well, that was in the early days, STS-63, obviously, since we weren't putting an astronaut on Mir, they weren't there yet. They were getting involved, they were setting up their way of operating as well. So we were trying to pull both processes together, and as we evolved throughout the Phase One Program, we learned how to deal with that and how to combine the two objectives into one team, called the Houston support team, or support group. So it's an evolutionary process. We went from that support group and the Houston consultant group to merging them into a Houston support group for Space Station.

Davison: We've talked to some of the different individuals that were part of the ops team.

Reeves: They did a great job. I mean, they were invaluable supporting astronaut-on-Mir and in keeping things going. They're really kind of the unsung heroes of this whole thing. You never heard much about them, but they were there working crazy hours and always there, and made great personal sacrifices to be away from home for longs periods of time. A really unique group of people.

Davison: You mentioned earlier that you were the lead flight director for STS-74, which was the docking module flight. Can you talk a little bit about the mechanism itself? You said you got a little Russian [unclear]. [Would you tell us] stories about how that was accomplished in such a short period of time.

Reeves: Yes. When we first docked to the Mir on STS-71, we already knew we had some very close tolerances between the Shuttle and some of the Mir appendages, the solar arrays and whatever, and it created some unique problems. Plus, we wanted to dock to the Mir differently than the way we were doing it, to get more clearance and to make it more useful.

So, mutually, between the Russians and the Americans, it became obvious that we needed this docking compartment or docking module, a new module, to put on their docking node, which is where we were docking, and give us more clearance between where the Shuttle docked to the Mir and their appendages. So the programs got together, and all the engineers, and they designed, mutually, this docking module and what they needed, and it was built in Russia by the Russians with the docking mechanisms adapted for our needs.

They took the Russian docking mechanism design that they had been using and then they modified it for the Shuttle, and put one of those on both ends of this module, and so what we had to do on 74 was fly this module up in the cargo bay of the Shuttle, and it's a module that has to be pressurized so that the crews can crawl through it and transfer logistics back and forth between the two vehicles.

We carried it up in the payload bay of the Shuttle, and then right after the Shuttle got on orbit, before we docked to the Mir, we had to figure out some way to get this thing on there. Well, you can't dock

to the Mir on the port where you want to put this thing, obviously. So we said, "Well, how are we going to do this?" Well, we finally figured out that we'd just take the robotic arm on the Shuttle and we'd pick up the module out of the bay and stick it on the docking module of the Shuttle, so you made one interface and then you'd fly this goofy configuration to the Mir, something that had never been done before. You're flying the Shuttle with this big module sticking out of the side of it. So the commander is actually flying a point out away from the Shuttle to the docking.

So with all the engineers and the integration folks and the ops folks and everybody got together and figured out what we needed in the way of targets and unique targets to be able to provide the feedback information the pilot needed to be able to fly to it with this module on there. So that was a big exercise we had to go through. We had to develop all the operations and procedures for putting the module on there, and hooking up a camera inside the module, so you had a camera looking out through a window in the hatch, looking at the Mir, so the commander's actually flying by looking at a camera that's bore-sighted to where he's wanting to go.

A lot of little problems like that you had to solve and figure out how to do, and then write them all up in procedures, and then look at all the failure modes, and what you'd do if you had any problem with any of it. Did a lot of simulations, a lot of testing, to figure out how to fly the orbiter with this thing on there, and flying a point out away from the orbiter. It all came together, and worked just fine.

Another benefit of the Phase One Program is that that is the very technique we're going to do on Space Station with the first node that we take up. It's almost a repeat of the flight, but it's a little different configuration, but the principles are the same. We now know how to do it. We had all kinds of problems figuring out how in the world to attach this thing when the robotic arm on the Shuttle doesn't have enough force to make the latches match up, and guarantee they'll latch. How do you do that when normally you're flying the Shuttle into the Mir and you've got this huge mass of the two vehicles that are coming together and make the latches work?

Here you've got a real lightweight module that you're just putting on with a fairly week arm, and we couldn't get the latches to work. Well, we held it up into place and got it just right, and then we fired the jets on the orbiter, and actually banged the two modules together and that latched them. We developed that technique, and it's the same technique we'll use with Space Station.

Davison: I have actually only skipped over probably the most historic flight of the Shuttle-Mir program, the first docking. You said you were in Moscow at the time. I wonder if you could share with us the emotion you felt, and maybe the atmosphere in the Control Center in Russia.

Reeves: Yes, it was obviously a very emotional event on both sides. It was something a lot of us had worked on for a long time, trying to make happen. It's like a lot of things I've experienced in this program: when you finally do it after working so hard on it for so long, you almost can't believe it. You've worked on it so hard, and you've thought about everything that could go wrong, and tried to guess at everything that could go wrong, and be ready to react to it, and then all of a sudden it's over. You know, and you think, "Holy smokes, we really did this."

Reeves: And extremely emotional. You know, I don't know how to describe the emotions. They were euphoric. The Russians, I felt, felt the same way, and I know we did on both sides of the pond, and I know their group over here felt the same way.

Davison: Did they see this as kind of a new beginning for their space program? They had been working so independently on the Mir station.

Reeves: They were very anxious, I thought, to do this program together, and I can't speculate on how important to their program it was or not. I mean, I could, but I don't have any data to back it up. I think they were very excited about doing this, and I know the individuals that I dealt with were extremely excited about it. As I mentioned earlier, when we first got over there, the efforts that they went to accommodate us and to learn and to work together were just amazing to me.

You know, after growing up in the fifties, sixties, like I said I did, with the fears and everything else and all of the movies you'd seen and all the stereotypes you'd been exposed to your whole life, you know, I expected to go over there and see a lot of closed doors and restricted access to everything else, and it was just quite the opposite. I couldn't believe it. It was just whatever you want. And we opened up to them and they opened to us and it was great, really great.

By the way, the people, the individuals, that we've worked with so closely over the years have had those discussions about the historical problems we've had in the past and the fear of each other, and now working so closely together, we have those discussions a lot socially. We sit down and talk about it, and it's as awesome and mind-boggling to them as it is to us.

Davison: We've come so far in a short period of time.

Reeves: Oh, yes. Yes.

Davison: You made numerous trips over to Russia. Do you have any stories you'd like to share with us, some special ones?

Reeves: Probably some of them I can't share with you, but--

Davison: You don't have to talk about any Halloween parties.

Reeves: [Laughter] Well, I mentioned that on my very first trip over there, it was still in a time of shortages. Communism had collapsed not too many years before that, and they were in the recovery process, and trying to get their economy going, and you saw on the news all the shortages and things like that, and that was all very true and we were exposed to all of that. But it was just amazing to me how much improvement and how fast that country is coming along, at least in Moscow, where we were. I don't know about the rest of the country, and I'm sure Moscow may be a little different story, but the progress is just amazing.

I've said it many times, and it's just my own personal opinion, that Moscow is going to truly be one of the major cities and tourist attractions and industrial hubs of the world in ten, fifteen years. The way they're developing now and the way they're recovering is pretty amazing. There are no shortages now. The problem over there now is just employment and money, from what we gather and what we see. Not too unlike what the United States has been through in its history. But just a wonderful, wonderful city. Moscow is one of the greatest cities I've ever been in my life. The history is amazing.

Davison: Let's talk a little bit about the working relationships with working with the same people and building up these relationships. I noticed that the flight director's office seemed to have almost a constant team of four or five directors that stayed with the Shuttle-Mir Program, and I know that the Russians tend to do that as well. Was that vital to what you're working?

Reeves: Oh, absolutely. That's kind of the crux of space flight operations in general. As a flight director here, just working with flight control teams and going through the training we go through and the training we go through with the crews, developing the rapport, the working rapport, and the working relationships with the people is one of the major objectives and things you're trying to achieve. Yes, you want to get knowledgeable of all the technical aspects of what we're doing and the operational aspects of what we're doing, but a big part of it is getting to know the people.

A flight director on a flight control team needs to know the people and be able to know the people on their team so that they can interface with them, and in a contingency you can work together and solve whatever the problem is. We had the same problem in Phase One, and now we're just trying to develop this rapport and this understanding of the people that we are going to be required to operate with, especially in a contingency. You have to understand the personalities. You have to understand where the people are

coming from.

The fact that we were able to come to grips with this interpretation problem, the language barrier, and the fact that we weren't so far apart in terms of what we're thinking. Our problem is communication, and you only resolve that through relationships and through personal relationships and getting to know each other. That was just vital to the whole process.

Davison: Now that we've built up this trust in the Shuttle-Mir Program and move on to phase two for the International Space Station, do you think the Russians are going to have a hard time using English as the primary language for their Control Center?

Reeves: Well, they'll have a hard time, but they understand the need to do this. I mean, there are other international partners besides the Russians, so we had to settle on a language, and that was worked out very carefully by all the managers involving all the international partners, and it was settled on to go to English. Most of the Russians, in their school systems, they study English as required courses in their schooling, so most of them have had exposure to English, and it probably will be a little easier for them to learn English than it would for us to learn Russian, but I don't know.

I know that the Russians that I know and deal with are working very hard to learn English, and doing a very good job of it. I don't think we will ever get to a point where we won't need interpreters and translators as a key part of the program. I think that's foolishness. I mean, it's like I've learned enough Russian just through my exposure over there and some personal study and a couple of courses, and this, that, and the other, to be able to communicate, but I can never get to the point on a technical level that I could deal with technical issues, I don't think. There's not enough time to do what you have to do in your job and your daily responsibilities, and take that on, too. I can't do it. Maybe some of these geniuses around here can do it, but I sure can't do it. So I would never get to a point where I wouldn't rely on or want an interpreter or translator around. But they've accepted that and they're going in that direction.

Davison: You talked earlier about a Russian consulting team that came over to Houston while the Shuttle-Mir flights were going on. Can you tell us a little bit about how the team operated? Did you get to work with them?

Reeves: Well, they operated very similar to the way we operated over there. They were at the ready and they were in the Control Center and had a room right in the same area as the flight control room. They were involved in the planning process, they were involved in any kind of problems that came up, any kind of negotiations that took place, and they would be involved over here. So we used them the same way that

we were used over there.

Davison: Were you able to have any Russians in your home when they came over to visit here in the United States?

Reeves: Yes, we've socialized a lot, taking them to our homes and been invited to theirs over there, and we've shared the cultural experiences and all.

Davison: Now that you're working International Space Station, are there lessons learned that you're bringing to the program that other people weren't able to because of your first-hand experience?

Reeves: Well, you know, I think we all had unique experiences and we're all throwing our two cents into the process of what we learned. Everybody that went over there learned something new that we're putting into the process. All of us that worked Phase One are heavily involved in Phase Two. I'm lead flight director on flight 4-A, which is the fourth American assembly flight, fourth Shuttle flight to the station, and so it's all applicable, yes, and we're contributing.

Davison: Could you discuss with us the most significant or memorable story or experience that you had during the Shuttle-Mir Program?

Reeves: Well, the most significant experience is the one I've already alluded to, and that is just being given the opportunity to go to Russia and to interface with the Russians and to get to know the Russian people. We've talked about this amongst ourselves; I have never gotten as close to anybody in my whole life as I have the Russian people, as fast as I did. Just love them to death. We have a great relationship.

But in terms of the events, when I look back at the whole Phase One Program, obviously the work that went into STS-63, with the leaking jet and the problems I went through, that was operations, flight control at its peak. I mean, that's the kind of thing we train and work for our whole careers here, and we get involved in, and it's a very rewarding thing to participate in. I've had several flights where I've been involved in things like that, and you always look back at them as the highlights. Of course, the first docking was just a really emotional experience.

I think that what you're looking for are some unique stories or sidelights, but I don't, I can't think of any right off the top of my head.

Davison: Let me ask a follow-on to the example you gave for STS-63. Did you ever think that the press or the politics of that situation would cancel the rendezvous? Because there was a lot of talk that was

going on. You were certainly working it from inside and trying to resolve it, but from the outside it sounded like the press was trying to say, "Well, the Russians are really concerned. They don't want us to be around their vehicle."

Reeves: Like you said, I was seeing it from the inside, and I was dealing, face to face, with the people that were making the decision, and there was no doubt in my mind that they had legitimate technical concerns, and there's no doubt in my mind they were very concerned, and there is no doubt in my mind that up until two hours before the decision was made, they still had not made up their mind.

There were some people running around saying they were really all along going to let us come in and the decision had already been made; the whole thing was just a drama. It's just nonsense, total nonsense. We were working it just like we would any problem. We were trying to understand the implications of it, trying to cover all bets, and the decision was not going to be made any sooner than it had to be, until all the facts were in and on the table. So, no doubt in my mind.

Davison: Okay. Rebecca, do you have any questions you want to ask?

Wright: You were talking about your perceptions, and I'm sure a lot of your family and friends, because of our ages, feel the same way. Did you have a hard time convincing them of how wonderful the Russians were and the hospitality that they showed you?

Reeves: No, as a matter of fact, I took my wife over there, and didn't have to convince her. She's met the Russians that have come over here, and so that hasn't been much of a problem doing that.

I remember one event where I was socializing with some of their key ops people that I've gotten to know so well, and I had told them how unique it was to be able to work with them after what I'd grown up with and I said, "I can remember going through drills in junior high school where we'd go through bomb drills and hide under a desk and worry about a nuclear attack or something," and they'd laugh and just, "Oh, yeah, you know, the funny thing is, we were doing the same thing."

The common theme that we've all expressed after going through Phase One is one of the biggest learning experiences that we had was not our differences, but our similarities. That was just amazing. When I first saw their Control Center and first got exposed to their operations and the way they ran their operations, it was just amazing, the similarities. There are unique wrinkles here and there because of the uniqueness of the politics and the uniqueness of the vehicle and this, that, and the other, but the general theme or the general process was very similar.

We all talked about it and thought, well, you know, why is that? And I guess our best explanation

is, if you take a technical problem and you lay it on the table with a bunch of engineers, I don't care what part of the world they come from, sooner or later you're going to get to pretty much the right answer, and the right answer always kind of looks the same, no matter where you're coming at it. I would like to believe that that's what happened. That's the way we got to where we are.

Wright: You've been doing your job for so many years, and, of course, the evolution of manned space flight continues. Have you, regarding the Shuttle-Mir part, ever taken yourself out of your current and present self and thought about what part of this historical partnership that you played in it? I mean, this is not routine compared to anything else you have ever done.

Reeves: Yes, you know, you think about that. You think, well, everybody likes to go through life and think you contributed something along the way, you know, and I'm proud of my contribution to Phase One, from just a personal level. I think we all contributed something. I've got my personal contributions. Like you say, I go way back. I got here in 1967 in the Apollo Program, and have experiences through Apollo and Skylab and in Shuttle and now this one. Yes, I reflect on those contributions quite a bit. Makes you feel good.

Davison: Thanks for sharing all these stories and your time with us.

Reeves: My pleasure.

[End of interview]