

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

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

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

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**ROBERT E. "BOB" CASTLE, JR.**

**June 24, 1998**

Interviewers: Rebecca Wright, Paul Rollins, Mark Davison

*Wright:* Today is June 24, 1998. We are speaking with Bob Castle, Flight Director of the Johnson Space Center, as part of the Shuttle-Mir Oral History Project. Rebecca Wright, Paul Rollins, and Mark Davison. Thank you for taking time out of your busy schedule to visit with us today. We'd like to begin by you telling us what your roles and responsibilities are with the Phase One Program.

*Castle:* Well, for me it's actually "were," in the past tense, because I have not had a lot to do with the Phase One Program in the last probably year and a half.

Just to recount some of the history, then, I started with the Phase One Program before it was called the Phase One Program. There was something called the Shuttle-Mir Program, which was going to be a single one-time event docking of the Space Shuttle in the Mir Space Station. Actually, Gary Coen, former flight director, he's now left the office, he's left NASA, he's retired, he was the original lead, who began working on this back in middle to late 1992.

Somewhere around there, I volunteered to be his deputy, because I thought that would be a fun thing to go do, an interesting project, something that would be, I thought, challenging. I'd been a flight director for four years at that time. That was in late '92.

I made my first trip to Moscow in early 1993, with several folks, two of which who were not flight directors at the time, but are currently flight directors now, but happened to be along with the group. This was, again, working on what was at that time simply the Shuttle-Mir Program, which was a single one-time event, one-time good deal, dock the Shuttle to the Mir Space Station.

Somewhere around a few months after that, the program began to expand. It became clear that it was going to be more than the Shuttle-Mir Program; it was going to become what was being called the NASA-Mir Program, which would expand it to a total of, at that time, seven, I believe, docking missions, of which the first, would be what later became known as STS-71.

Somewhere in there, Gary Coen retired and left NASA, and then I became the lead for the first docking mission, STS-71. I became the lead for MOD, Mission Operations Directorate, in Phase One Program, which was the support to the Phase One Program Office, which at that time had just come into existence. Tommy Holloway, at that time, I believe, was the Shuttle Program manager's deputy. He was Brewster Shaw's deputy. He'd been put in charge of the Phase One--well, again, it wasn't called Phase One--of the Shuttle-Mir thing, kind of what it was called at the time. That was mainly procuring the hardware to do the docking, all of this.

Around about that same time, Tommy Holloway proposed, and was accepted, to actually form a

separate program called the Shuttle-Mir Phase One Program, with he, Tommy Holloway, as the head of the program. Frank Culbertson, who was also on my first trip to Moscow, was then named as Tommy's deputy. Then, of course, later when Tommy moved on, Frank became the program manager. So I was the lead flight director then all the way through STS-71, which is the first docking mission with the Mir Space Station, and the overall lead for Mission Operations Directorate. Again, the lead flight director is the one that's charged with pulling together, making sure all the operations aspects of the flight are pulled together, make sure any issues are identified up at the program offices. The same thing we do basically on any lead flight, just this one was considerably bigger than anything I'd done before. So it was a very good challenge and I very much enjoyed all the work.

STS-71 was a big success, everyone was very happy with it. The program then moved into more of the Phase One Program, Shuttle-Mir/NASA-Mir Program, which started off with STS-74 and then some of the subsequent flights. I served on many of the subsequent flights, either as a flight director, not the lead, but a flight director, or what's called the mission operations director rep, the MOD position, which is a management interface position. I guess I was the MOD on 74. I was a flight director on 79. I'd have to look at the details. Actually, I think I've been in some function or other on all the flights up through this last one. The very last flight, 91, I had no official job at all. But 89, I know I did; 86, I did.

Somewhere around the middle of the program, it was almost exactly the middle of the program, I transitioned and started work on the Space Station Program. I'm currently the lead for the first Space Station Docking Mission 2-A, which is launching, hopefully, in December of this year. But for the past year and a half or so, probably the last two years, I've had an increasingly reduced level of involvement in the Mir Program.

The current MOD lead for Shuttle-Mir is Phil Engelauf, who's two doors down, and tells me you're interviewing him tomorrow. So you'll get his version of a lot of the stories.

That's really my involvement. It's been quite a while. I was involved in '92. My first trip to Moscow was in '93.

*Wright:* Why don't we talk a little bit about that, about the trip to Moscow and how it was to have international partners, and your whole perception of being there.

*Castle:* The history of how our involvement with Moscow and with Russia has progressed is really very interesting. When I first when there in '93, we stayed in the same hotel we stay in now, but there were essentially no services, no NASA-provided services there. It was strictly what any businessman in Moscow could get. We spent almost all our time in the hotel. We ate almost all our meals in the hotel. We were

very reticent, I think, just even to go out on the streets. If we wanted to make a telephone call, we paid outrageous amounts for satellite phone calls back to the U.S. That type of thing.

We first met the Russians, my first meeting with them was, again, in '93, and kind of a standoffish feeling at the beginning, as well as getting through the logistics of having to deal with everything through an interpreter, which is difficult to do. A few of the Russians spoke a little bit of English. None of us spoke, essentially, any Russian. Culbertson had a little bit of Russian, but none of us really spoke enough to really get by in Russia. So it was kind of challenge in that way. By the end of that ten-day period or so, we'd already started to get to know some of the people, and they got started to get to know us.

Over the next several years, I've made probably seven or eight trips to Moscow. Each time I work with many of the same people. We became better and better friends. Victor Blagov is my main point of contact that I've come to know fairly well, and there were three or four others that we worked with quite a lot. But as we progress, one, we get to know the people a lot better. We worked with them a lot better. Also the infrastructure that NASA started to build up ramped up, I think, fairly well. We went from essentially no support, to where right now there's a NASA-dedicated little business office in the hotel with NASA telephones, fax machines, copiers.

My first trip to Moscow, we carried our own laptop computers. We carried our own miniature printers, small ink-jet printers. When we wanted to make copies of our protocol, the final agreement at the end of the meeting, the head of the Russian delegation came back and kind of apologetically asked us if we had any paper, because they couldn't find the key to the room where the paper for their one and only copy machine in the entire building was locked up. Part of the Soviet era of things.

You go over there now and there's copy machines, there's printers, there's computers, there's PCs, both U.S. provided them things and the Russians have provided themselves. So the infrastructure has changed a great deal.

The personal relationships, I think, they're important in any endeavor. I think they're more important with the Russians. They tend to want to get to know people, get to know you. They think more in terms of individuals doing things than a job function. So the fact that the lead flight director says something doesn't mean nearly as much as if you say Bob Castle says something or Phil Engelauf says something. And they tend to stay in their jobs a lot longer. The major cultural difference, I think, is exactly that, that whereas the Russians tend to stay in one job for a long time and you get one person who's very, very experienced, knows a great deal about whatever their subject is, whatever their job is, Americans tend to be more mobile in that. We tend to change jobs more often. So, as a result, pretty much any expert we matched up against their expert, our expert had been on the job less time, probably knew less about the

core fundamentals of things.

Another aspect of it was just the way they do things. A lot of times the Energia people will actually be working at universities, they'll be teaching classes, they'll be writing textbooks. That generally doesn't happen in U.S. industry. In the U.S., the university system and the industry system are more split apart. You don't have working engineers writing textbooks for example, and the Russians, they do. So again you'll have their experts tend to be very, very deep. There tends to be very few of them, but they tend to be very, very deep, very knowledgeable, and, I think, probably a little more knowledgeable than the typical American expert that went over.

When we got into operations, some of the similar things. I say Victor Blagov is my counterpart. In the history of the Apollo-Soyuz Test Program that I read--Glen Lunney [phonetic], I believe, gave me a copy of that book--Victor's name is in there from 1975. He was a flight director in 1975. I was in college in 1975. So, again, you see that they stay in one job a long, long time. That's the major difference, is the long time they stay in the jobs, the infrastructure that's built up. I mean, just the nature of a job of a long-term space flight instead of the shorter Shuttle missions, that shows up over and over again. I think you'll hear that over and over again, that we learned a lot from the Russians.

Things are a little slower paced. You can take a little more time. An anecdote that I told and made one of the magazine articles not too long ago, I think when the electron oxygen generator in the Mir went down. We said, "Okay, you're going to bring in a bunch of people to go work on this, right?"

They said, "Well, we're really not going to bring anybody in. We'll start working on it Monday." And this was like a Friday afternoon.

Then our own environmental people downstairs said, "Well, with the current pressure of oxygen in the Mir and the volume of the Mir and the number of people on board, it will take ten days to breathe the oxygen down."

So, okay, ten days. Well, I can see why you might want to just take the weekend off, let people come in fresh and work on it Monday, because you've still got a lot of time to work on it, whereas in the Shuttle Program ten days is an entire mission. You wouldn't take two days off; that's a large percentage of the whole mission. It's just a different way of thinking about things. It's not fundamentally different, it's just a different scale, because we do the same thing in the Shuttle missions that I've worked. If something breaks, you don't work it immediately, you figure out when you have to have an answer.

*Wright:* During this time that you were getting to know them and they were getting to know you, was there any specific incident or situation that you knew, as a flight director, that they had accepted you on their level of expertise, something that might have happened where you have to converse with them and they

looked to you for information, as well?

*Castle:* I can't say that there's any specific incident when that happened. It seemed over the first year or so, it seemed to slowly happen that they would call me and ask me questions, and I would be respected as a flight director, someone on their level. The more I talked with them, the more alike we seemed.

Blagov is as smart as anybody in this office, and he approaches problems the same way. He thinks about them the same way, as we do. His training on how to do things is very much the same, in terms of how you go about tackling problems, how you organize to work on problems. So more and more we realized how much alike we were, how much we thought alike. But I can't say there's any one moment when I say, "Ah! Now they respect me," or, "Now they don't." I think I was always respected. Did they get to know me well enough to where they would trust me to talk to me? I'm not sure exactly when that occurred.

My first real interaction with them, actually, was during STS-63, which when we approached the Mir, we didn't dock. I supposedly had nothing to do with that flight, but I wound up working quite a bit, because the Shuttle developed a thruster leak, which "a leak" is something you worry about, when you're near a space station with large solar arrays. So we did a lot of work. How close can we bring the Shuttle with this potential leak to the Mir Station? We did a lot of work back and forth on that. Somewhere in there, and I don't know whether it was before that or after that, but I remember coming, at the end of that, saying, "Well, we did okay. They trust me. They know what I can do. They know what we can do as a group."

Again, I can't say it's any one person, there's a scattering of people. Bill Reeves was in Moscow. Phil Engelauf was the flight director. I was essentially the MOD, the mission operations director, for that period of time for that one piece of it.

*Wright:* What all did those duties involve as the MOD rep?

*Castle:* The MOD rep is mainly the interface. It's mainly an interfacing job between upper management at NASA and the flight control team. That is its defined job. I was a combination of that. I guess I could also call myself the fourth team, or the Tiger Team leader, to go tackle this one particular problem. Quite often in space flight, if you have one significant problem you'll form up a little team, separate from the team on console, to go work on it.

That's essentially what this was. It's a little bit different scope in that we didn't work on what to do with the Shuttle. It was very clear what to do with the Shuttle. The flight teams handled that completely.

It was more an impact of, "What do you do with the Space Station we're rendezvousing with?" That was a new thing for us. We'd never rendezvoused with a manned vehicle before in the Shuttle Program.

But the mission interface role, as well as leader of the off-console team, this other group of folks who went off to tackle this other problem, and Bill Reeves, who was in Moscow, was very instrumental in trying to coordinate that, as well as the group of Russians who were here. In all of these missions, we have exchanged what we call consultant groups. So we sent a small group of Americans to Moscow, they sent a small group of Russians here. Theirs was led by what they called a shift flight director. Ours was led by a flight director, in this case, Bill Reeves, on 63.

*Wright:* What's the differences that you noticed between Mir Control Center and the one here in Houston?

*Castle:* Well, I'm not going to talk about the physical differences, because those, I think, in a lot of ways fairly minor. They're organized a little more, I think, for long-duration flights where things are slower. They have four basic teams and four basic what they call a shift flight director. The major operations thing that I noticed that is different is their individual shift flight directors appear to have less authority than one of our flight directors has got, whereas we've got, I guess, twenty-two flight directors now, and they've probably got eight or ten shift flight directors.

One of our flight directors in the Control Center has got authority to do what needs to be done. Pretty much anything we need to do, without consulting upper management, they can do. As far as I can tell, there's probably only a couple of people over there, which is Victor Blagov, is one, Vladimir Soloviev [phonetic] was the other, who've really got the authority to do a lot of things. They call them the flight directors, and then the others are shift flight directors. Well, the flight director will come in and essentially take over and be directing things for any important operation that's going on, be it a docking, be it an EVA. Anything that's significant, one of them will come in. When one of them is not around, it's pretty much the shift flight director's got limited authority as to what they can do, unless he calls one of the two of them in.

They carry it to the level that in the five years, almost six years now, over six years I've been working with them, Soloviev and Blagov have never been out of the country at the same time. If one of them travels, the other one stays in Moscow. And that's not an accident. That is very deliberately planned out. So I've never seen both of them in Houston. The only time I've ever seen the two of them together was in Moscow.

Even all the way up to this final meeting, Blagov was two or three weeks ago, and Soloviev is coming next month for a meeting. But it's always opposite numbers. One of them stays in Moscow. So they're more centralized in some ways than we are, whereas we have a little more distributive approach to

our operations. There's more authority vested, I think, in the lower-level people. That's just a style difference.

*Wright:* Would you share some of the details of 71 and the docking mission, and how that was for you personally to be part of that historical event?

*Castle:* Well, it was extremely satisfying. There had been an enormous amount of work getting ready for it. We spent several thousand man hours, I believe, in simulators practicing the approach, characterizing how the Shuttle would approach the station. That was probably the major pre-mission thing that we worked on. We rearranged the mission time line two or three times. We made fundamental changes in the method of approach. Being in on all those was very interesting and very satisfying.

For me, the whole mission had come together, I think, at the docking. We watched all the docking live. We had TV of the whole thing. I even had little cross-hairs taped on my TV set at the console so I could see if they were lined up when they came in. But when I watched it on TV and the two docking systems came together, I could see on TV the jets firing. The Shuttle jets fire to push the two vehicles together. I could see the structure actually rebound. And when it rebounded, it stayed together. The Shuttle stayed docked to the Mir. At that point, I felt this enormous of almost wall of relief that says, "Okay, we've got it. This is the hardest part. This is the riskiest part. This is the trickiest part for the whole joint mission. The rest of it, okay, if this mechanism works, it works. If it doesn't work, it doesn't work. Nothing we're going to do about it. But everything that we could do has all come together."

And the rest of it worked. We transferred Norm [Norman] Thagard back to the Shuttle, we exchanged the Russian crew. First time we've ever done that. There was a great deal of media attention. Several of us got interviewed on CNN and things like that, which was all very flattering in a way. But it kind of comes back to me, that was the crisp moment when this has worked, because I can remember seeing it. I've never seen it that clearly on any subsequent docking mission. Either I don't have the camera views anymore or I just can't quite see it or feel it, anymore. But that was the big moment for me, when it worked. "This is going to work."

Working with all the people, essentially organizing how we're going to have two control centers work together, which we hadn't done before. We created the position called the Russian interface officer. A bunch of really sharp folks who did that. If you haven't talked to some of them, you probably should. This whole new thing of how to communicate with the control centers was in on bringing all that together.

I mean, there were a lot of things that were very satisfying. I don't know whether I can particularly point at one of them and say, other than the one I just talked about.



*Wright:* Could you give us some more details about the Russian interface officers? Did they have a lot of authority or were they there for a communication vehicle? What was their main purpose?

*Castle:* They were there as a communications vehicle. They were the major, if you will, mouthpiece for the Control Center. They spoke to the Russian flight control team. The Russian flight control team had an equivalent position. These two were charged with just passing information back and forth, getting data transmissions, be it fax, electronic, or whatever. They had to be translated; managing the interpreters; working out what information was to be passed back and forth when. A great deal of that was all put together. That was, again, one of the major challenges of doing this.

Again, there were four original RIOs. One of them is a flight director now. I don't know what your interview list has got on it. But that was a very interesting whole thing to set up. I'll admit that I laid out the basic concepts of it. Phil and I were the ones who actually selected the RIO, the matrix jobs. We actually picked the four people to go do this job and pretty much gave them their head, once we let our basic concepts of what to go do and basically how to go about it.

*Wright:* What are some of the criteria that you were looking for when you were looking for these special people?

*Castle:* Since it was a job that wasn't defined and it was a job that I knew Phil and I weren't have a lot of time to really babysit, if you will, I looked for people with a lot of self-initiative; a lot of experience in the Control Center before; experience at how to lead teams; how to get things organized; and a fairly good overall knowledge of Shuttle and Shuttle operations. Probably in that order, were the things we looked for. That was a new position. It's still there today. People are rotating through it all the time now. It's now become a standard thing, as opposed to being something that you created brand new.

*Wright:* Were people excited about serving in this position, or did you have to solicit?

*Castle:* No, we had quite a few people. We had probably three or four times the number of slots we had. Three or four times that many actually bid on it or expressed interest in it and their managers said they could do it, type of thing. That was one of the new things. The entire Shuttle docking approach was something that was very new. That was the more technical subject.

*Wright:* How was the learning curve on that? How do you go about learning something that you're not quite sure how to do?

*Castle:* Well, it's very interesting. Actually, the Station Program had been thinking about how to dock a Shuttle to the Space Station, what was at that time Freedom, for quite some time. They had not really settled on a method, but they had some very good ideas. They'd thought them through and had some thought-out ways of doing it.

When the Shuttle-Mir Program came up, the one-of-a-kind mission came up, essentially a lot of that experience, a lot of those thoughts, were pulled in. Said, "What have you guys already done? How much have you put together already on it?"

Then actually flying the Shuttle turned out to be the easy part. The Shuttle is a very, very good vehicle. It can fly very accurately, position very, very accurately. But to do that, it has to fire jets. Well, those jets affect large flimsy structures like solar arrays very significantly. So the real challenge was not to fly the Shuttle up and dock with the Mir; it was fly the Shuttle up along an approach path in a method such that you don't damage the Mir.

We went through concepts all the way from--once the docking system was chosen, we knew what docking system we had. We went through, should you approach at high speed, at slow speed. It takes a certain amount of force to engage the docking mechanism. Do you get real close and fire jets? Do you come in at a high enough speed you don't have to do that? All those concepts were brought out. How do you go about flying this approach?

Once we settle on a basic concept, we then spend several thousand hours in simulators with a variety of crewmen. I flew a fair number of them myself, just flying the simulator, collecting a lot of jet-firing history data and then having that all analyzed, saying, "Did you damage anything?"

You're essentially building an envelope in which we could operate, to bring the Shuttle and the Mir together, all the way down to once they were docked and the Shuttle was going to do attitude control. Well, that's a very large flimsy structure. There's a lot of work done there. I was on the periphery of it, something we hadn't done before. Knew we'd have to sooner or later for Space Station.

Those are the fundamentally new things--dealing with the Russians as partners. We'd dealt with several foreign nationals before on various programs and the Shuttle Program, but they weren't quite partners, because they were riding on the Shuttle, it was our vehicle, we controlled everything. The Russians were our partners. They had their own spacecraft, their own program, their own launch vehicles, their own everything, the physical approach and docking to the station and developing techniques to do that, and probably the third piece was just tying the two control centers together in new ways that we hadn't done before, and again as a partner basis, instead of like we done with a lot of remote payload operations control centers, where they had a much more narrow role. Here the Russian Control Center had a very large role

compared to any of the other organizations that we've worked with in the past.

*Wright:* We were partners, but yet at the same time it was their center, their vehicle, and so forth. Did we feel that way the whole time, or at some point did you feel like we were definitely partners and decisions were being made by both sides?

*Castle:* That took a learning curve, as well. In the beginning, it was very clear that one was their vehicle, one was ours. They made the choices on theirs. We made the choices on our vehicle. We tripped over a few minor things, from what the carbon dioxide level was on the Mir Station to some other things, where they'd made a decision on their side. I don't think they tried to hide anything from us, it just didn't occur to them that they should tell us, because they weren't used to dealing with anyone else.

I'm sure they could tell you similar stories about the things where we decided something and didn't think to tell them. I think the Russians, probably more on their side, than ours. I think their culture is just such that for many, many years they were taught you don't tell people things they don't need to know. So several times we tripped over things like that. Slowly, we kept pushing more and more. "Okay, we just messed this up because you didn't tell us this. You need to tell us this. We need to know what you're doing." Then it progressed more to, "You need to tell us this before you do it, so we can jointly agree on these things."

Decisions on sending Americans EDA from the Mir was something that was done very much jointly, with both sides reviewing what the tasks were. Was it safe to do? What were the advantages, etc. But like I say, the earliest one we tripped over was the 71 item, was just the Russians had made a change in their carbon dioxide-removal system and hadn't told us about it. Well, when we docked the vehicles and opened the hatches, the air mixed, suddenly our carbon dioxide removal system was facing a much larger load than we'd expected. We could handle it. It wasn't a big deal, but it was not what we were prepared for, and we had to go scramble and go change some cartridges and things out. Those kind of things.

But I call it a growing thing, that as we went on, we got better at working with each other. We never got to the point where we were completely partners, nor should we have been. The Mir *is* their vehicle. The Shuttle *is* our vehicle. There are a lot things that they do internal to the Mir that they don't need to tell us about because it is their vehicle. It is their property. As long as we have a crewman on it, we have a great deal of say-so and we do get quite a bit of information. And the same thing on the Shuttle side. When we flew their crewman, they wanted to know a lot about what's going on the Shuttle.

That's probably the major change between Phase One and Phase One of the Space Station Program. Is in Phase One it isn't the Russians have a vehicle and it's theirs, and we have a vehicle and it's

ours. We're all tied together in one big vehicle, with pieces of it having been built, some in Russia, some in America. And that's going to be the big change. And we progressed that way. As I said, on 71 things were very clear: yours versus ours. By the time we got to 91, it was a lot less clear. There was a lot more cooperation, a lot more joint decision-making going on. Still not as much as will have to happen for Space Station.

*Wright:* On 71, when you were ironing out all the details on how to approach the Mir, how much was the crew involved with some of the decisions that you made prior to the launch?

*Castle:* They were extremely involved once we actually got a crew. The crews typically are assigned a year to eighteen months in advance. This crew was assigned pretty early. But a lot of the fundamental choices were made before the crew was actually assigned. That doesn't mean we didn't have astronauts participating; we did. When I say there were several thousand man hours flying simulators, probably half of those man hours were astronauts flying the simulators, developing the approach.

Hoot [Robert L.] Gibson was the commander and he certainly flew a lot of them once he was named. Prior to being named as a member of the crew, I don't think he flew very many, because he was head of the Astronaut Office and very, very busy. But an awful lot of other pilots from the Astronaut Office did fly a lot of those simulations. They were participating in the meetings where we decided how to go about these things. So there was a lot of participation. Of course, once they actually got assigned, I think Hoot had quite a bit to do with it, and the rest of the crew had quite a bit to do with it.

71 was also a little bit different in that every mission to the Mir Space Station, except 71, was a logistics flight, essentially. We're taking up resupply items. We're bringing back items. 71 did a fair amount of that, but it was fundamentally a science mission, where we were returning some crew members who had been on board the Mir for a long time. We did a lot of medical tests on them in the space lab module in the payload bay of the Shuttle before we landed. Both while we were docked with the Mir and then after we'd undocked, there was some more tests. It was a science mission on long-duration human space flight, using subjects that had been on the Mir and the scientific instruments that could be carried on the Shuttle to gather the science data.

The rest of the missions had pretty much been logistics. They're delivering hardware. They're delivering cargo. They're returning cargo. They're returning people.

*Wright:* I was going to ask you about, as lead flight director, the big differences between the Shuttle flights and the Mir-Shuttle flights, other than the docking. Is that pretty much it?

*Castle:* That's pretty much it.

*Wright:* They're pretty routine except for the transportation of those items?

*Castle:* They've become very routine, much more so than they were in the beginning. You can see that in the crew selections, too. STS-71 had an all-veteran crew. Every member of that crew had flown at least once before, every one of them. Then you go toward the later flights and there are three or four rookies on each flight, because it's no longer the new challenge. This is something we've done before, we've got an experience base and we know a lot more about. The same thing on the flight director's. You can look at our staffing, how we've done some of those things, as well.

But, yes, it's a Shuttle mission that the two differences are, you're docking with something and you're working with the Russian Mission Control Center. Those are the two real differences. Other than that, it is fundamentally no different than any other Shuttle mission. It's a short mission, only lasts a week to ten days, I guess nine days for most of these missions. All of the preparation, the types of things you go through before the flight, are the same with those two exceptions. So it's real easy, once you get past the first one or two of them, to say, "Well, gee, this is another mission," because it pretty much is.

*Wright:* When you were in Russia, were you there at any time when a docking was occurring? Did you see a docking from that side?

*Castle:* I've seen dockings of Russian vehicles. I was there when a Soyuz docking occurred. But I've not been there for any of the Shuttle dockings. I was always here in Houston for all those. There's a scattering of flight directors who have been there, certainly. We started off with flight directors. Then we started sending some other people out of Mission Operations Directorate, two of whom later became flight directors after they were chosen to go up to this job. So I guess you could say, retroactively, we sent a flight director. But I've never been one of them. I've always been here.

Phil Engelauf and I, I think, are the only two that have never been to Moscow during a docking. Both of us have always been here for all the docking missions. I think both of us have been to Moscow probably seven, I think I'm up to seven or eight times.

Again, Moscow, itself, has changed so much. I talked about my very first trip there. My last trip there we were wandering the city on Metro pretty much at will.

*Wright:* We noticed your Metro map [displayed on the office wall].

*Castle:* Yes, a map of Metro. We were going to restaurants and bars, generally in two and threes.

Generally you don't go out alone. I actually felt safer in Moscow than I would in downtown Houston at night alone, as an example. We know a lot more people there now. There are a lot more Americans, a lot bigger infrastructure, as well. There are a lot more places to eat. The overall economy over there, I think, just from the surface, seems better. Every time I fly into the airport I see more signs in English. I see more things being advertised. I see more stuff in stores. So it's not the same place at all. It's not at all the same as it was when I first there.

*Wright:* In just a short amount of time.

*Castle:* Just a short amount of time, five years or so. The ruble has changed by a factor of twenty or so since I first went there.

*Wright:* How long were you there when you stayed? Did it vary?

*Castle:* It varied. Typically it was about ten days. Then this past February and March, I was there for a month. We started doing a little longer rotations, where we actually put flight directors over there for a month at a time. Mark Krishish [phonetic] went for the first one in January. I went in February. Mark Farring [phonetic] went after I did. Then Bill Reeves was the last one. Right now John Curry's in Moscow, another retroactive flight director. He was there for a different job, now he's a flight director. So he at least has the title right now. We're going to keep people there for probably several more months. John's coming back, I think, in the next week or so.

*Wright:* How was it from just staying a few days to a month?

*Castle:* A month is where you start making the shift. For ten days to two weeks, you're on vacation. That's what you think about it as. You're visiting. There was a mental shift that happens somewhere about the two-week point that just kind of felt like, "Well, I'm here now." I started to think of the hotel as home, started not thinking in terms of, "Gee, I've got to get this all done like right now, because I leave in a week." I started thinking more in terms of, "If I'm going to be a month and there's somebody that's going to come after me and somebody's going to come after him, I can spread this on out." So there's a definite shift when you commit to probably on the order of a month. We've had people there, I guess, the longest we've had somebody there is probably four to six months. None of the flight directors have been there that long, but we've had NASA people there on the order of four to six months. Of course, there's some NASA liaison people there who are there for a two-year tours, and, of course, it is home.

*Wright:* You make it that way.

*Castle:* You make it home. That's the transition you have. I enjoyed Moscow. Moscow's a nice place to visit. It's a fascinating city. There's an enormous amount of culture in Moscow. There's a lot of things to do. It's only problem is, it's not here. Friends and family are still here. And, okay, you make new friends, but you still have more friends here than you do in Moscow and you still have all your family here, of course.

*Wright:* Was there winter and summer?

*Castle:* I've not been there in the real heat of the summer. I have been there in the dead of the winter, twice. I've been there in spring and fall, when it was moderately cold. I have not been there in some of the 90-degree days that they had. Last week they had some really scorcher days. Except unlike Houston, Moscow doesn't have any air-conditioning, so it really gets kind of miserable, but it doesn't last very long.

*Wright:* That's the good news.

*Castle:* Miserable while it happens.

*Wright:* Well, your new duties, or maybe I should say your current duties, will take you into the International Space Station, Phase Two. You feel your experience with Shuttle-Mir and Phase One Program has been beneficial to lead you into that?

*Castle:* I think it's been invaluable, just in my knowledge of the Russians. They know who I am. They respect me. I know who they are and respect them. That's been invaluable.

I spent a month in Moscow this time, and I was effective the day after I got there, because I knew everybody and they knew me. I could go right to work. If I hadn't done that, if I was a stranger, it didn't matter what my title was, it would have taken a couple weeks before I would have started to get much of anything useful done, I believe, just to get to know who to talk to and what to talk to them about. It would have been a lot slower.

So I think it's been invaluable. I think our knowledge of how the Russians build hardware has been invaluable. What we've learned about the Mir has been invaluable, because the Russian component of the Space Station is going to be very much like the Mir. They tend to evolve things. They built a system, they're going to evolve it, make it a little bit different than the one before, as opposed to the American way, where we invent everything completely new. The electrical system on the Space Station, for example, bears

virtually no resemblance to the electrical system on the Space Shuttle, which bears no resemblance to the electrical system on Apollo. So both in the systems and in working with them, knowing the people, it's been invaluable. Learning how they operate has been invaluable. I think the Phase One Program has been extremely useful. Again, I was only in it for probably half of it, the first half, and have been somewhat involved the second half, which you'll get the second half from Phil.

*Wright:* Your first half sounds extremely busy, those long days or thousands of hours. I'm sure a lot of those thousand hours were built in a short amount of time.

*Castle:* There was a lot of work that was poured into getting ready to go do these flights.

*Wright:* What was the attitude, or environment, of all the folks that you worked with here, coming together to work with the Russians? Was it a time of excitement, or a time of caution, a little bit of everything? What was everybody feeling when you got together to do this?

*Castle:* I think for most of them it was a matter of great excitement. It was excitement, because it's something new. It's a new technical challenge, something we haven't done before. It's a new challenge working with the Russian Control Center. There was certainly some frustration just because of cultural differences and the amount of work we had to do. It took time to get through things. But mostly people were excited. No one was reticent or fearful, if you will, of taking this on. They got frustrated at times. We all did. But mostly it was very exciting. Then to see it play out and become successful.

I think toward the later missions, I think a lot of that excitement is still there. It's toned down quite a bit because you're doing one more. The ninth docking mission was quite a bit different in the level of excitement than the first, and you're going to see that in any endeavor. It was a wonderful time, striking off to do something that hadn't been done before, working with people.

It was very refreshing, because the Russians are really, I don't want to use the word "competitor," but they're the only other space power in the world. They're the only other country that is putting people in space, that has launched vehicles to put people in space and keep them there, and do useful work while they're there. So, working together, as opposed to being in some sort of race, was very, very rewarding and a great learning experience, because I think we'd all kind of wondered, "Well, how do the Russians do this?" And to a certain extent they were wondering how did we do things, because they knew as much about our program as we knew about theirs, which wasn't very much.

*Wright:* But now we do.



*Castle:* We know quite a bit more now. That's not to say we know everything, but we know quite a bit more than we did at the time, STS-71. In 1992, I knew there was a Mir Space Station, but that's about it. I knew it existed, and I'm sure if I went off and dug in the literature, I could have found out a few things about it. What I know about it today, I can name the modules and how they're interconnected, what the major systems are. Far, far superior to what I knew six years ago.

*Wright:* You're involved in this business, and so you knew, at least, there was a Mir, but how do you feel like it's impacted the general public, for which now "Mir" has become a very commonplace word in their vocabulary?

*Castle:* I hope it's--I'll tell you what I hope. I hope it's impacted the public. I hope it impacts the general public with the knowledge that there is, in fact, a Space Station, that there is, in fact, people in orbit all the time, that the Americans and the Russians can, in fact, work together on something, not a one-shot deal.

Apollo-Soyuz was a one-shot deal. I was in college during Apollo-Soyuz. But it was a one-shot deal. I'm glad that the Shuttle-Mir Program have all been more than a one-shot deal, and I'm glad the Russians are involved in the Space Station Program. I think that's going to be a positive in the long term. I think they've still got things to teach us, we've got things to teach them. I think we'll be better together than we would separately. I think there's going to be a lot of work to get there.

In the short term, if there was no Russian participation and all the modules were U.S.-built, it would be simpler. It would be simpler in the short term just because I wouldn't have that extra piece of having to deal with someone nine hours ahead of me in time, and on the other side of the ocean, speaking another language. But in the long haul, I think it's going to be well worth it.

I'm not sure if I answered your question, but I rambled.

*Wright:* No, it was a great answer. I'm going to ask Paul or Mark if they have some questions for you.

*Rollins:* I was just wondering if you had any interesting or miracle stories while you were in Moscow. I know you told us the details of how things were there, but maybe on a personal level, were you able to share some stories about some events that happened over there?

*Castle:* I don't know that I have a whole lot more time here. There were a lot of little things that happened. Blagov has been very good at showing us around the city. He arranged with one of his friends to take us on a little dinner boats on the Moscow River one time, which was very, very interesting to go do. As far as any particular things, one of the flight directors, Victor Carzonoff [phonetic], had several of us over to his

apartment one night, had dinner over there. It was a wonderful setting, fairly small apartment, but they really laid on the food. Everything was very beautiful. Told us stories about where they got their apartment. It turned out it was one of the apartments that housed Olympic athletes for the 1980 Olympics, which was held in Moscow, of course, which the United States didn't participate in, of course. Then when all the Olympic athletes left, the apartments were put up for sale and they brought them at that time very cheap. He's been there ever since. But they laid on a wonderful dinner for us all.

They're very good at giving little gifts. You have to actually be careful, because one member of our party expressed admiration over this type of plaque thing, it was done with a piece of metal and a nail punch and put patterns in the metal, expressed a great deal of admiration. Well, they wanted to give it to her. Well, then she really didn't want to take it. It was an interesting little dance there with the interpreter to say, "Well, once they offer it to you, you really can't refuse." But in the end we did, in fact, refuse. I think there was a compromise gift made, because it really was way too nice. There are other stories with people who did that. They admired something greatly, and before they knew it, it was a gift, sometimes a very large object they had to put in their suitcase.

But those are some of the fun times that we get to do. We've had similar things here where Victor's been over to my house and that type of thing. We have parties for them and all this. At the same time, I've never been in Victor's apartment, for example. I don't think anyone has. I get the impression it's a very small apartment, and he'd just as soon not have us all up there. But that's kind of up to him. But I've been in a couple of apartments like that. Carzonoff's is probably the nicest. We had five or six us over for what was really a very nice dinner and all this. There have been other similar things like that.

I'm listening at the end of the door here, because I have another meeting at 3:30.

*Rollins:* Are they grooming anybody? These older guys who are getting ready to retire, did you feel that there was some people waiting in the wings?

*Castle:* Yes, Victor's got a deputy, a recently assigned deputy, about a year and a half ago, Alexander Kotov [phonetic]. Before that, his deputy was the cosmonaut Sergei Krikalev. Sergei, I think, is clearly being groomed. He's a very, very smart man. I expect him to take either Blagov's place or Soloviev's place, quite frankly. Wouldn't be surprised to see that happen. So they're grooming people. They also just hired a whole bunch of new people to help support the Mir Program and the Station Program. That's been one of my major worries. I see them grooming someone to replace Victor or Vladimir. I didn't see that they were grooming anyone to replace the replacements. So is there a pipeline of people here or not? But I think there are a couple of people being groomed, yes, to take some of these top jobs.

*Rollins:* They're not five years younger than the guy who's getting ready to retire? [Laughter]

*Castle:* No, but they're probably--I'd have to look it up--Kotov's in his forties. Victor is sixty-two.

*Rollins:* I figured they're not young men.

*Castle:* No, they're not twenty-year-olds. But Kotov's got another ten or fifteen years, certainly, in front of him. And Victor's sixty-two. Now, how long Victor keep going, I don't know. He appears to be in excellent health, and I suspect he will keep going quite a while.

*Rollins:* We met with some of the Russians in Florida, so that's why we know something about it. That's why I sort of light up when you talk about these--

*Castle:* Well, Blagov was there for the launch, because he came up here after the launch.

*Wright:* We did get to meet him and did interview him. He had wonderful things to say about the American flight directors. So we'll have to share that with you at another time, when you've got more time.

*Castle:* I would love to see some of that.

*Wright:* Thank you.

*Castle:* You're very welcome.

*Wright:* Appreciate it.

*Castle:* I hope an hour was enough.

*Wright:* Yes. Thank you. We appreciate you squeezing us in.

[End of interview]