RICHARD W. NYGREN

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Interviewers: Rebecca Wright, Carol Butler, Summer Bergen

Wright: Today is July 23, 1998, and we're visiting with Rick Nygren with the Shuttle-Mir Oral History Program. This is Rebecca Wright, Carol Butler, and Summer Bergen.

Thanks for taking time out of your schedule. We know you're busy, and we appreciate you making the time to visit with us.

Nygren: Glad to do it.

Wright: We would like for you to start by telling us about your roles--and I understand there are many--that you've had with the Shuttle-Mir Program.

Nygren: Okay. I can do that. I joined Space and Life Science Directorate in the spring of '94. I [came] off of the Space Station Freedom Program, and the Director of Space and Life Science, Carolyn Huntoon at that time, asked me to come to the directorate and pick up the lead role as far as the directorate's interface with the Russians and the Shuttle-Mir Program were concerned. And I did that, I came on board as the assistant director for Russian programs, and at that point in time it was just the Shuttle-Mir Program, which was Norm [Norman] Thagard's flight up on the Soyuz, time on the Mir, return on the Shuttle.

The directorate's responsibilities at that point in time focused on the medical research aspects, which were basically what Norm was doing at that point in time, and the training for that experience, both here and in Russia for Norm and the cosmonauts, because they were going to also participate in some of our science activities, and then the training kinds of things and the hardware development. We were going to put a fair amount of hardware up on a [Russian] Progress launch vehicle and then utilize it on the Mir. The Russian requirements are somewhat different than the U.S. requirements are, so we had to go through a learning experience of what it is we had to do to our hardware to make it compatible with the Russian systems. So that was kind of how I got started.

Later in '94, the NASA-Mir Program kind of got kicked off with the generation of the contract with the Russians and the extension of up to ten U.S. visits to the Mir. With that, Tommy Holloway was named as the program manager at that point in time, and he extended the working group structure that had been in place for the Shuttle-Mir Program. They had a few working groups in place for the Shuttle-Mir Program, and through his program management structure and expansion of the program, he extended it to where there were basically eight working groups.

He asked me to co-chair one of those working groups, which was the Mir Operations and

Integration Working Group. As Tommy had outlined that, it had basically the overall responsibility for the long-duration mission. What I mean by that, basically, in simple terms, is, it was not when the Shuttle was there. If the Shuttle was there, that was under the responsibility of Working Group Three, which was headed by MOD and by the Shuttle Program Office. But for anything that was going to happen during the long-duration mission, the Working Group Six entity was supposed to take care of that.

There were basically three aspects, again, with that, and that was what I'd kind of been doing, the training aspect of making sure that all of the astronauts and the cosmonauts were trained on the U.S. hardware and the research program that we were going to try and conduct, all of the operational aspects, and for that we had a control center support team in what's called the TsUP, or the MCC in Moscow, and we had an equivalent control team here at JSC [Johnson Space Center] that had started out in Building 36 in what was called the science monitoring area and subsequently was moved over into Building 30 and became known as the POSA, the Payload Op Support Area.

We supported from the time that Norm Thagard was launched, and we [will be] supporting until the Mir 25 guys' return, and when the Mir 25 crew returns in mid to late August, we will close down our control center operations. But for that length of time we had a control center that was up, it was manned, and we basically ran two shifts a day coverage.

Then the third aspect was getting our hardware on orbit. As the program expanded, the research activities grew immensely, and what they originally started off with, launching some stuff on the Progress for Norm, expanded into providing a significant amount of hardware into the Spektr module, which was going to be a research module that the Russians launched. We outfitted it with a number of human life science experiments that we could not launch on a Progress because of the size of them. They needed to be integrated on the ground. And then the program was expanded even farther into the addition of the Priroda module, and we did the same thing with the Priroda module and outfitted it with a number of U.S. components and a significant amount of stowage volume that we could use for on-orbit stowage of our hardware experiments.

Then we launched the majority of our hardware on the Shuttles, took it up on the Shuttles, brought it back on the Shuttles. But we did have an agreement with the Russians that for certain items we could use the Progress vehicle, and we did that on occasion, generally when our hardware would break unexpectedly and we needed to get something up. We'd call on them and ask them if we could use some of their space, and they were generally cooperative in that endeavor, and we could get the stuff up there. They treated us the same way, that if something broke and they needed some help, that we'd try and get it on the Shuttle and get it up for them.

But for the job responsibilities, the real-time mission operations during the long-duration flights, the training aspects for the U.S. hardware, didn't do the training on the Soyuz systems, didn't do the training on the Mir systems, but only the training on the U.S. hardware and research activities and then getting the hardware up there and compatible with the Russian systems. So that was the job I did as far as Working Group Six was concerned.

For the directorate, it has three working groups as part of Phase One. In total it has Working Group Six, the one that I co-chaired. It also has the Mission Science Working Group, which has had a number of co-chairs but started off being Carolyn Huntoon, and John Rummel chaired it for while, Peggy Whitson chaired it, and now John Uri is the chair. And the Medical Operations Working Group, which was originally chaired by Sam Pool and is now chaired by Roger Billica. So from a directorate perspective, I oversaw the activities of the Mission Science and the Medical Operations working groups, as well as chairing the Mir Operations and Integration Working Group.

Wright: What did you do in your spare time? [Laughter]

Nygren: I didn't have any spare time. I didn't have any spare time at work, and my wife was wondering why I bothered to come home at night. [Laughter] There was no spare time in that time frame.

Wright: It's been such a load for you to be responsible for. How did you ever pick the people to be on the scene? What were you looking for to help you accomplish all this?

Nygren: That's a really interesting question. A number of the people had actually been involved at the beginning. When we were looking at getting some of the hardware on board, we were going to still have to do some operational kinds of things. We were going to have to do some training activities. We ended up looking for and ended up replacing a certain number of folks, looking for people who could take on a challenge and could be innovative. What we found was that we have an awful lot of very talented people that understood the Shuttle system and could do their job almost blindfolded. They were very good at doing their job. But faced with a completely new environment, a new culture, the language barriers, it takes a different kind of person to deal in those kinds of things.

So it took a little bit of an iteration to go through that, but, interestingly enough, we found that those people kind of volunteered for the work, and even if they weren't the best person in the world, they were enthusiastic about it and they wanted to do a good job, and we found that they did a really good job. I was thrilled to death with the people that I ended up working with on this program. I really was.

Wright: Now you really understand what "long duration" means. When you took that job on and you thought it meant just for that area, but you said you've been with it since Thagard, and now you're going to stay with it through Mir-25 in that one area. I guess you've become a survivor of a long duration.

Nygren: Well, that's true, although back in February, I started looking at the phase-down part of the program and how we were going to roll off our contractor work force and how we could free up some of the civil servant personnel to go on to other things as the program was coming down. So I put together this what I would consider fairly elaborate phase-down plan, and I took it in to John Rummel, who is the acting director for Space and Life Science, or was until yesterday, and showed him this great plan. He looked at it and said, "That's a great plan, but the plan I want you to develop is the one that frees you up so I can put you on other things, and we'll let those people close out the program."

So, back in February I pretty much backed out of the Phase One Program and started working as the acting deputy director for Space and Life Sciences. So although I've got some responsibility, you know, you just get wrapped into these things and want to keep involved to some degree, technically I actually have been out of it since February.

Wright: I don't think your pace has slowed down any, though.

Nygren: No, and I kind of thought it was going to do that, too. I was kind of looking forward to a little bit of free time. I just kind of seemed to keep getting more jobs. One of the things that happens to people, I guess, if you're doing a half-way decent job, they just keep giving you more work until you cry "Uncle." [Laughter]

Wright: And hope they hear.

Nygren: Yes. That's right. That's true, too.

Wright: You mentioned to us earlier that you had been in the area since the sixties. Have you always been with the NASA environment?

Nygren: Yes. I came to work for NASA in 1966, right out of college. The first twenty years of my career was in the Flight Crew Operations Directorate, and over that twenty years there was some combining of the flight crew operations with mission operations. They created the Space Operations Directorate. They split it apart again, and I moved around in the operations area all of that time, starting off general engineer, doing general engineering kinds of things, supporting training and crew activities, got into the test and

check-out activities with the Apollo Program. In fact, right after I came to work they had the fire, and I was assigned to the Frank Borman Tiger Team for redesign out in Downey, California, worked on Lakewood Boulevard, worked on the Apollo redesign at that point in time, finished that up.

I followed the test and check-out for Apollo 9 all the way from Downey, and from Bethpage I worked on both the command module and the lunar module, followed it through the launch. After Apollo 9, I went back and worked on Apollo 12, did the same thing on Apollo 12. After Apollo 12, I went to work on the Orbital Workshop on the Skylab Program, back to California, this time to Huntington Beach, spent a lot of time in Huntington Beach and in Florida launching the Skylab Program, supported Skylab from an operations point of view.

We were responsible for the experiments and the stowage activities, and, unfortunately, we had a remote site in Building Four, and there were two people per shift, three shifts a day every day, and it was really bad when we had to sit over there, because we couldn't leave the console, and we would keep seeing--the Mission Control Center teams would go out to the Mexican restaurant or the Chinese restaurant, and they would come on back, and they would show on the closed circuit TV having their great dinners that they've had, and we're stuck over there in this remote dark place day in and day out where there's only two of us.

But anyway, we got through the Skylab Program, and then I went to work on ASTP, which gave me my first introduction to the Russians. I was responsible at that point in time for training the cosmonauts on the crew station for the command module, and got to visit with a number of the cosmonauts and their engineering staff in Florida and here in the simulation world. That was fun, but I never did get to go to Russia during that program, but I did get to meet a number of them and work with them.

After the Apollo-Soyuz Program, there was kind of a stand-down, because we weren't flying anything, but I was working in the training and simulation world in mission operations, and we started working on training manuals for the Shuttle Program, and I did that. Then when we got close to the Approach and Landing Test Program, I was approached to go out and do the test and check-out activities with Enterprise at the factory. Then after delivery to Dryden, I participated in all approach and landing tests where we did the unmanned captive active and the active drop tests.

I supported all of the Approach and Landing Test Program, another great program. It was one of those similar to Phase One in that there was a very small team, and most of the team moved out to Dryden and worked out of the Dryden facility, and you kind of build a camaraderie when you're working with a small team like that, where, when you're working in the whole center and big programs, you don't quite build that. There's still everybody trying to do the same job, but when it's a small team of folks you get

closer to them. So I worked through Approach and Landing Test Program.

By the time we finished that up, they were about ready to power up Columbia for the first time, and I went back out to Palmdale and supported the test and check-out activities there, followed that through STS-1, and worked, as you can see through the patches and everything I have on my wall here, I worked in the astronaut office supporting test and check out. There's a group over there called the Vehicle Integration Test Office. I created that, I guess, so to speak. I'm not sure that you could say that, but it grew from me and one other guy to a complete office. I supported up through STS-26, supported the first flight after Challenger.

So when I finished that off--this is an interesting little story. Dick Truly had approached me about coming up to the headquarters and working with him while he was the associate administrator. The first time he asked me if I could do that, I told him I couldn't, because my daughter had just finished a basketball game where she had torn a ligament, her anterior cruciate ligament [ACL], and had just finished surgery and was in rehab. So I couldn't do that. And he understood. And I told him, "Call me some other time." And he did. He actually called me back and said he wanted me to come up there, and I said, well, I could probably do that. He said okay. We started talking about it a little bit more, and then he told me one day, "Wait a minute. We've got to put this on hold for a couple of weeks. Things are happening."

So I waited, and next thing I knew, he was the Administrator instead of the Associate Administrator, and he did, in fact, think I should still be up there. At that point in time, Mr. [George] Abbey was up in Headquarters working in Code M, and the next thing I knew, I had a letter that said I was supposed to be there two weeks ago, why wasn't I there? [Laughter] So I took off and went to headquarters, and I was a year there on a detail.

While I was there, I was the Director of Shuttle Operations and Utilization, so all of the Shuttle operational activities fell under that entity. It was like a fifteen-man office, and, as everybody knows, the real Shuttle operations stuff is either done here or at Kennedy. But anyway, the oversight or the management and the program activities fell in that organization.

After my one-year detail at headquarters was up, I moved into the Space Station Freedom Program offices. The Deputy for Systems Engineering and Integration, which, in fact, was a Headquarters position but it was here at JSC, and my immediate supervisor was in the Station [Program Office] in Reston, so I was relatively left free to run the office down here by myself.

When Freedom was turned over to ISS [International Space Station], Carolyn came by and said, "How about coming to work for me?" That's where we started at. So I've been here a long time, done a lot of things, and can't complain about a bit. I've enjoyed every job I've ever had.

Wright: Now we know why you were prepared to do Shuttle-Mir. You'd gone through the whole--

Nygren: I'd been through a lot of operational and engineering aspects, and it was fun. I really enjoyed it. There were a lot of hard times in the Shuttle-Mir Program, particularly in the beginning. Traveling to Russia was like traveling to a Third World country. It was not like going to New York or going to L.A. or even going to London. It was different, and it took some adjusting.

Wright: When was the first time that you went?

Nygren: I went in November of '94 for the first time, and it was cold. I couldn't believe it was that cold in November. And it was really kind of funny, because all of the stuff that I had, after living here for thirty years, was hunting gear. That's the only thing I had that would survive that kind of weather. I had taken it along, but it sure makes you stand out like a tourist. And every place I went over there, those guys tried to sell me one of those fur hats. They just couldn't understand somebody walking around without a hat on, that they knew was a tourist. So every time you'd walk by one of those stands where the guy was selling fur hats, he'd pull you off to the side and stick a hat [on you], and then he'd tell you in his broken English whether it was fox or mink or rabbit or whatever it was. I kept telling them I didn't wear hats, but it didn't sink into them. But it was an experience. It really was.

Wright: Did you ever buy one?

Nygren: Never bought one. I'm not big on wearing hats, and I have one of those little stocking caps that I can stick in my pocket if I ever really need it, but I very seldom wear a hat.

Wright: How was working with the Russians different with Shuttle-Mir compared to when you worked with the ASTP?

Nygren: I'm not sure that there was a lot of difference when we first got started. There was a very standoffish "Why are you here? Why are we doing this?" environment and then the Cold War environment that was the same kind of thing. So I'm not sure that there were a lot of differences. I think probably the thing that was more prevalent of what was the same is that to get things done with the Russians, you have to have an established personal rapport with the person, to get things done, and if he understands where you're coming from and he knows what your objectives are and that you're going to be there when he needs some help, he's going to support you. But until you've established that rapport, that's a problem. That's going to be difficult to do. They don't operate on the same thing that we do where it doesn't make any

difference who you are, if you come and have the right credentials that this is your job, we're going to help you get that job done, and if you don't like the guy or don't have a rapport with him, that's still okay, you're going to get it done. So that's a cultural difference that we had to get used to. You have to spend the time up front getting to know the people before they will be what I would consider really cooperative and supportive of what you're trying to do.

Wright: You mentioned you were co-chair, so did you have a specific counterpart that you worked with?

Nygren: No. Unfortunately, that was one of the fallacies of the program that we never managed to overcome. Tommy identified the things that he wanted me to do in the Mir Operations and Integration Working Group which I identified as those three entities, so when we went over and tried to establish the counterparts with the Russians, the Russians do not have a counterpart that covered all of the things that I could cover, because we were covering different entities in total. The hardware integration aspects of the activity were handled by RSC Energia and their general design organization. The operational aspects were handled by their control center, which is under TSNIMASH and Energia in their control center, and the training part is basically done by Star City, and that's the Air Force and their activities.

So they could never identify a counterpart to me who could work in all three of those environments and get the job done. So I ended up, actually, with three counterparts in the program, and when I did things, I needed to work with those. That was a problem for probably half of the program, and then the Russians eventually identified a guy by the name of Oleg Lebedev as my interface, and he was actually the co-chair for the Mission Science Working Group, and he could do certain things for us, and he tried to help us, but when it became an issue where policy had to be set or something, he would say, "No, you've got to go talk to these specific people," and we would have to go talk to those folks. So I ended up working with three different groups as opposed to having one counterpart.

Wright: Well, it kept the variety in your job.

Nygren: Yes, it did that. [Laughter] It did that. And they, like a lot of other people, they have a tendency to make agreements that aren't totally coordinated with the other side, or they will point the finger at the other side and the other guy's pointing back at them. So it took a little more coordination. But eventually we got to a good rapport where we could do most things by faxes and telephone calls and stuff like that. But there was nothing that worked better than going over there the first few times and sitting down and getting to know them, getting the rapport established so that they were comfortable with who you are and what you were responsible for, why you were asking for these kinds of things. But over a period of time it

came, and we had a good group of folks. We had very little turnover within my working group in the hardware and the training areas and stuff like that. So they got comfortable with that.

Wright: Was there a turning point, or was it just time?

Nygren: Time. I don't think you could say that there was a true turning point. You just had to spend the time working with the people. Probably the most difficult area was in the hardware integration aspect of it, because we would be changing from increment to increment the science that we were doing. We would be bringing in new principal investigators, new hardware providers, and, depending on what hardware we were bringing in, the Russians would be bringing in different people to look at our hardware with similar expertise. If we were bringing in something like a biotechnology experiment, they would bring in a biotechnology expert. If we were bringing in a medical experiment, they would bring in a medical expert to look at what we were doing.

So those people were always struggling with new faces, new issues, new hardware, and trying to come to grips with that, and we struggled practically for the entire program in trying to come up with a standard set of criteria that we could agree on, we could build our hardware to that, and then the Russians would accept it pretty much carte blanche. If we said we built it to these specs, they would accept it. We got there on some of the stuff. Some of the stuff we never did quite get there on.

It presented an interesting challenge in that we had been building hardware for a very, very long time, but the way that the system is set up is that if you're building hardware, you're building it to the Shuttle's specifications, because the Shuttle's what's flying. If you build a piece of hardware, you build it to the Shuttle's standards. Well, if you're going to build a piece of hardware and fly in on the Russian hardware, you've got to build it to the Russian standards. Well, you can take the Russian standards and turn them over to the design organization and say, "We want you to design to these standards. We want you to test to these standards," but where you start running into problems and complications is that while the quality organization that may be doing the quality control has a set of procedures that are built to the Shuttle standards, so he's inspecting to something that's supposed to go on the Shuttle, which doesn't necessarily mean it is acceptable to go on the Russian vehicle.

So there was a lot of peripheral data that had to be collected and processes that had to be changed and worked on. One of the ones that got us early in the program was something as simple as cleaning our hardware. Our hardware, the way we normally clean it is with isopropyl alcohol; you wipe it down with isopropyl alcohol. Isopropyl alcohol is unacceptable to the Russians because it outgasses and it is incompatible with some of their components in their environmental control and life support system. So

their requirement was you have to wipe everything down with hydrogen peroxide.

Well, can you imagine trying to change all the standards in NASA that when you clean components you have to clean them with hydrogen peroxide if they're going up on the Mir? Well, okay, I've cleaned them with hydrogen peroxide, and they're going to be used on the Mir, but they've got to get launched on the Shuttle. Is hydrogen peroxide an acceptable cleaning agent for the Shuttle? And if not, does the Shuttle require we use isopropyl alcohol? Well, if you do, you're not going to get it on the Mir. So it presented some interesting challenges as to how to get everybody on the same wavelength and get things tested and everything.

We managed to finally work our way through it and get to where we could clean hardware every time and it would pass the tests, but it was a struggle at the beginning trying to understand where they were coming from and why they were doing that.

Some other interesting things along that line was in their documentation, some of their design requirements were plus or minus 50 degrees Centigrade. We couldn't figure out why you would ever design below zero. Why would you ever freeze any of your hardware? And most of our stuff was designed to Shuttle standards or had been previously built for the Shuttle and we were modifying it to fit that kind of stuff, and we found out that when they ship their hardware, they ship it in unconditioned railroad cars across the country, and they can see minus 50 degree Centigrade, and we froze a lot of our hardware that we had to go back and fix because of that.

Subsequent to that, we started building special heated containers and doing some design stuff to get around that. And things like 100 G shock loads. Why would you have 100 G shock loads? You never hit anything with 100 Gs. Well, when you're humping railroad cars in a railroad yard, you can see some pretty big G loads. When you drive across some of the roads in Baikonur [Cosmodrome, Kazakstan], the trucks fall in some pretty big holes. So we ended up having some problems with that, too, but it was one of those cases that they gave the standards, and we said, "Those aren't good. We're going to build on our own." We found out that they had learned their own and they knew what they were doing, and we should have jumped on board earlier. We'd have had less problems.

Wright: Did they learn things from you also?

Nygren: I think that they did. It's one of those cases where I think that over a period of time they saw how we were doing certain things and recognized that, yes, that's a good way to do it, as good or better than the way we would do it. But we would be working with a small contingent of people, and although they agreed with what we were doing here, I didn't see where they were very effective at ever implementing any of that

stuff back on the Russian side. Now, over a period of time maybe they will convince the powers-to-be, the people that write the procedures and make the rules, that they had some good ideas or they have some good stuff on the U.S. side that could be rolled into that.

But generally the engineers accepted it. And you could see that again in the camaraderie kind of things that they would say that it had to be done this way, and we would say, well, here's our procedure that does it this way. They'd sit down and look at it after we'd gone through this a number of times, and they'd say, "Yes. That procedure's as good as our procedure. You can use that, and we'll check it off and say it's okay." And they were willing to do that on some things, and there were other things that they wouldn't budge on. Trying to figure out why it was, whether there was a technical reason for it or whether it was a personality reason, there was a conflict between the two guys, the Russian and the U.S., and the Russian was just holding firm for that reason, very difficult to break down.

Wright: That's part of your job, too, is to stand the ground and do those negotiations at times?

Nygren: Yes. When you say that was part of the job, the fact is, yes, that was part of the job, but the bottom line in most cases was that the job that they actually gave us was, get the hardware on orbit and be ready to support the mission. So after a period of time of looking at how long it was going to take to negotiate with the Russians and what level of support we were actually going to get from our senior management, it became, in most cases, what the Russians wanted that way, it was easier to do it in that way and just, say, get it done, and if it cost us more time in redesigning it or testing it or something like that, we would just go do it, rather than try and argue with the Russians and win our case. It just wasn't worth the effort.

Wright: When you began your career working on the Apollo days that we were in competition with the Russians, now your days and your career, you're working on a Russian space station. How does the Mir compare to all the different vehicles that you've got? I know you haven't actually had a chance to see it, but you've certainly been able to study and see how it works.

Nygren: The Mir, the Progress vehicles, the Soyuz vehicles that the Russians have built are very good vehicles. They have a very good space program. They don't do things the same way we do. They have a long-duration program where we have short-duration Shuttles that forces you to do certain things different, but they have a very good program. They have matured to the point that they know what they're doing and they do it very well. I was impressed at the robustness of their program and of their hardware, their very good hardware. It's very reliable and it's robustly built, especially if you're going to survive plus or minus

50 degrees and 100 G shock loads. It will stand up to those kinds of things.

What they don't have is the quality of workmanship, not so much workmanship in that it's not reliable stuff, but ours is aesthetically--we put a little bit more, I guess, pride into what ours looks like. Our switches will be polished and chrome plated and their switch is just as functional, but it doesn't look like that. It's cast, and it just does its own thing. So if you looked in the two spacecraft, you would say, "Well, this built by a bunch of quality craftsmen and this one wasn't," but when you look at the functionality of it, their hardware is very functional and it does its job, and they were looking for a different set of standards than we were in that area.

So I think they've got a very good program. Their hardware is very reliable. You can look at all the problems we had during the program, and the fact that they were able to fix all of them, very commendable. A lot of those things would have just shut a program down. They had failures right and left, and they tore things apart and cut out lines and welded in new lines--didn't weld them in, but with their patching systems they could put patches on lines and get things back up and running. You figure it's been up there for ten years, it's kind of like your car, you have to fix the air-conditioning belts and hoses and stuff like that. So I think that they've got a good program, and if you look at the things that are important, will it stay up and will it fly, theirs will stay up there and it will fly.

The other thing I think that was kind of interesting was, again, these are some of the interesting tidbits and sidebits at this end, but when we were trying to work the integration of our major components into the Spektr and Priroda modules, there's generally a thing that we call an ICD, an Interface Control Document, that says, "This is my interface, and I'm going to interface with your hardware, and we jointly agree to it," and it says, "This is the size of connector you're going to use. This is the electrical wiring size you're going to use, and this is the bolt-hole patterns that we're going to use, and this is how we're going to get together. And when we bolt this stuff together, it's all going to work."

And we would just sit down and talk ad infinitum with the Russians about, "Where's the hole pattern for this? What is it we're supposed to match drill to? They said, "Well, just drill the holes and tell us where they're at." And you know, that's just foreign to us. We couldn't believe it. Drill the holes and tell you where they're at? You're not going to build your spacecraft to our standards. You know, if we deliver this thing and we don't match up the holes, this isn't going to work. Well, it turns out in a lot of cases that's exactly what they did. We ended up shipping our stuff over there, they checked it out functionally, loaded it up in a bunch of boxes, took it down to Baikonur, where the Spektr module was at, and they would go in there, they would take our module in there, and they'd slap it up there, and they'd take a piece of chalk and they'd mark where the holes were, and they'd take ours out, and they'd drill the holes,

and they would bolt it in right there. It sure cuts down on a lot of engineering drawings and stuff, but it was foreign to us, because we kept thinking we have to have all these interface drawings and agreements, and, they're, "No, no, no. Just bring the hardware. We'll figure out a way to make it fit." They did, and that's commendable, that they can work in that kind of an environment. Just bring the hardware, and they worked it in very easily.

The reciprocal of that was that we would build things that would require an electrical connector. Well, the Russian electrical connector's obviously in the vehicle and we have this lose piece of hardware that needs a connector on it. So we would tell them, "Send us a connector," and they'd go, "Okay. We'll send you a connector." And we would wait forever, it seemed like, to get this connector, and we couldn't figure out why it was it was taking so long. Why can't you just mail us a connector? Well, it turns out that--the story we got, and I assume it's relatively accurate, was that the connectors have gold-plated pins, and the gold is a precious metal, and there are certain rules in Russia for exporting precious metals, just like on money and stuff like that. Well, it took forever for them to get clearance to send these connectors out of there with the gold on them. And, you know, we were thinking that there's this delaying tactic, that these guys are doing something funny. So you build up all these false impressions and everything. Then when you find the real story out, you go, "You know, it would have been a whole lot easier if you'd just told us that. We would have built the pigtail, sent our hardware over there, and you could have put the connector on it."

And, interestingly enough, if you do that, when you're sending a connector over here, the connector has a part number on it, and the part number identifies that there's gold on the connector, and therefore it has to go through all these exercises and getting all the right paperwork. However, if you send your hardware over there and they put the connector on it, it then becomes part of your assembly, and they can't track that part number. So when they look at it, they say, "Well, it came in as U.S. hardware. It's going out as U.S. hardware." Then you don't have to worry about all of that paperwork. But that's one of the little intricacies of how they did things and how we had to learn to get along with it.

Wright: Work around, and it made it work.

Nygren: Yes. Oh, yes, and figuring out what it was that you needed to deal with a lot of times made the problems go away, and the problem was trying to find what it is you're really dealing with. Are you dealing with a personality? Is it some other institution that you're dealing with? Just identifying the problem, and then you could generally get around it, but it was difficult, a lot of times, to really identify the true cause.

Wright: It seems like coordination was a major ingredient of making everything under your responsibility, that you'd have all these different areas and different folks working on this side and in Russia. How were you able to coordinate everything where it always came out at the right time in the right place?

Nygren: When did I say anything about coming out at the right time in the right place? [Laughter] That's probably going to depend on who you go ask. Well, when we first got started over there, and there were people who were over there before I was, and they lived through this even more than I did, but it was not good when I got there. There was very poor telephone communications, very few fax machines that were available. It was very difficult to coordinate things. Generally, when you went over there, you basically empowered the team to do whatever it took to get the job done, and that was their job while they were over there, to get it done.

When they went in and put in what's called the PSCN and the program support network that Marshall manages and we got an infrastructure in place for communications and stuff like that, things got a whole lot, a whole lot better. We could have telecons, we could fax things back and forth, we could send electronic messages back and forth, and things like that. But when we first got started, you basically had to send an entire team over there and empower them to do everything that needed to be done: integrate the hardware, do the training, set up the operational procedures. Everything that needed to be done while you were in Russia had to be done by that particular team. You can get by that way. I wouldn't say it was the best way, and if you go back now and look at some of the drawings and stuff and say, well, where is the traceability that you would expect in a program like this, it just doesn't exist. It doesn't exist at all.

Wright: Is it a different way that NASA worked compared to any other place that you've seen? Seems like it pulled lots of folks from different disciplines all working together for the same goal, and I know that NASA has a long history of that, but this was so unique, of pulling different people from different places.

Nygren: I don't think that the program was unique in that it required different things from NASA pulling all the different elements together here: Marshall, the headquarters guys, the different science communities, and stuff like that. The language barrier, the cultural barrier, was very, very significant, and probably the biggest driver on the front end of the program was the schedule. One day we weren't going to do this, and the next day we were going to do it, and we were going to do it on a Russian schedule. Where do you find all of this hardware? Where do you find time to do all of the training? How do you run a control center in Moscow and actually have one back here? We didn't have any capabilities to do that. So, finding a bunch of guys and throwing them in there, they did a marvelous job, figured out how to set up a control center. We can go over there and negotiate with the Russians to get floor space and room for the computers and all

of the data that you needed, get the data lines put in, go to Ostankino Tower and negotiate satellite relay antenna capability and stuff like that. The guys just said, "Well, okay. If that's what we're supposed to do, we'll go off and do it," but if somebody came back and said, "Where are all your memorandums of agreement and what are your layouts for all of the as-built wiring and the kinds of stuff that you would do if you were working in Building 30 over here?" I don't know. You might ask the Russians, but I doubt they have it. [Laughter] We'd tell them what we want, and one day it would happen, or they'd tell us you couldn't do that, and we'd have to come up with an alternate solution to our problem. It was interesting.

After, I don't know, probably like Increment Three or Increment Four, we had established what I think was a really good rapport with the Russians in that they were really interested in seeing if they could get our science completed. They took a real interest in making sure our program got completed. At the beginning, I don't think they were all that interested, but at the end, they realized that we did have a good science program. We had a good rapport established with them, and they took it on as a personal challenge to make sure that the things they had committed to get done, they would find a way to get them done.

Wright: I know at some point the criticism was stated that science may be sacrificed because there were so many operational parts to do as the astronauts were on Mir, but it seems to me to review all the science accomplishments that have been part of this program, there are many of them. Do you feel at any point in time that the science was ever threatened or that at some point it was going to be put as something that wasn't as important as it started out to be, that was a major factor of this whole mission?

Nygren: Well, you've got to remember, when you look at the beginning of the program, science was the lowest priority item, and as we got to the end and it seemed like all of our critics wanted to know what did we accomplish, science seemed to move up on the screen a lot higher than where it was at the beginning, because the science was a side benefit of learning to work with the Russians, learning how to do rendezvous and dockings and those kind of things, how to do operations, was a higher priority than the science was. But we managed to overcome, in my opinion, what were the higher-priority things, and we managed to do those, and at the same time, we still got a lot of the research that we wanted to get done completed.

We did have to reduce the scope of our science program because there wasn't enough Russian resources available to do that, whether it was power, whether it was crew time, whether it was training time, but we did have to reduce the total size of the science program we would have liked to have done. But once we signed up to do a research program, I think that the Russians did a fairly good job of trying to meet our requirements, and certainly it got better as the program matured. At the beginning, I think that

they weren't all that interested in our science program, but as we continued to get in there, some of it, I think, was driven by the interest by the Russian scientific community, that they had a chance to look at what we were doing and they became interested in it, so their science community started supporting what we were doing. We had co-PIs from the Russian side on most of our experiments, and they really started trying to get our stuff done, and they would make sacrifices on their own activities to get our research done.

But did we get everything done we wanted? No. But we don't on the Shuttles. [Laughter] We always want to have more to do than what we can get done, because otherwise we wouldn't get everything we can out of a flight.

Wright: Talk about the training aspect. You said you were in charge of that as well. Can you give us some examples of what all that entailed?

Nygren: Training was--oh, man, it was a tough one to come to grips with. There was actually another working group that was called the Crew Exchange and Training Working Group, Working Group Five, and they had the holistic responsibility of all of the Soyuz training, all of the Mir training, looking at the U.S. Research Program training, and what we did was we would go in and out of the training time available, out of the template that was there. We would negotiate a certain amount of training time in Russia to train on U.S. research, and then we ended up negotiating where, for each one of the increments, the astronauts and the cosmonauts would come back to the United States for three weeks of intensive training here in the United States. So they would get six weeks of training in the United States, and then they would get a certain number of hours of training in Star City leading up to the flight. After we got that put in place, that started working pretty well for us.

The problems that we had early on in the program with the training aspects of there were no well-understood shipping and customs policies for how we could ship our hardware into Russia for training and how we could get it back out, and we struggled with that forever. There's no telling what all we did to get the stuff, but we'd get stuff locked up in Customs, and we probably carried stuff through Customs in our bag that there was some rule that said you weren't supposed to do that because nobody knew any better. But just the logistics of getting the hardware in and out of Russia was an enormous overhead, because we would send stuff over there, if we didn't have the right paperwork, they would lock it up in Customs. It would be locked up in a place that wasn't conditioned. Our hardware required a conditioned environment, so they would overheat it, they would freeze it, those kinds of things.

There was an ongoing power struggle between Energia and Star City. Energia, who was in the contract, who we had to ship our hardware to if we wanted it to go to Star City, the Energia guys might have to go to

the airport. There was no interest in having those guys go to the airport. So it created a lot of problems in that area, negotiating with the Russians the training space in their laboratory so we could set up our equipment and conditions that we needed.

We struggled for a long time trying to get power compatibility. They have a different grounding scheme than we were used to. Well, first off, they have a completely different power system than we do. So we had to accommodate that, and we thought just plugging in standard transformers that would change it from our 120 to their 220 system would work. We found that they had a different grounding system in their buildings that created shock hazards for our people, and we burned up all kinds of hardware, it seemed like, for a long time. Every time we took a PC over there, we'd burn the PC up when we were trying to charge it back up. So we had a lot of learning curve to come through in that particular area.

The shipping and the logistics and the cost of sending people over there for extended periods of time, where the Russians would change the schedule for probably legitimate reasons, but we would have people over there to do training and they would say, "Well, we missed this opportunity, so you're now going to be scheduled three weeks later." Having those people stay there for two weeks was very expensive. Housing accommodations in Star City were almost nonexistent.

So we finally said, "This isn't working. We've got to have the folks come to the United States and have dedicated training sessions." It eliminated having to ship the hardware over there, made it easy for us to get an eight-hour day of scheduling done, it separated them from the distraction of Soyuz and Mir training, get our guys back home to visit with their families and stuff like that. So that started working out very, very well for us, and at the end of the program we were doing almost all of our training during those two three-week sessions. It was better for us to do that than it was to fight the Russian system and trying to get over there.

When you're training in Russia, you have to train in Russian. So when you're training in Russian, the U.S. crewman's not that familiar with the Russian language, he's not that familiar with the technical terms associated with the science that's in there, they have translators that are not familiar with that kind of technical terminology. So what you could train on in the United States in an hour might take eight hours in Russia. So there was an enormous overhead in that, and bringing the training back here was probably our salvation. I think it worked out for everybody. The Russians enjoyed it.

The other part that was very difficult, and this rolled over into the operational aspects of it, too, is that the Russians required that the procedures all be in Russian and that they not only be in Russian, but they also be in the Russian format. Well, it took us a long time to figure out what the Russian format was, and we really never did, but we finally established a good enough rapport that the Russians would let us

have some flexibility in what our procedures looked like. But we sent procedures back and forth numerous times where we would write them, we would translate them, we would send them to the Russians, the Russians would mark them up, they would send them back, we would back translate them into English, and we would look at what we've got, and we'd have a set of procedures that were totally unacceptable. Then we would rewrite them, and we would go through the translation, the review, the back translation, our assessment, and we would be right back where we were before.

That's a problem that's going to face the Space Station guys if they have to go to a dual-language environment, and it's going to be very, very difficult. The Russian procedure format is very good, but it's not compatible with what we've got in our system, and trying to merge the two, we never really did it. Basically what we ended up with is most of our experiments were going to be done by the astronaut, and if they were going to be done by the astronaut, we would put together an English set of procedures that the astronaut would use, and we would build a Russian set of procedures that the Russian crewmen on board could follow along and would get the general gist of what was in there, and we would make sure that the safing procedures were done right to the Russian standards and that the Russians had been trained on it, so if there was ever a problem, the Russians knew how to safe our hardware. But as far as operating it, the procedures, you probably wouldn't have gotten what you wanted out of it.

Then there were some experiments that they did operate, and we would work with them and try to get them good procedures that they were comfortable with, but if they weren't going to touch it, we finally got to the point where we're going to write an English set of procedures, and that's the way we're going to go with it.

Wright: Supporting all the increments that you did, is there one that stands out for some reason more than the others, for one reason or another?

Nygren: Well, they all presented their challenges and their rewards. I think probably the Spektr collision was the one that stood out the most, because we had a significant investment in hardware in the Spektr module, and when the Spektr module collision occurred, they lost the pressure, they had to close the hatch and they locked up our hardware over there. Trying to come up with a recovery plan where we could get hardware on the Shuttle back up there to replace the stuff that we had lost in the Spektr module to the greatest extent that we could presented enormous challenges, as well as trying to work with the Russians on if they were going to go back in there, what is it they could find, do we have any hazards with any of our hardware when it was exposed to the vacuum environment, is it presenting hazards to the crewmen going in there in a suited environment, that kind of stuff.

That was seven days a week, multiple hours a day, trying to figure out how to recover from that particular incident and get our program back on track, because from a human life science perspective, which is what most of the hardware was that was in the Spektr module, we had almost totally obliterated that program with that accident, and we needed to come up with some way that we could get hardware back up there and recover. Fortunately, we got some of it back. We didn't ever get all of it back, but we got a fair amount of it back, but we lost things like our ergometer, our freezers, our centrifuges, that kind of stuff, which are big pieces of hardware that have to be structurally mounted.

Working with the Russians on alternate locations for that kind of hardware was a challenge, but we had gotten to the point that we had a good relationship with them, they recognized they had a problem, and they worked with us on trying to come up with solutions. In most cases we got most of the hardware back up there and found a place to put it. Now, if you asked the crewmen, they'd probably say it was way too crowded, we should have never done that, we should have left that on the ground and we'd have had some more room. But the Russians did work with us, and we found ways to put freezers up there and centrifuges and some fairly large pieces of hardware and continue on with the program.

Wright: That's about the increments, but what was probably the high point of you working in this program for as many years as you did? It doesn't have to be limited to one; if you've got several that you remember as being good memories that you're glad you took this opportunity and would have missed if you hadn't.

Nygren: I don't know. It's difficult to come up with a single or even a couple of high points in the program. I really enjoyed the program from the aspect of it was small, it wasn't over-managed. I really enjoyed the people that I was working with, had a fantastic team. The Russians that we interfaced with we got to know fairly well, became friends with them. So the non-technical aspects are probably the high point, the new friends that you've made on the U.S. side, the friends that you made on the Russians side.

We also had some interesting situations in that during the NASA-Mir program, ESA [European Space Agency] flew a crewman, and since their crewman was going to be on orbit at the same time that our crewman was going to be there, we had to work our science program in conjunction with their science program, so we ended up having a number of trilateral agreements where we worked with the Russians and with ESA on what they were going to be doing. DARA, the German space agency, they had a crewman up there. CNES had a crewman up there. So we got to work with the French, with the Germans, with ESA as a whole.

So when you're talking about the international partners and how the Space Station's going to work, a lot of that ground has already been plowed, and we had the opportunity to go through it the first time and

work with those folks and develop integrated time lines, do training. We made sure that all of the foreign--in this case CNESS, ESA, DARA--astronauts got training on the hardware and the science program that we were going to run during their increment. If we weren't going to run the hardware when they were going to be there, we didn't brief them on it, but we told them, "While you're up there, here are the experiments that we're going to run. These are the objectives of the experiment. This is hardware that's going to be set up," how it's going to be set up so that they would know what was going on around them.

They were very cooperative in that and gave us a reciprocal kind of a deal where they would brief our guys, say, "This is the stuff that's coming up. This is what we're going to do during that time frame." So we established a good rapport with the other internationals that were flying, and that was a lot of fun. I really enjoyed working with the ESA program manager and with the science community out of CNES. They were a lot of fun to work with. We did, in fact, have certain principal investigators that were co-PIs on each other's program, so that just kind of bonded it a little bit more. I enjoyed all of that aspect of it.

Wright: Other than the vendor trying to sell you a hat that you would never buy, what are some other memories that you have of being in Russia?

Nygren: Jeez. One that always sticks in my mind was on my very first trip over there. We were staying at the Penta Hotel, which is where we stayed most of the time over there. There were like twelve of us over there, and we were going to have dinner, and we were in what's called a "beer stuba" which is a little pub on the main floor, and we decided we were going to go down to the Italian restaurant in the basement of the hotel and have dinner. So I decided I would go down there and coordinate the dinner plan, because whenever you walk into a restaurant with twelve people, it's difficult to seat them.

So I go down there. There is nobody in the restaurant other than the hostess, the waitress, and the bartender. So I go down and start talking to the hostess about we have a party of twelve and could we put some tables together such that we could seat a party of twelve for dinner? That's a problem. I probably spent thirty minutes trying to convince the hostess, the waitress, and the bartender that it was okay to relocate the tables so that twelve people could sit down. We were unsuccessful and ended up going to a different restaurant because we could not get them to put three tables together so twelve of us could sit there. [Laughter] And it wasn't that the place was crowded; there was nobody else in the restaurant. I look back at that as they had not shifted to the capitalistic system yet. We're here, and the intent is to satisfy the customer, get some money out of the deal, where they actually turned away business because they wouldn't reposition the tables at that restaurant. So that was one of the things that really stuck in my mind at the beginning.

Obviously, going into a store in Moscow for the first time at the beginning of the program, before they had become capitalistic, was a very enlightening experience. I don't know if anybody's ever described it to you, but if you envision you go into a store, and you would have like the breads against one wall, all the canned products against another wall, the meats against the third wall, and the fresh vegetables against the fourth wall. You would walk in and get in line to order your bread. You would go all the way through the line, get up to the front and tell the counter person what it is that you wanted. They would write down what it is that you wanted on a little strip of paper and the price of it. And then you would get out of that line, and say you wanted to go to the meat line, you'd get in that line, you would wait all the way through that line, you would tell them what you wanted and they would give you another piece of paper. And for however many places you wanted to get things, canned goods and fresh vegetables, you would go and get in each one of these lines.

Then you would go to the central cashier and get in that line, go to the cashier, pay for all of this stuff. The cashier would mark each one of those pieces of paper that you had collected from the counter person. Then you would go back and get in that line again and wait your turn until you got up to the front, and then you would hand the counter person the piece of paper with the stamp on it that said it had been paid, and then they would go back to their shelf where they had set your stuff aside and bring it to you. It was an interesting system, but if your interest was to occupy people's time and have full employment, it looked like a good system.

But at the end of the program, they had a supermarket-type thing. The one that was closest to the Penta over at the Olympic stadium over there, it was probably half again as big as your typical Circle K or Stop and Go or something like that, and they had bar-code readers. You could walk in there, and they would run stuff through a bar code. Although they had a lot of people standing around looking down the aisles to make sure you didn't steal anything, but you could walk in there and get a basket and go pick stuff off the shelf on your own, take it up, they'd run it through a bar-code reader and give it to you. So it's interesting that they had gone that far in just a few years.

When we first went over there, you ate at a hotel. There were very, very few restaurants you could eat at other than at hotels. At the end of the program, they had lots of American restaurants over there with the McDonald's and the Pizza Huts and stuff like that, but there were a number of Georgian restaurants and Italian restaurants and Tex-Mex restaurants that you could go to and didn't have a problem with that.

My first trip over there, I would say that--well, I had one suitcase that was packed with nothing but food. I had all my own food. I basically took it with me. I had peanut butter, I had jelly, I had tuna fish, I had fig newtons, everything you could possibly think of, bottled water. You basically went over there

assuming you were going to subsist in a very hostile environment. And on my last trip over there, I didn't take anything. I could go over there and buy Mars candy bars and Snickers and M&Ms and bottled water, Coca-Cola, Dr. Peppers. Whatever it is you basically wanted, it was available. So that was something we did.

Then, Ismalofsky [phonetic] Park, if you talk to the folks and ask that question, everybody's probably talked about Ismalofsky Park. You haven't hear about that? That's a tradition. Everybody does that. It's basically a huge flea market. It's off of one of the metro stops. I can't imagine how big it is, but it probably covers an area three or four acres of booths just lined up one next to the other, and it's people selling their wares, whatever it is, hundreds of places selling hats, you know, space memorabilia, Soviet Union kinds of things, carvings, paintings, carpets, jewelry, precious stone--well, I wouldn't call them precious stones, but stones and stuff like that.

You go out there and you barter, just like you would at a flea market anyplace else. You're not supposed to have dollars, but that's all they wanted, so you had to make sure that the local gendarmes who kept control of whether you were using rubles or dollars weren't around when you were negotiating prices and stuff like that. So it was fun to go out there and pick things up. There were lots of things that were relatively good deals. Amber was dirt cheap. You could buy amber necklaces for five to ten dollars that were really nice and come back here and look at them, necklaces, earrings, just rings, that kind of stuff, carvings of different kinds that were available. I ended up bringing a few back that were carved out of mastodon trunks, which was one of those things that was a little--"Is this really ivory or not?" and they gave you a little certified piece of paper that the animal was extinct and everything.

It was kind of interesting to go through all of that kind of stuff, brooches that were hand-painted, things like that, the little eggs that they're famous for painting, picking those up. They have a lot of those kinds of things, matrishka dolls, all of that kind of stuff. So it was fun to go over there and pick up a bunch of things for the family, the friends, the relatives, the kids, and stuff like that. That was a Saturday or a Sunday jaunt.

At least every trip that you went over there, you had to go out and see what was there and go through it. They were out there in the summertime in their t-shirts trying to keep cool, and they were out there when it was forty below, wrapped up as much as they could be, trying to stay warm, but they were there. Every weekend you could go out there and do that. So that was fun.

Then on one of the trips that we were over there, we got together and the embassy worked with us and set up a trip to St. Petersburg. St. Petersburg is an absolutely gorgeous, gorgeous place. We had a wonderful time there. We had a bus and a tour director, a translator, that took us around to all of the

different places. We went out to Cathrine's Palace, went through the Hermitage, took a boat ride on the river and all that kind of stuff. But that was very nice. It's a Western city compared to Russian--you know, if you're going to St. Petersburg, it's like going to Paris or London or something like that. I really enjoyed that.

I wish I had gone earlier, because I thought we would go back a couple of times, but we never seemed to find time to fit that in. Normally we'd go over for two weeks, and we'd end up working on one of the weekends that we went over there, so it wasn't very often that there was time that we could go up there. It turned out that when we went it was also summer solstice, so the place was light all night long, and that was really nice. But we were over there on a three-day weekend, and the Russians weren't working, so it gave us an opportunity to go up there.

At the travel office, actually, there's a travel group that works with the embassy, and they set the thing up for us. There was like eighteen or nineteen of us that went up there, and they rented a couple of train cars for us with sleepers, and we took off in the night about six o'clock, and we showed up about eight o'clock in the morning, spent a couple of days there and then got on the train at night and came back. It was really worth doing. Had a good time at that.

Wright: Did you have a chance to see equipment--speaking of space memorabilia--things that were built during the days that you were working on the Apollo?

Nygren: Yes. Interestingly enough, there is a museum right at the Energia facility that, if you know that it's there and you tell them ahead of time, they can make arrangements to get you in there. It's not open like we would have one open, but they have a lot of their early hardware in there, and they give you a tour that kind of takes you back to the very beginning of things that they were doing, and you can correlate the time frame of what they were doing with what we were doing. I thought there was some stuff that was really interesting there.

The approach that we just used with the Mars lander, with the inflatable balloon and bouncing it and stuff like that, they had that concept back in the mid-sixties on some of the things that they were doing with their lunar stuff. So it was interesting to look at that.

Probably the thing that was kind of unique is there's one area in Moscow where they have--and I'm not exactly sure how all of this fits exactly with the way the Soviet Union is set up, but it's kind of like a theme park where each one of the republics of the Soviet Union had a particular building that was a theme park and was kind of their embassy or consulate or something like that. It wasn't an embassy; it was kind of like a cultural center representing that particular entity in the Soviet Union, and they had turned it into,

basically, a bunch of malls. You'd go in there, and it would be the Sony place and the Toshiba place and all of that kind of stuff. You could go in there, and you could look at these buildings, and they had put up freestanding walls, but you could kind of look around at the ceiling, and the architecture in these places was just absolutely phenomenal, just phenomenal.

So we got to wandering through there one day. One of the buildings was like a huge Quonset hut, just an enormous thing, and we walked in there, and basically it was a car dealership, and they had every kind of car that you could possibly think of buying in the world, it was in there, including a Humvee. They had a Humvee in there for sale, but they had Blazers, they had Buicks, they had Mercedes. It was just one big huge showroom, and it was as big as a hangar.

But interestingly enough, way back in the corner of this thing, on a pedestal, was a model of the Soyuz, the docking module, and the Apollo command service module. Whatever it was that was in there to begin with when they had moved it out, that was too big to move, and it was in there. [Laughter] We were going, "What in the world is this doing in the middle of a car dealership?" So obviously it had, at some point in time, been some kind of a museum that had some relation to the space program or something. That was unusual, because we were in there wandering around, just, "Where did they get all these cars from? Where did they get the mock-up from?" It was on a huge metal pedestal and everything.

Wright: Did you run into any old friends from the ASTP?

Nygren: Only the crew guys. I didn't remember any of the engineering folks, but a couple of the crew folks I ran into. One of them remembered me, the rest of them didn't, but that's okay. They were meeting a lot of people when they were over here.

Wright: When the Russians came over here, were you able to extend hospitality to them, take them around and show them--

Nygren: Oh, yes. Space Center Houston was one of the places that they went to. Different people would take them out sailing, or we'd go to the tennis courts and play tennis, go downtown and look at some of the things downtown. Early on in the program, the Russians were sort of like we were when we were in Russia. We were without transportation and stuff, but at the end of the program they were renting rent-a-cars. They could rent a rent-a-car, and they could go off and do their own thing. So they got comfortable enough that they could go off and do their thing.

But, you know, have them over for dinner and some parties and things like that, we could do that. It turned out that the guy that I interfaced with most is Mr. Lebedev, he had some health problems, so he

was not inclined to socialize very much. He went to a few things, but I would say that we could have done more of that, and we would probably have been better off in the long run had we even done a lot more of it to establish that personal rapport.

I can remember the first time I went over there, one of the big things that's over there is a toasting at the end of the joint working groups, and you'd toast all the folks and the people who helped you and everything that you could think of in the toasting. Well, since I didn't drink, I was a real oddity. They didn't know, really, how to deal with me. They are not comfortable with people who do not drink. They really aren't. So I learned a lesson, that I was going to have to learn how to drink a little bit to be socially accepted by those guys. I think today they have gotten to the point that if you didn't drink, that that would be okay with them. They understand now that there are Americans that don't drink, and that's okay. But when we first went over there, if you didn't drink, you were an outsider. You were considered as an outsider. You didn't fit in. I think they have some kind of a philosophy of you get enough in you and you get inebriated, the true you comes out. [Laughter]

Wright: That might be something to explore at one time. Or maybe they've already explored that.

Nygren: Well, I'm not sure where they're going with it, but I can tell you that they think that that's part of socializing, is actually having liquor. It's almost a requirement.

Wright: The years that you've spent in the Shuttle-Mir Program were many and the accomplishments were many. Do you believe the benefits and everything that we did with Shuttle-Mir was worth all the effort?

Nygren: There's a lot of different ways to look at that. If you look at the long-range global situation, and if we're going to get off of this planet and we're going to have deep space human exploration, the United States can't afford that on its own. It's going to have to be a global environment. Getting the Russians involved, working with the other international partners, certainly has a long-range benefit. It's the only way we're going to do it. You can't do it by yourself. So the answer in that context is yes.

Three or four decades from now, as we're really trying to get away from Earth and go to Mars and establish colonies and stuff like that, it's going to have to be a global thing, everybody's going to have to chip in, and it's going to have certainly paid for itself many times over.

If you look at it from the short term of did we get $400 million worth out of the contract, it would be difficult to audit that and say, "I can show you where I got $400 million worth of return on the government taxpayers' dollar," but the investment in the merging of the two cultures, posturing yourselves for what's going to be required as we go forward with deep space exploration and stuff like that, no doubt

that it was the right thing to do.

We're going to have problems in the International Space Station with the cultural differences, the political aspects, the financial aspects, the technical aspects, but we're going to have to learn how to do it. It's going to be how we do things in the future. ESA, who's a thirteen-member nation conglomerate kind of thing, has learned how to do that. We need to learn how to do the same thing. It's going to be a learning experience for the United States, and it's going to be a difficult one, because the way we have done things in the past, where, one, we're in control, and, two, our culture is that you want a decision and you want to be able to act on that decision as soon as possible, when you have a half a dozen equal partners that you have to get consensus on it before you can move, it takes longer to get decisions. There's people in this agency that don't understand that, that when you say, "Go do something," and you say, "Well, last time I did something like this, it took me only eight months to get it done, and now you're on your second year and you haven't got it there," well, it takes a year just to decide what you're going to do and get everybody together and to agree on it.

So there are some problems there, and we need to figure out how to make that process work faster, but it's never going to be as fast as what we used to do by ourselves when we said, "It's our money, it's our sandbox, we can do with it as we see fit and get on with it."

Wright: We can't take our toys and go home this time, can we?

Nygren: That's right. That's right. We've got lots of other players that have an equal stake in this thing.

Wright: Personally, for you, was it a good decision to be part of this program all these years?

Nygren: It was very rewarding. I enjoyed the work, I really did. It has worn on my health. I think I have accumulated some health problems that had I not been under that kind of stress and working those kinds of hours and stuff, I probably wouldn't have them today. There are some things on my house that I probably would have fixed long before now had I had time to go home sometime when the sun was still up so I could work on them. So there are certainly some drawbacks from a personal perspective.

It came at a time in my life that I, in fact, could donate that kind of stuff. My youngest kid's a senior in college now, so he was basically away in college the rest of the time. My other two kids had already left home. So it wasn't that big of an inconvenience. If you go ask my wife, she'd probably say, "Well, it would have been nice if he'd been here to fix some of the stuff, but look at all the free time I had and didn't have to put up with him." [Laughter]

Wright: Did she save all those things for you to fix?

Nygren: They're still there, and I'm trying to figure out how to fix them, because I still haven't got the time and I haven't got the money, either. What I need is a windfall here so I can afford to pay to have them done. I need to get a lottery ticket.

Wright: A winning lottery ticket.

Nygren: Yes. That and one that just says, "If nothing else, we'll paint the house. We'll put up some of the plaster and repair some of the bricks and some of the other things."

Wright: That might be an enterprise that we could look at. Nobody's got a lottery for that, you know, where people would buy tickets so that you could get your house painted.

Nygren: Yes. You know, you would buy a service, as opposed to just cash. Because I need those kinds of things desperately done to my house, and all of my cars are very old. But that's probably not from the work; that's from kids in college.

Wright: Those three kids.

Nygren: Yes. Right. But I keep telling my son that I'm going to be rich soon as I get him out of college and financially on his own, but he keeps figuring out some way to make college last one semester more.

Wright: Well, you raised a smart kid, then, didn't you?

Nygren: Well, let's see. If you take it on that aspect, probably. If you look at the grades-- [Laughter]

Wright: Well, we won't go that far. I was going to ask Carol and Summer if they had a question for you. Do you have anything?

Butler: You said you worked with other space agencies. How do you think you're going to be able to transfer that knowledge to people working on the International Space Station, or is that going to happen?

Nygren: Well, I don't think that there's anything that's going to be written down that's really going to change how you do that. We have a number of people who have gone through that experience, and not only from the U.S. perspective, but a number of the people that we've interfaced with from ESA and DARA and CNES are also the people who are working on the Space Station Program. So they are

bringing that experience with them. So, from a personal perspective, there are going to be a lot of people in the program that are going to have that experience. They're going to have it brought with them and stuff like that.

From a more formal perspective, as an example, when ESA finished up their program, they invited us to send people to their debriefings so that we had an opportunity to listen to their crew debriefings, to listen to their technical debriefings. We have extended a similar invitation to them to come over and listen to our debriefings afterwards, so they have done that.

Here's a little interesting tidbit of information that we got from the Europeans, and didn't do anything with it, didn't know how to do anything with it, but it was an interesting input, and I believe that it has a lot of creditability. You'd probably get some folks who wouldn't agree with that. But what it was, was that you're better off sending rookie astronauts to Russia to fly on the Mir than you are to send experienced Shuttle astronauts. See, they had done both. They had sent people to Russia to fly on the Mir that were rookies and had never done that. They had also taken people who had flown on the Shuttle and sent them to Russia to fly on the Mir.

The American experienced crewmen are used to a standard of training and care and feeding that is not existent over there, so they have a level of expectation that is very difficult to support. When you send somebody over there that's never done it before, his level of expectation is what he's getting, so he's willing to live with it. That, in hindsight, was very true. The people who had flown over there expected us to be able to provide training like what they're getting over here in Building Four. The answer is, you can't do that. You cannot provide that kind of training. We want the level of procedures that we're getting out of the Shuttle. Well, we can't even give you the level of procedures that you would have got if you were getting ready to fly STS-1, because all of the translation implications of it, the time delays in getting it all done were always behind the power curve. But these people are used to a system that provides a certain level of support, and certain crewmen could adjust to that, and others, it was more difficult for them to realize that wasn't something that was going to come about.

But the internationals picked up on that right away. They had taken people who had been over here and gone through the Shuttle training and sent them to Russia, and they're going, "You know, the Russians don't do this and the Russians don't do that." Well, you're right. The Russians don't do that, but that's what you're going to get, so you've got to figure out how to deal with that.

Butler: Do you think that the American experience with ASTP helped with Shuttle-Mir, or was that too long ago to have been an impact?

Nygren: In most areas I think the answer is it really didn't help because it was too long ago. In some of the design areas, particularly in the Shuttle docking area, I think it had helped, because a lot of their technical experts and ours were the same people in the docking interfaces, and we had gone through and developed the docking system on the Apollo-Soyuz so we didn't have to argue about how it was going to be designed and what system we were going to use and stuff. There was a basis to pick up and go with that that point in time. So in that particular area, I think there was some benefit from it.

From the training aspects of it, from the operational aspects, different program, different set of people, particularly on the U.S. side. Some of the Russian flight controllers, in fact, a fair number of them had gone through ASTP, but very few of the folks that were supporting NASA-Mir were experienced. In fact, we had what's called a Team Zero meeting, where we had the Russian co-chairs over here a week or so ago, and one of the folks had a party in the evening for them, and some of the toasting and stuff, we got to talking and things like that. As part of that activity, I had mentioned the fact that I was there during ASTP, and there was only one other American that had been around during ASTP. Now, whether that's good or it just ages me, I'm not sure. [Laughter] But a number of the Russians had been there. In fact, most of them were around during the ASTP Program.

Wright: One last question. To borrow a phrase from you regarding level of expectation, was your expectation met of what you wanted to accomplish as part of this program?

Nygren: First off, you're assuming that I had an expectation, and when I started into this--remember, when I started off, there wasn't even a program. There was just a little bit of a job to go do. So I kind of got into this where you didn't have a chance to develop an expectation of did you want to participate. It just kind of evolved around you.

Wright: You didn't get to define those expectations?

Nygren: Yes. That's right. But I look back on it, and there are lots of good times that I can talk about. I had a lot of fun doing the program. Like I said, I was under a tremendous amount of stress that was associated with it. Would I do it again? I would probably do the job again, but I would do it differently. I wouldn't take on the ownership at the level that I did. I would delegate more things and try and maybe restructure what the scope of what I was responsible for was, because it was an enormous amount, when you talk about all of the science stuff, all of the medical stuff, all of the operations integration kinds of aspects of it.

For the time that the Shuttle wasn't there, if you take off the PAO guys and maybe the EVA guys,

the ones that did some EVAs, it was basically the program that we were running. I was very fortunate in that when Tommy came along, he came by and asked me if I wanted to do this. It was certainly a personal compliment to have somebody like Tommy ask me if I would take that role on for the program. On the other hand, I think Tommy recognized that since we had been doing it for the front end of the program, we had already established the operational interfaces, started doing all of the training, what hardware we were going to put up for Norm's flight, we had already figured out how to integrate with them. It would have been very difficult for him to find somebody else who could step in at that point in time to go do that.

Then Tommy went off to do the Shuttle Program and [Frank] Culbertson took over. Frank has a completely different management style than Tommy does, and Frank didn't have a lot of program experience when he took on the job. He did have a rapport with the Russians because he was a flown astronaut. I don't know how much you know about the Russian counterparts that we had, but a number of them were ex-cosmonauts: [Valeriy] Ryumin, the program manager, [Yuri] Glazkov, the head of Star City for all of our interfaces, [Anatoly Y.] Solovyev, who was the head of their Mission Control Center, Aleksandr Aleksandrov, who was their counterpart on crew training and stuff like that, were all flown crewmen.

So Frank had an in with those people. He could talk with them, "I've been there. I've walked the walk," kind of thing, and Frank grew into the program management role and matured faster than anybody else probably could, and he did a spectacular job of working with the Russians, in my opinion. I was concerned when he started into it where we were going to go, but he did a bang-up job, and he took a lot of heat. I think he did well on the NASA side, too, dealing with the Congressional [hearings] and Press kind of folks [especially] when we had accidents, [asking] why are we doing it, when we had fires, why are we doing it. He did a good job of representing the program, explaining why we were doing it, what the benefits were, and he did a good job of negotiating with the Russians so that we could work together.

So I think they did a good job, and all the working group chairs, I think, did a good job. If they weren't interested in doing it, they didn't stay around very long, and most of them got in there and dealt with the Russians, established the right kind of rapport, and we got what I thought was an extremely productive program completed. It's unfortunate that it's over with, because there are still some things that we could go off and do, but if we want to get on with Space Station and get our money on it, we're going to have to quit doing this and go do that.

Wright: Which seems to be the story of your life. You've just moved from one to the other.

Nygren: Yes. It's going to be interesting to see what it is I'm actually going to do next, because, as I came

out of the Phase One Program back in the February time frame, John Rummel was the acting Director for Space and Life Sciences, and he asked me to be Acting Deputy Director of Space and Life Sciences, and I have been doing that. Tuesday they named Dave Williams as the director of Space and Life Sciences, so he will be the director and John will be the deputy, which is his true title, and it will be interesting to find out what it is I'm supposed to do, because there is no Phase One Program and there is no deputy job anymore. So I will probably be looking for a job in some form or fashion, whether it's in here in how I can help them run the directorate the way they would like it to be run and how I can participate or whether it's off to do something else.

Wright: I'm sure whatever you'll be doing, you'll be busy and hopefully, though, you'll find some time to rest and get those things done at your house that you need to have done.

Nygren: Yes. You know, you want to get just enough time to do the ones you want to do and just tell your wife it's on the "Honey, do" list. It's on the list. It might not be near the top, but it's on the list.

Wright: We thank you so much for spending time with us. We certainly have learned a lot and enjoyed every minute of it. So thanks again for taking time out of your schedule.

Nygren: Glad to do it. I appreciate your showing the interest in hearing what I have to say.

Wright: I'm sure we could sit for longer, but then you probably really will be looking for a job because we've taken all your time.

Nygren: Well, you know, when you're behind a closed door, they can't come down and give you something to do.

Wright: That's how it works. Well, thanks again, Rick.

Nygren: Thank you. I enjoyed it.

[End of interview]