J. KEVIN WATSON

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Interviewers: Mark Davison, Rebecca Wright

Davison: This is an interview between myself, Mark Davison, and Kevin Watson of the International Space Station Operations Department working maintenance and logistics. Good morning, Kevin.

Watson: Hello.

Davison: Would you start off by just giving us a little bit of background from your start in the space industry, kind of briefly, and then what you've done here at JSC [Johnson Space Center], and how you got involved in the Space Station Program?

Watson: I started with Rocketdyne, a division of Rockwell International, in 1979 working on the Space Shuttle main engines. My emphasis there was fabrication, welding especially, and brazing from the developmental side. We worked on specific problems that might arise with production engines, and then I spent a considerable period of time working on the application of robotics systems to the welding of those engines. Also with Rockwell I worked on a project where we were trying to define a flight experiment to do extravehicular activity welding. I spent some time doing that. Ultimately the follow-on project wasn't funded, but that was some additional broader experience I had there.

I came to JSC in 1990 and I joined the Missions Operations Directorate. There I was involved in the maintenance and structures and mechanisms group. The emphasis was on maintenance, Space Station maintenance. Of course, that was prior to the Russian involvement in the program. So we were looking most exclusively at maintenance of what now would be considered the U.S. elements, truss and so forth.

Then in, I guess it was 1994, I joined the Space Station program office and joined the logistics and maintenance office within operations there. My responsibilities have been fairly diverse. I have responsibility for all the non-prime hardware logistics and flight crew equipment provisioning, and now I'm responsible for the development of the inventory management system.

Davison: When did you take up Russian or start studying the Russian language?

Watson: I studied some when I was in college, so I had some basis then. Since that time I've done some self-study. Since college, I've had no formal language instruction. It's been either self-study or just exposure. My language skills still are rather minimal. I'm able to carry on a very limited social conversation, but I certainly can't work in the language.

Davison: Let's go back and talk about your first meeting with the Russians, Mr. Languev, I believe it

was, and tell us how those went and how you progressed through those early meetings to some of the contacts that you've made now in the different areas.

Watson: All those contacts really are Phase Two oriented. They were not Phase One-oriented. I first met Aleksandr Languev in probably, I would guess, March or April of 1994 when he was here at JSC and [at a] TIM. Logistics and maintenance certainly was not his area of specialization, and I kind of grabbed him during the meeting and said, "I want to talk to you for a little bit about some issues," and kind of dumped this on him, logistics and maintenance kind of questions. Initially, I received a rather cold response to the issues. But we told him that we'd like to make a trip to Russia in the summer, July of '94, and pursue it further.

We actually followed a regularly scheduled TIM, and it was Maurice Kennedy and myself went over, and it was really just the two of us. We spent about a week with Languev. It really was an initial meeting to try to educate them on what we saw as the issues, what we even saw as the scope of the area of logistics, and the types of things that we were interested in and that we'd want to talk to them about. So what I had done is I prepared a briefing of where I had gone through our integrated logistics support plans. We had developed a briefing from those plans just sort of a tutorial: "Here's what logistics means to the United States, where it comes from, and how it's structured, and the formalization of process and concepts that we use here," and just spent some time going through that, not pushing it or anything.

Then the other thing I did was also I had taken our logistics support plans and I'd had the entire document translated into Russian. It was hundreds of pages that I had translated. I took that with me and I gave that to him. I think that the fact that I took the time to just explain what we were interested in, and the fact that I had gone to the trouble of having this entire document translated for his benefit, I think that tended to break the ice quite a lot.

The other thing I think broke the ice a lot was that I was willing to listen. I'd had some experience with other people who they were kind of always on transmit, they were never on receive, and I think the Russians found that a little bit frustrating, because they obviously have a lot of pride in their history and feel that they have a lot of experience, and that they're not clueless about how to do this space stuff. It's true. I think they felt somewhat offended when people wouldn't listen to them at all. So I tried to be in the receive mode a little bit and listen to him as well. It wasn't like the curtains were parted and all of a sudden everybody understood and agreed, "Yes, this is exactly what we need to do," and all that, but it was a beginning, and that was really what started it.

Then through subsequent meetings both here and there, continued the discussions and asking questions and explaining things and so forth. I think the professional relationship developed quite a lot

through that process. Again, I think the key was being willing to listen, to kind of turn off the transmit occasionally and just listen. And we developed a real strong professional relationship. Then his responsibilities changed a little bit, and ultimately I was handed off to some other people from Energia to deal with.

The principal person I deal with, actually there's two, there's Vladimir Vaskonov Vysokanov and then a subordinate of his named Andre Kuznetsov. I deal with both of them. Again, I think that I tried to continue the same approach dealing with them, of not only explaining and so forth, but listening and trying to be patient when they don't necessarily agree with our approach, or whatever, and try to find common ground, trying to see, well, for example, if I explain an approach or a concept, and they come back with a counter explanation, it seems like sometimes they think that there's a big difference in approaches or concepts, and what I've tried to do is not focus on the differences but focus on the commonality between our two approaches and use that as a starting point to build from. Generally it seems to be reasonably successful. I can't say that everything I ask of them they agree to and that there's never any disagreements; there are. But it's a positive professional relationship, and we deal with the issues in a very constructive way.

Davison: Do you think building the professional relationships, and also, I think in some cases you built some personal relationships, I think Mr. Languev and yourself went crabbing or fishing one time with your family--

Watson: Yes.

Davison: I remember he took us over to the museum and showed us different parts of Moscow. You think those type relationships help in the negotiation and building contacts?

Watson: Oh, yes. Yes. The crabbing incident was a good example. I think it was probably our second real meeting here in the States with Languev that I invited him over to my home, and we didn't have an interpreter, and his English was as bad or worse than my Russian was. But we made it through the whole evening, just kind of with a dictionary and sort of stumbling through things. But we felt that we ought to provide some sort of entertainment, so what we did is, we live near Armand Bayou, so we took him over to the bayou and we went crabbing, because my kids like to go crabbing. So here's this mid-level Russian manager standing there, he's got his shoes off, and his bare feet, and his pant cuffs rolled up, and standing there because there was a little bit of water flooding across the floating dock. And he's standing there crabbing and stuff. He finally caught a crab and sets it down on the surface, and it starts to scuttle away,

and he goes and he tries to kind of capture it with his foot, and the darned thing reached up and pinched his toe and drew a little bit of blood. But he didn't seem too upset by that.

Then we took him over to Toddville Road, and there's a stream that runs under the road there, and we knew that there was an alligator lived in there, so we took him over to try to see a real wild alligator. Sure enough, the alligator surfaced and we got a picture of him in the foreground and the alligator in the background. He was up on the bridge, so he wasn't in any jeopardy. Then I took him a copy of the picture at a subsequent meeting, also as a gift. It's kind of traditional to exchange gifts, especially early in a relationship. One thing I did is I got one of these alligator heads, just a dead--

Davison: The dried skull.

Watson: Dried, mummified, alligator head and gave that to him as a gift. He seemed a little shocked when he opened the package. [Laughter] I think that was a real positive thing for the relationship, too, was doing that kind of thing. I don't think I've done much of that, but it helps.

Davison: You also, on the maintenance side, dealt with Mr. Tsygankov. We've interviewed him, and he seemed like a very interesting man to talk to. In fact, he had a common interest with you. I think he invented one of the space welding devices.

Watson: Right.

Davison: I was wondering how your conversations and your relationship built with Mr. Tsygankov.

Watson: Well, he's quite a character, and he has a very distinctive personality. Initially, I was a little nervous about trying to establish a relationship with him. It seemed like he might be difficult to warm up to, or to get to warm up to me. But again, through the process of just repeated meetings, and listening as well as talking, I think we established a pretty good relationship.

I think you were with me at the TIM when--this is not necessarily the most flattering incident, I guess, but I think it was in some sense important to the relationship, was we had spent like an hour one afternoon negotiating a paragraph, the wording of a paragraph on protocol. We really hashed through it, spent a lot of time on this one paragraph, and we all agreed that that's how it was going to be. When we walked in the next morning, he pulled out the protocol and he wanted to readdress that paragraph again. I got pretty adamant that we had already done that, and I wasn't going to spend any more time working that paragraph. End of story. He just said, "Okay."

Davison: I remember that.

Watson: And we went on from there. It seems to me that since that point, the relationship was much better, and I think perhaps it was just that he saw that I was willing to take a stand, and in a sense that he couldn't push me around. It may not be the best way to state it, but I was someone who was willing to take a stand on something, and I think it helped.

Davison: He wanted to test your negotiating style and see what you were willing to give up with from one day to another.

Watson: Maybe so. But you're right. Interestingly, I think he started his career at the Paton Institute in Kiev, in the Ukraine now. There he worked on some of their early welding systems that were flown on the Salyut back as early as the late sixties before he moved here.

Davison: I know he called his welding experiment or machine the Volcano, is what it translated to. I thought that was interesting. He said it's flown on the Shuttle once, but they didn't get to go outside because of the hatch problem. He said that they're trying to remanifest it to fly it again.

Watson: I don't know where that is. I'm not sure if it's flown on the Shuttle. They were trying to fly it on the Shuttle. I think the deal was that they were manifested, but then because of the Shuttle hatch problem, that had a ripple effect which bumped him from the manifest. They're trying to get it back on the manifest, but there's lingering concerns with the experiment and the potential safety hazards and so forth. So it's a little uncertain what's going to happen with the whole thing.

Davison: Let's talk a little bit about when you made the decision to bring your family over to Russia and kind of act as the NASA liaison there in Moscow. Tell us a little bit about how that transpired, the decision process, and how you talked your family into it, or whatever.

Watson: This was in the spring of 1995. There is a group at the U.S. Embassy in Moscow that was called the NASA Moscow Technical Liaison Office. At that time there were roughly a half dozen people. There may have been five, may have been seven, or something, but roughly a half dozen people that worked there, and the manager was Kenny Mitchell. Two of the people who were working there came home before their normal tour would have been up, so they had to replace those people. Well, they found some permanent replacements, but those permanent replacements were going to have to go through language training, and that was going to take them six months or so. So in the meantime they were looking for some temporary

replacements.

I heard about this and it just sounded like an interesting opportunity to be able to spend some time in Moscow, an extended period of time, and not be living in a hotel, but rather living in an apartment, and kind of, to some degree, living off the local economy rather than just restaurants and that kind of thing. So I talked with my wife, who also works here at NASA, and we thought that it would be a good opportunity, but we weren't willing for me to go alone. I wasn't willing to go alone and be away from my family for that long, so we decided that if we could take the family with us, that we'd be willing to do it.

So I started talking to Kenny Mitchell and also with his management over here in the program office. Initially, there was a lot of reluctance to send someone with small children, because at that time the oldest was ten and the youngest was about seven. There was reluctance to send people with children of that age. But we convinced them that we understood the risks, because both my wife and I had been there before on business, so she was not clueless as to what the environment was like either, and that we knew there were some risks and some concerns, but we had considered those. The primary concern, I think, was health-care issues associated with children.

So we finally were able to convince them that we would go, and so the whole family spent about two months in Moscow, and I stayed a little bit longer, and then we overlapped the beginning of the school year a little bit. My wife did some home-schooling with the children so that they didn't miss anything that year in school.

Really, from our standpoint, the request of the medical thing, the official staff, the permanent staff at the liaison office there, had diplomatic status, and as such they had the benefit of the use of the medical facilities at the embassy, and also they had the opportunity, if there was a critical medical situation, to get a medical evacuation to Finland or England, or wherever they might need to go. But being there on a temporary basis, I didn't have that diplomatic status and didn't have the privileges associated with the permanent staff at the embassy, so we didn't have any of those medical benefits available to us, so we were really on our own from a medical standpoint. We were just generally concerned about the local standards and so forth, and what we would do in the event some serious medical situation arose, but we felt that it was probably worth the risk. As it turned out, we didn't have any problems.

Davison: Tell us a little bit about living on the Russian economy, what your apartment was like, and how you guys were able to shop in the market and cook your meals there.

Watson: The apartment was one of a block of apartments that had been secured for the embassy. It was a group of people from the embassy. It was several miles from the embassy, it wasn't anywhere close to it,

and was in a building that had been converted from a hotel. It was primarily occupied by foreigners, non-Russians, which actually was somewhat of a disappointment to us, because one of the things we were looking for when we went over there was we were hoping that our kids would have the opportunity to interact with Russian children and get to know them a little bit, and maybe pick up a little bit of the language and so forth.

Physically the apartment was very nice. Once you got into the apartment itself, when you came into the entrance and rode the elevator, it was a pretty typical Russian building. Very small elevator. You could look up the shaft and down the shaft as you entered and exited the elevator, and it kind of rattled around in the shaft a little bit, and things like that. It was always an experience riding the elevator.

But the apartment itself was pretty much what we would consider Western standards. It was carpeted. We had three bedrooms, we had a living-dining area, we had essentially one and a half baths, a kitchen with a dishwasher, we had washer and dryer for clothing. It was perfectly comfortable and a nice place to live.

Davison: Sounds more like Western standards than Russian standards.

Watson: Yes, it was not a typical Russian apartment. The only thing, I guess, that was typical Russian about it was that in August, while all the hot water in Moscow is from a central facility or maybe multiple central facilities, but it's not like each building has their own hot-water heater, so in August they shut off the hot-water system so they can do maintenance on the system, I guess, in preparation for winter, because there's a lot of steam heat also over there, and then they can make sure the system is fully functional before the winter hits. So they turn off the hot water. Well, that means that most Muscovites don't have any hot water for the month of August. You just have whatever comes out of the tap, which is pretty chilly. That was the case for us, too, except that we did have supplemental heaters available in each apartment, but ours didn't get turned on immediately, so we spent about a week and a half with no hot water, which really is a minor inconvenience. Everybody else over there lives with it an entire month, but it was a new experience for us to not have hot water available. The cold showers and everything else was a different way to live.

Davison: Did you find that allowed the Russians, and particularly the Muscovites, would typically go on vacation during the month of August, so they'd be out in the countryside?

Watson: There were a lot, yes, that were on vacation, especially children. That was the one thing that really struck us was that we didn't hardly see any children at all for the entire period we were there, which was basically July and August. As it turned out, it's very typical for Russian families to send their children

off to live with their relatives, whether it's their grandparents or aunts and uncles or other family members that live in the country, or possibly Mom goes to the *dacha* and the kids go with her, and Dad stays in the city and works, or whatever. It's very typical for the children to be out of town during the summer. So we probably didn't see more than a dozen kids during the entire two months we were there. Immediately after the family left, then the kids came back to the city to start school, and so then I would see all these kids. So we just missed them, which was a disappointment to us.

Davison: What about traveling around in the city? Did you all take the public transportation, the subway, and the bus?

Watson: Yes. For any personal travel, we always used the subway. We used the buses a little bit, trams. The only time we had embassy transportation, really, was just to and from work. But the subways, that was another one of our big concerns, was getting separated from the kids on the subway, because the subways frequently get very crowded, and it's difficult even for an adult to get on and off the cars when you need to. So our concern was that if we got into a situation where it was real crowded and somehow we'd lose contact with the kids, either they wouldn't get off the train where we did, or they wouldn't get on when we did. So pretty much every time we went out, we'd give them another briefing on, "Here's what you do if this happens." We had pretty clear contingency plans for both of those situations with the kids.

Then the other thing we did is we had little three-by-five cards printed up with a message on it that was something along the lines of, "Please help me, I'm lost." We said, "Please call the U.S. Embassy duty officer," and we gave phone numbers. Then also, "Please tell them where I am so they can come get me." We laminated those and put them on a neck chain, and just about every time we left the apartment we had the kids wearing those around their necks so that if we did get separated and the contingency plan didn't work, that they wouldn't be able to communicate adequately with the locals, so they would at least have this to help them out to some degree.

Davison: Were you able to have any Russians come visit you in your apartment, or did you ever go to any Russian apartments while you were there? Did you have any kind of relationships like that?

Watson: Well, we really didn't have any social visits at our apartment. We did go visit one family once, kind of an interesting situation. My wife, in her work, had met a fellow who worked for Alenia, who is an contractor to the Italian space agency. Well, he, interestingly enough, was originally from Brazil, but he works in Italy, and his wife is Russian. Her parents lived in Moscow, and we had become friends with this fellow that worked for Alenia, and his wife. So when we were in Moscow, we had her parents' phone

number, so we contacted them, and we ended up going over and spending an afternoon with them once. That was a real neat experience. We took the subway and then the tram to a designated stop, and we got off and just stood there and waited for this gentleman to show up. He arrived and escorted us back to his apartment.

It just looked like a typical Russian apartment block. It was just all these nondescript buildings that looked, honestly, kind of old and unkept, and so forth. The yards were pretty much dirt. It just visually wasn't particularly appealing. Even the common area inside the building was somewhat dilapidated. The apartment itself, when we got in there, was really nice, parquet floors and just absolutely spotless. It was actually a relatively spacious apartment, but it still was pretty much packed with furniture and books and personal belongs, and so forth. But everything was just spotless and neat as a pin. It was a really very comfortable apartment. I think from what I've seen and heard, that's pretty typical, that the exterior appearance of the building may not be very appealing and the common areas may not be very appealing, but once you get inside the apartment, that they usually are pretty nice.

Davison: So people take a lot of pride in what personally belongs to them, but the common areas, or the outside, everybody doesn't pitch in together to make those look nice.

Watson: No, and I'm not sure what the reason for that is. I don't know if these all used to be state-owned, and when they were state-owned, there was probably a state-employed caretaker who for each building for each complex they probably had a network of people that did all of that. But now with the change in the system there, I'm just kind of guessing here, but I would suspect that they probably are not sponsoring those caretakers any longer, and now it's more of a co-op kind of an arrangement for a given building, and whether they pay to have the common areas maintained or not, it seems like they are not as concerned about that.

Davison: So did you ever have the pleasure of being able to drive a car in Moscow, or drive with somebody?

Watson: I've ridden a lot, but I've never driven, and I don't think I ever would drive. It's a pretty scary proposition driving around there. It's just not an environment I'd want to drive in.

Davison: What about your office in the embassy? If I remember, wasn't there something that happened while you were over there with the office that you were in? I'm trying to remember the story.

Watson: A couple of things. One is not the specific room that I sat in, but the one that Dave Herbek sat in

had a bullet hole in the window frame or door frame on the exterior, that was a result of the--I think it was 1991 White House incident, because the embassy sits right across the street from the White House. It was back when they had the tanks on the bridge, and they fired on the White House with the tanks and so forth. There was some stray gunfire that one of the bullets penetrated the door frame in his office. He wasn't there, of course, at the time, but you could still see the bullet hole.

Then when we were there, there was an incident. It was actually the last day the family was there, they were scheduled to fly out the next day. My wife and the kids were on the embassy grounds, it was mid-afternoon, and I was sitting at my desk and my wife walked in and she said, "What's going on?" I thought maybe she had been expecting me to go see her and the kids, and she was going to chew me out or something. I said, "I don't know, I'm just working." She said, well, she had heard that somebody had fired a rocket at the embassy. So I checked around a little bit and no word had been passed to the NASA office at that point about the incident. So I said, "Well, let's go on over." She had left the kids in the cafeteria building, which is largely below ground.

We walked out the front door of the building where the office was, and one of the Marine guards went running by, and he was wearing his helmet, wearing his flak jacket and web gear, and carrying a rifle, and that was not typical the way they dressed and handled themselves, plus he was running, too. So that immediately told us that something had been going on, so we hustled on over and went back and joined the kids. Then we started noticing that the Marine guards were taking up positions to the entrance of the cafeteria building. They were all wearing their combat gear and so forth. Most of them were either wearing civilian clothes, which, if they weren't on duty, they would wear civilian clothes, or they were in athletic clothing or something like that, but they still got all the combat gear on over top of it. So it was kind of an unusual sight to see people dressed in this hodge-podge of civilian clothing and combat gear. But they were all carrying rifles and shotguns, and were taking up defensive positions.

So the kids and my wife and I are sitting there. The kids thought it was pretty neat. They thought this was really cool, but my wife and I are looking at each other and trying to figure out, okay, well, if all hell breaks loose, basically, what do we do? We didn't have any real good answers, because this was not one of the contingencies we had really thought about or planned for. We were just thinking, "Well, just do the best you can to hide someplace, and hope it all blows over."

As it turned out, we then were instructed--as this is going on, you don't really know what has happened. The first priority of the embassy officials is not to inform everyone, but rather to deal with the situation. So we're sort of sitting in the dark, figuratively, but they asked everyone then to move to the gymnasium, which was also part of this building. They had evacuated the main embassy building where

the ambassador and his staff was. They had to all come over to this building as well. So we went to the gymnasium and we all sat around there for about half an hour, and then they explained that there had been a rocket-propelled grenade had been fired at the main building, so that had stimulated all this response. Then they told everybody that the situation was under control, but they were going to release everybody for the day and instructed everyone to go home.

So we left the gymnasium and that building and went over to the NASA office and informed everybody there that we had been instructed to go home. So the vans that normally took us to the apartments had arrived by that time, so we climbed into the vans and left the embassy, but we asked the drivers to not take the normal route home, because under the circumstances, you don't know if it's just one crazy guy fired one shot and that's the end of it, or if that was the first shot of possibly more to come, or if there's some more coordinated activity and this was just one aspect of it. So just to be a little on the safe side, we decided not to take the normal route home. We took an alternate route that day.

Fortunately, from the family perspective, they were leaving the next day, anyway, on the airplane, and after that I don't think we've been real comfortable with being there anyway, so it was well timed if it had to happen. Plus it was the highlight of the trip for the kids, anyway.

Davison: They probably heard you were leaving, that's why they did it then.

Watson: That must have been it.

Davison: Tell us a little bit about the Mir Improvement Program and the tracking of the spares that you were doing for Phase One, and how that evolved, and the database that was built up.

Watson: When the Phase One program was negotiated, one of the deliverables that was defined was a series of reports to be provided by the Russians about ongoing maintenance activities on board Mir. Initially, the--I think it was called Mir Extension Assessment Team under Dennis Webb, was the recipient of those documents, but then their responsibilities changed, and ultimately I inherited the role of being the recipient. Pretty much what they did in these reports was they just identified very briefly when an on-orbit failure had occurred of some sort, and it also identified when items had been launched, replacement items had been launched, and when replacement items had actually been replaced, when those activities took place.

The format of the report was such that when you read the first report and then you read the second report, you had to really relate the two to each other yourself to make sure that you weren't reading about two separate events, but rather that these two citations were connected to each other. So there was some

interpretation required there. Plus the format of the report evolved over the first year or so that they were provided, so it really was kind of difficult to develop a really reliable picture of the maintenance picture over this entire period of time, which really was only a couple of years of reports. It was a little difficult to get a clear big picture, because of the way in which the data was reported and the fact that the format of the reports had changed.

But we did learn some things from it. We could kind of get some picture, at least, a snapshot in time of what the maintenance situation was. It was a little more difficult to see how the maintenance situation was evolving over time, if it was. The data made it appear that events, failures, were increasing through this period of time, but we tried to not interpret that picture literally, but rather recognized that again the format and the content and the data had changed some over that period of time so it might simply be that we weren't getting all of the events reported early on, we were getting more thorough reporting later, and so therefore it appeared that there were more events when in actuality there might not have been. So we've tried to always caveat anything we say about the reports with those considerations.

We did learn a little bit more about the general approach to sparing and maintenance from the Russian people. Really what we learned was that they do try to keep prepositioned spares on orbit, what they consider to be critical systems or systems that are known to be likely to fail based on history, and that sometimes they'll utilize spares in their on-orbit supply, and then when they ship up a spare, it's not really that those shipped spares are immediately going to be installed for a replacement, but rather it replenishes the onboard spare set and it returns that back to the point where now they have a new onboard spare available.

Davison: Could you tell that the health and well being of the vehicle was improving because of this money that the U.S. had pumped into their sparing process, or was there any type of feedback you could see from that?

Watson: From the data I saw, I couldn't draw any conclusions.

Davison: Because several people that we've talked to in Frank Culbertson's office felt like the Mir operating budget was so small at the beginning of the Phase One Program, that keeping the vehicle up there for them was very difficult, and then this process of this Mir Extension Program was able to get some spares up there that everybody felt was badly needed.

Watson: Well, I would expect that's probably the case, but from the deliverable reports that I was receiving, there was no way to tell what effect either the money that was being spent in Phase One was

affecting that situation, and really pretty much the spares that they were launching and reporting on were on Progress flights, but aside from the deliverable reports that we were receiving, of course, we know that we were launching spares and hardware for them when they were having especially critical failures. We were helping them quite a lot there.

Davison: Putting them on the Shuttle.

Watson: Yes, on the Shuttle. And I think that that had to have been a positive effect for them, not only because it increased the up-mass capacity, but it also provided another dimension to their scheduling flexibility. If we had a vehicle that was being prepared for launch, we in some cases were able to do some light [late] manifest that were critically needed, whereas I'm not sure what the status was of a Progress flight or the availability of a Progress flight in that same time frame, but certainly it had to add a new dimension and give them a little more flexibility to deal with some of these critical situations.

Davison: Some of your early talks with Mr. Languev have kind of dealt with that subject between moving parts from either Progress or Shuttle to help on the station side, so it seemed like that was kind of all set in motion almost simultaneously.

Watson: Yes, it was kind of a concurrent activity, I guess. We, Languev and I, began talking about what we were calling contingency resupply, were the terms we were using, and it was basically that if there's a critical need on board, whereas nominally Russian spares would be sent on Progress and U.S. spares would be sent on Shuttle, that certainly since on the International Space Station we are all in it together and dependent on each other, that the smart thing to do was to make some agreements that, yes, we would support each other, and launch U.S. items on Progress, and vice versa, if there was an urgent need, and that doing so would best support the station. I think that concept was certainly proven out with the Shuttle-Mir experience where I believe we were providing contingency launch services of some critical hardware for them.

Davison: You talked about the reporting system, how it evolved, and it improved. Do you think they were doing any kind of reports like this before, or did we kind of put them in the mind-set that you need to keep track of what you're sending up there, and what's up-mass and down-mass and the status of the spares and inventory?

Watson: Well, I don't know for sure to what degree they recorded this information previously and developed internal reports. But I think--this is my impression based on what I've seen and so forth--given

the nature of the information they were originally providing, I would be surprised if they had been developing very much information internally previously, because if they had been doing that sort of thing before, then I think they would have been provide a product that had more meaningful information in it from the beginning. The fact that the initial reports were pretty sketchy and had very little meaning to us initially kind of tells me that we were introducing new concepts of information to be tracked. But that's just sort of my extrapolation.

Davison: You talked about your early discussions about inventory and some of the different folks you dealt with on the inventory side. In the Shuttle-Mir Program there was a risk mitigation experiment that dealt with inventory management, and I believe you were involved in that. Do you want to talk a little bit about that?

Watson: That was an experiment that was done on STS-79, and really on that experiment I was sort of peripherally involved. Robert Hanley was the key person on that and one of the co-principal investigators. There it was not really an operational test in that we weren't trying to really track the movement of things, it was more of a real sort of experimental test where there was a kind of a manufactured environment in that they were just scanning cards and things like that. Well, they were scanning some bags that were going to get transferred, but it wasn't part of the operational transfer process. It was just done on an experimental basis.

It really was relatively unsuccessful, and it was really for a couple of reasons. One was that the bar-code reader that was being used at that time was rather large and cumbersome. It was being used on board Mir to support some of the medical experiments that were being done there, but ergonomically it was not a real compatible device. Plus the other reason that we had problems was that when the crew members were trying to scan the bar codes that they were looking at, they either weren't recording or they weren't getting data. The crew member was not being successful. It wasn't clear to the crew member or to the people on the ground at the time why this was happening, but they just weren't acquiring the data that they needed.

Then after the flight, on the ground, I sat in on a session where Robert and some of the other people went through this with Tom Akers, one crew member who had conducted an [the] experiment on orbit. What they discovered was that the bar-code reader would be expecting an input. If it didn't receive an input in a certain period of time, it would time-out, and then it wouldn't accept inputs. Well, this then was coupled with the ergonomics, because the crew member would be trying to position himself and scan the label, and in doing so, was exceeding the allowable time and would time-out. So then when he tried to

scan it, he wasn't getting any scan. Well, when the training had been done on the ground, they didn't encounter the time-out because they didn't have the ergonomics problems of positioning themselves to be able to do the scan. So they encountered this on-orbit situation they hadn't encountered on the ground. So that was really the bottom line as to why that had not been successful.

Davison: That's why they call it risk mitigation, right? Let's shift gears a little bit and talk about your other responsibilities. Tell us how you're adjusting the clothing requirements that the Russians are used to seeing on Mir to what we're trying to use on the International Space Station.

Watson: Our initial point of reference was the Shuttle clothing approach. They are really quite generous with the crew members as to the amount of clothing they get. They get fresh changes of clothing pretty much every day, but you're only looking at a typically roughly a two-week mission, and the available volume and mass capability of the orbiter is such that for the size of the crew, you can support them for that long at those rates.

Well, I think we even realized that that probably wasn't practical on a station to provide quite that quantity of clothing. So we started at that point, but then we made some adjustments and tried to extend the rates a little bit, like whereas an item might have been changed out every day, now we were going to try to change it out every other day, or every third day, something like that. So that was the position we went into negotiation with.

The Russians, on the other hand, they have a much more spartan approach to providing clothing. In essence, they provide each of their crew members one penguin suit for about every forty days on orbit. The penguin suits are the coveralls with the bungees that are integral to the suit, and they're a part of the countermeasure system that the Russians utilize. They provide one of those about every forty days, and they're expected to wear one of those suits for eight hours a day is the nominal requirement that the Russians have. Then in addition to that, they have other types of coveralls, and they are provided at even less frequent intervals. For example, for the first station mission, which is 166 days, there are three types of coveralls, and they're going to get a total of four pairs of coveralls. For two types you get one coverall, and for the third type you get two pairs. So you get a total of four coveralls for 166 days. So for this mission they would get a clean pair of coveralls about every forty days or forty-one days as well, in addition to the penguin suits. So if you combine all of this, you get a clean pair of coveralls, whether it's a penguin suit or coveralls, on the average of once very twenty days or so, but yet you still have to wear your penguin suit for forty days.

Undergarments are changed out certainly at a more frequent interval. There the approach is they

have a set of undergarments, it's a pair of shorts and a teeshirt and some socks that they call Kamelia underwear. That's the term they use for it. There the approach is that they'll wear a set for three to four days as underwear, then that set of Kamelia becomes their athletic wear for the next three to four days, and in the meantime during that second three or four days they're wearing a fresh set as underwear. So they essentially change out their undergarments about on a three-day cycle.

Our undergarments, it's a different rate for each piece. Teeshirts, shorts, and socks are all slightly different, and then we also, from the function equivalent to the Kamelias, since they wear as both underwear and as athletic wear, then we consider also our athletic shorts that we provide in this category as well. The weight again is a little bit different. But on the average, over a three-day period, if you look at the mass of U.S. items versus the mass of the Russian items over a three-day period, the masses are roughly comparable, and the U.S. mass may be slightly lower. So we're concerned not only with just the nature of the items, but also with the mass and the volume of the items that we provide so that we don't exceed the capacity the vehicle provided.

Davison: Did the first crew with "Shep" and the two Russians get involved in this negotiation process or what was going to be in space?

Watson: They didn't really get involved in the negotiation, but we did, it's typical for Shuttle crews to go through an exercise, it's called the "fit check." That's an exercise that's conducted with the contractor that provides and processes all this equipment. What they did was all the items that the crew may use or put out on a table essentially, and the crew members can go through and familiarize themselves with them and make some selections between options that they might have and perhaps tweak the quantities that they're going to get. They may choose more of this or less of that and so forth, or may decline an item entirely.

So we did an exercise like this with the first crew back at the end of October, and the crew members went through and they actually selected at a lower rate than what we had initially proposed to them. So we're really moving towards adopting those rates as standard rates for these items for station crews.

Davison: Do you think the U.S. might have been outvoted since there were two Russians and one U.S. crew member?

Watson: No, they each made slightly different selections. The two Russians were a little more closer to each other than they were to "Shep," but there were a lot of things that were pretty common as to what they selected and so forth. Some of the differences were just simply like, do you choose a blade razor or do you

choose an electric razor. That's where some of the differences were. Those are some of the kinds of options you have. For deodorant, you get a choice of types of deodorant, or for toothpaste, you get a choice of types of toothpaste. So that's where some of the differences were.

Davison: Let's talk a little bit about the Russian maintenance training, some of those discussions you had with Mr. Tsygankov. The Mir training is more of a skill-based-type training. Talk about how we evolved the ISS maintenance training to a compromise there between the two different backgrounds.

Watson: Well, you're right. In Mir, the training is more skill-based, typically, and I think that's an important lesson learned in that when you're going to be on orbit for six months, you just don't know what's going to fail during that period. You may know what has already failed prior to the mission, and in cases where it's some critical failure that has to be repaired specifically in your flight, they may be able to give them some task-specific training, but typically the emphasis seems to clearly be on skilled training. In fact, very often their crew members seem to work rather independently of the ground, and rely on their own capabilities and their own skills. So that definitely is where the emphasis is.

Now, in Shuttle, we do give some skill training, but there's a lot more emphasis, I think, on specific tasks. But the nature of the tasks that are possible for the crew to perform are more limited than they are on the Mir, and they are really focused on restoring functions or redundancy for critical systems that you have to have to be able to return to the orbit successfully and return, as well as to ensure mission success--changing out GPCs and changing out switches and keys on keyboards, and doing things like that. But they do get some relatively specific task training on Shuttle.

I think that we've recognized that for a station we're going to have to evolve to something that's more similar to the Russian approach where the emphasis is skill training, and when you know you're going to have specific critical tasks to perform, you are trained on those specific tasks in advance of a mission. Very often a crew member is just going to have to rely on basic skills.

I think we're going to be trying to place more emphasis on a closer relationship between the crew member and the ground in performing these maintenance tasks than the Russians have typically. In part, it will be more possible for us to do because we'll have more complete communications coverage with the crew than the Russians have had. The Russians typically are out of communications with the onboard crew for often hours at a time just because of the location of the ground stations and the vehicle. So they just don't have the opportunity to have that communication, and, as a result, the crew has to operate more autonomously. We should be able to avoid that situation on the station. Maybe we'll have a little closer relationship with the crew on these maintenance tasks.

Davison: One of the comments of Frank Culbertson said when we talked to him was that when the crew selection process is looked at for a station, that he thought that you need to have an emphasis on people that have maintenance skills, or IFM-type background, and that that was critical from what we learned working on the Shuttle-Mir Program. I just wondered if you had any thoughts on that.

Watson: I think certainly onboard maintenance is going to be one of the critical activities, and I think it's going to be one of the significant activities for the crew time standpoint, and certainly there would be some advantage to having people represented in the crew. It may not be the entire crew, but at least have some selected individuals who are very capable and comfortable doing that kind of work. In fact, some of the feedback from the U.S. astronauts who have flown on Mir supports that. There have been some comments, very, very plain comments, that you need to have real handyman types as part of the crew to be able to deal with that. Mir certainly, being an older vehicle and hopefully being higher rates of failures than we'll be experiencing on station with it being a new vehicle, it may be that was more important on Mir that it would be on the station just because of the volume of activity. But certainly we expect the models that we've run indicate that there is going to be a significant number of maintenance tasks required on station, even early in the program, and certainly as the vehicle ages, undoubtedly that will become even more important.

Davison: Dan Bursch is one of the crew members I picked. I know he's your neighbor. Have you brought him over to work on your Mustang at all and give him some maintenance training at the house? [Laughter]

Watson: [Laughter] No, I haven't drafted him to help out with anything, but he's kind of a garage mechanic himself, especially woodwork. He's a woodworker.

Davison: Well, you could get him to help with the wood floors, too, right? [Laughter]

Watson: Good idea.

Davison: How do you think the operational experience from the Shuttle-Mir Program will benefit the International Space Station Program?

Watson: I think we've already kind of touched on that in a lot of the things we've just discussed, I think. Certainly from my perspective, we've learned the importance of good inventory management. The anecdotes about difficulties encountered by the crew because of essential lack of inventory control on Mir are pretty known. Those anecdotes are well known. It clearly has been a problem for the crew. It results in a real inefficiency in the use of the crew time. Certainly, not only does it result in inefficiency, but it

could potentially under more proper circumstances be critical from a vehicle safety standpoint, or even a crew member safety standpoint, just to be able to find the things you need quickly. And that's not just an observation from our standpoint. The Russians also clearly understand that and are very concerned about making sure that that problem is not repeated on station. We're working very closely with them to incorporate what we hope will be a good and effective inventory management system, and will also be a system that's common throughout the station and used by all the crew members and all the partners in a consolidated fashion.

What we really want to avoid is having a Russian inventory system, a U.S. inventory system, a Japanese inventory system, and a European inventory system, because we really want a crew member to be trained only once in how to do inventory activities, and not have to get training in five different systems, and we want also a crew member to be able to go and query the system and find any item he needs on board, and not have to go work with several different systems to locate an item. So I think that's really something that was learned from Mir. I think the importance of maintenance is another thing. I think the value of having some onboard critical spares is an important lesson learned from Mir. In fact, we've been conducting a very extensive and intensive effort here at NASA to identify potential critical failures during assembly of the station, and ways of mitigating the risk associated with those failures, either through workarounds or through prepositioning spares to support those failures, and we're working now with the Russians to try to do a similar activity for their elements. So I think those are some of the real important things we've learned.

Davison: What about the manifesting of the special tools, the multimeter and some of the other tools that you and Mr. Tsygankov have talked about? I'm trying to think of the tools that have been developed here that he was interested in bringing up early.

Watson: Actually, the stimulus for that was from Shepherd to launch some of those items early. They included the Fluke scopemeter, which is kind of an elaborate multimeter-type device, battery charger, a [unclear]--

Davison: Logic analyzer was one.

Watson: Logic analyzer, yes, and also the lab view software capability, which is resident on the PC, and an impact driver, and essentially a drill, some things like that that Shep felt were important that he have available early on, because I think his concern is that with being on a vehicle essentially that is right out of the showroom, and never tested in space before in an integrated fashion, that there's potential that there's

going to be malfunctions that may require more in-depth activity on the crew member's part than what we would normally expect to see.

These tools or diagnostic items were things that were planned to be flown on flight 6A, which would be right at the end of his mission, and he felt that it was important that we try to get them up early. So we worked with the Russians, and we provided the items to them in an off-the-shelf condition, and then it's up to them to try to make any necessary modifications to be compatible with the Russian power system or whatever, and also then to get them certified for flight. They're being launched on flight 2A1 as part of the Russian allocation, but this way we'll have some enhanced capabilities early on.

Davison: Is there anything that we haven't talked about that you would like to add to the discussion?

Watson: Nothing that I can think of.

Davison: I have one question that Paul Rollins always likes to ask. He's not here today, so I'll ask it for him. What's your favorite beer?

Watson: I like St. Arnold's, but I usually can't afford it. [Laughter]

Davison: Okay.

[End of interview]