JEFF CARDENAS (Session 2)

May 21, 1998

Interviewers: Rebecca Wright, Carol Butler, Mark Davison

Wright: Today is May 21 [1998]. Today's interview for the Shuttle-Mir Oral History Project is with Jeff Cardenas, who is co-chair of Working Group 6 and previously served as the Operations and Training Integrated Product Team [IPT] leader. Interviewers are Rebecca Wright, Mark Davison, and Carol Butler.

Thanks again for spending time with us. We would like for you to start by explaining your role with the Shuttle-Mir Project.

Cardenas: As you mentioned, initially I started off as the Operations and Training IPT lead, and basically for all the mission preparation and execution aspects of implementing the NASA-Mir Research Program. Since that time, though, for about the last six months, I've also been the co-chair, in the sense that we have a Russian counterpart, so the co-chair for the MOIWG, which is the Mir Operations Integration Working Group, and that's been roughly since January of this year.

Wright: What was your previous role, and what helped you prepare to take on the role you have now?

Cardenas: Having done the operations and training aspects of it roughly the last six to nine months of this program, I've been involved primarily in the training and operations aspects itself, so it was a natural fit to take over the other duties, the other duties within our working group that I had not been doing before such as hardware processing and preparation, but that was very low level, and the contractor's in a good position to pick up that job and basically we provide some direction and oversight on the NASA side.

Prior to this program, I had been involved in some Space Station and some Spacelab efforts, which we believe gave us a good foundation to start off going into Phase One.

Wright: What was your first real job in the Shuttle-Mir Program?

Cardenas: The first job I had was kind of, I guess you would call it, for Mir-18, which was Dr. [Norman] Thagard's flight. Didn't really have a title. It was kind of like an operations point of contact, just with regards to preparing the timelines and procedures and ground support teams to support Dr. Thagard in Moscow. Then once the mission got started, it kind of evolved into a NASA operations lead over there. So I did about two or three tours over in Moscow during Mir-18.

Wright: Was it a natural flow for you, or was there lots of changes and challenges from your previous role in taking on this--

Cardenas: It was a natural progression. It was an evolution in the sense of what I had been doing before, because prior to that time on the Space Station programs, I was kind of an operations point of contact for those efforts. So it was a natural fit. It was a challenge in the sense of this was something we, NASA, had not done before in long-duration flights and working with the Russians, in particular. So it was a challenge in a good sense.

Wright: Could you give us some examples of some of the challenges that you had to meet?

Cardenas: We never planned on sending people to support the space flight from a ground support role for more than a couple of weeks at a time. It was always usually either at JSC or another NASA center, Marshall, usually, in particular. So we never had to send people long-term to various locations. We never had to give them all the tools and processes that they would need to work over there. Russia is basically, especially at that time, a Third World country. So it was somewhat of an eye-opening experience, trying to pick the right people for the right job and get all that stuff in place, especially with regards to the crew, getting the crew members prepared, trying to figure out what they would need two or three months down the line to do their job.

Actually, in some cases it was easier working with the Russians than with, say, the mind-set that NASA had at that time about the traditional way of doing Shuttle flights and the way Phase One was looked at early on.

Wright: Could you explain a little bit more about that?

Cardenas: I think my perception is that early on it was looked at as somewhat just a flash-in-the-pan kind of one-shot kind of deal, that Mir-18 wasn't really going to lead to anything, it was just a science research program that was off doing some common efforts with the Russians, and that was going to be the end of it. I don't think early on it was envisioned that it would grow to this and become part of the Phase One to Phase Two kinds of projects with regards to Station. So it did not get a lot of support, I think, from an operations perspective and a training perspective. We tried to put the same structure and discipline into the preparation for those flights, but that required support services and tools of processes from outside our directorate, and we weren't always getting those in a timely fashion. It wasn't given maybe the cognizance at the Center.

Wright: Do you feel like the Mir-18 went well, since all of the challenges were there and experiences that no one had had?

Cardenas: Relatively speaking, yes. Even going in, you knew you were buying into some risk, but you didn't really know downstream, because we had never had the experience of what the negative aspects would be necessarily. For example, if you didn't prepare for this or for that, you weren't really sure how it was going to hit you two months from now. You were kind of speculating, because you'd never been through this before. So I guess the thing is, when you buy into risk, make sure everyone buys into it and they understand what's there, that you're not just biting the bullet and agreeing to proceed on, that the team as a whole--and that would include the flight crews--understand what the shortcomings are going to be.

Wright: While you were the ops lead for Mir-18, I imagine your duties just kept getting added on every day. Could you give us some examples of the different areas that you had to cover or some of the questions that were asked to you, that you had to come up with the answers for?

Cardenas: Usually just a lot of things with regards to the long-duration space flight, how you were going to handle some of the products that are being returned, either on Soyuz or on the Shuttle, how those things were going to be handled. If someone should get sick or just through normal attrition, how were you going to replace people? There's a lot of the group interactions that you see. I'm sure that the Navy has studies on that, and Antarctic expeditions have run into this, of basically having a small team of people somewhat isolated for long periods of time. Luckily, we haven't seen much of that until lately--the negative aspects of the group dynamics. We haven't seen that till lately. I think what's complicated is that the more people that are over there that come from different organizations, different ways of doing business, and you throw them together in Moscow. After a certain time, their nerves get frayed and that kind of stuff. Plus, a lot of people, they've been working this three or four years. I think they're tired. They're just kind of wearing out. So it's those type of things, kinds of things you associate with people interacting with other people.

A lot of things have come up. There's always new challenges, things we can expect. A lot of times on the Russian side there's not a lot of coordination between their different houses, the group that's responsible for flight control, in comparison with the group that does integration of flight hardware, that kind of thing. So you will have coordinated things with one group and you've got to be sure the other group knows about it, because they won't always talk, because they are still so very much of a vertical hierarchy, very tied to compartments with the sense that they don't always do a lot of horizontal integration in talking with each other.

Wright: Could you walk us through a couple of yours days as ops lead over there?

Cardenas: Usually a typical example of a lead over there--and I'm sure you can get more details from the leads that have been there since me--usually first thing in the morning, try to get there before the first com pass with the crew. It's transportation from Moscow, because Korolev is about, depending on the traffic, thirty, forty-five minutes roughly northeast of Moscow. It's kind of out in the suburbs. That's where Energia is located at the Control Center. So you try to get there about an hour before the first com pass, go down and talk to the shift flight directors for that day, see what's happened overnight, any updates to any of the Mir systems, anything that's impacted negatively, the events for the day. Go over, kind of script what you're going to say, because roughly the pass--you've got a morning pass and an evening pass that are dedicated with the American crew members, so you have roughly about ten minutes on each pass. In some cases you may have to share that time with the surgeon if there's something that he needs to talk about. Kind of script, go over the day's events with the crew member, any uplink messages that he may have been sent overnight that he should be looking for. Basically you're just trying to give him a thumbnail sketch of what's coming up on the day for that first pass.

For the rest of the day, usually both following what the crew member is doing that day and also preparing for three or four days down the line. For example, if there are new messages that need to go out to tell him how actually to do this experiment, or if it's something associated with the Mir system, those have to be already in process, in work, has to be coordinated, of course, on the Russian side, both from a science and engineering standpoint. So it's shepherding a lot of these activities. There is a staff over there that's responsible for this, so it's basically making sure at the end of your shift that at the end of each day that everything is done, that the responsible party has completed the job. So depending on the shifts that you're working that day, usually you're out of there by five or six in the evening.

If you come in later on the days that you work the later shift, usually you will come in around two or three in the afternoon. You have a tag-up back with Houston around 5 p.m. These are Moscow times. Five p.m. Moscow time, which is roughly eight o'clock over here, and tag up around that time, basically talking about what's happened during the day and the things that are going on, because the majority of the people show up on the Houston side by eight o'clock, so you're filling them in as far as what's happened overnight. Then usually you're out of there, I imagine, by around eleven.

So basically you're trying to cover the day from beginning to end as far as being available to talk to the crew member. That's not only your duty as an ops leader, but also there's a backup. We instituted the backup position for NASA 3 because it's just too much of a workload to ask a single person to cover that much. Also, as I mentioned, you also have the flight surgeon's support as needed.

Wright: You mentioned you were there several times. Every time that you'd go, did you have something different to do? Or was what you did this time pretty much the same?

Cardenas: I first started going over in April of '94, so each time we went over we were preparing computers, understanding how their process works. Like I said, a normal day in the life of the things that would be required of us with the Russian side. So I was over there about three or four times in '94 setting these things up. We took a couple of trips to Europe to talk to European counterparts about how they did things, that kind of thing.

In '95, once he launched, I was going about every other month. Basically at that time it was basically to support the mission. Shortly after that time, we were told we were also going to take responsibility for what's called the Phase One-B aspects, so, NASA 2 through NASA 7. At that time it was only NASA 5 aspects. We were going over there starting to put the ground work in place just for the follow-on flights. So it was kind of a little bit of both. I would work actually from a flight support standpoint for three to four weeks, then I'd usually tack on a couple of weeks to finish the planning for the follow-on efforts.

Wright: What were your experiences like in Russia? Was that your first time to go, associated with this program?

Cardenas: Yes. Very good. I've enjoyed working with them very much. No real negative. It's a big world, you know, so just a lot of different people and different attitudes.

Wright: How long was your stay there each time? Would it vary?

Cardenas: It varied. The longest stay I ever had, I think, was about six or seven weeks.

Wright: Are you planning to go back soon?

Cardenas: I'm going the tenth of June, in about two or three weeks.

Wright: Is that part of the close-up?

Cardenas: Yes, we'll be closing some things down, also kind of doing a final push in preparation for the final few months of this flight with the cosmonauts, and then we're returning, I think, roughly mid-August.

Wright: We still have experiments?

Cardenas: Yes, about three or four experiments will be continuing on after the American crew member leaves on STS-91. They'll be docking, I think, around the eighth or ninth of June, so our plan is to get there shortly after that. Then we've got about two months. I won't be staying there two months, but the team will be in place about another two months there. A lot of the things we'll be turning over to the station guys, because they're also establishing a base over there, not in the same physical location, but in the same building. So a lot of our computers and some other things will be turned over to them either in June or in August.

Wright: What are your duties and roles as far as the science areas are concerned?

Cardenas: With regards to the science, the way it's structured within Phase One is you have basically one group, one organization responsible for managing the science requirements, and then it's our responsibility to actually go off and do feasibility assessments on the requirements and form those into some kind of implementation plan on each increment, and then also establish and process some systems across all increments so you have a way of doing business. As far as the science, strictly speaking, our responsibility lies on doing evaluations and feasibility assessments on that. Not everything that's agreed to that, yes, it's a definite requirement can be implemented, of course, so you decide, well, do you carry this thing below the line if there's an experiment of opportunity that comes up, that you can move it back over, move it above the line, rather? Or do you just roll this over to another increment, to another mission?

Wright: In the course of Phase One, was there one increment more challenging than the other regarding the science aspect?

Cardenas: The science itself, no. I would say it was the level of preparation of the payload, of the flight hardware and the associated science with it. It's not to put that in necessarily a negative light, but part of the concerns that we had with this program is because the funding has come so late for the PIs. They've had to try to do several things at the same time. A lot of times they don't actually come together [unclear] for launch, or even during the flight. They don't actually figure out how this thing would have worked, or you'll run into instances where they've never seen this before on the ground just because of the short development cycle. So the challenge or the interesting aspects of that is watching all this play together sometimes at the last minute and trying to sort that out, because strictly speaking, you set a target. You set a milestone. There's a reason for that, and if it misses the milestone, say, okay, we're going to allow one, but do you allow one experiment to do it, not two? Two, not three? Three, not four? Where do you draw the line? Because basically you're increasing the workload of what you've got to do. You've sorted this thing out and you've put

together a schedule based on what you think you can accomplish within a certain amount of time. If there are delays, you are constantly juggling against delays.

So, as I said, it's not a challenge in the sense of the science; it's a challenge in the sense of the payload that's associated, the limitation aspects of it. Overall, if you look at the increments, no two increments have been the same. We've never really had a nominal increment, if you want to call it that, because NASA 2 was extended for several weeks. That was Shannon's [Lucid] first flight. So we didn't really know what nominal was per se. A lot of the things we've learned from Thagard we fixed for Shannon, the negative aspects. So that was a step up. So we didn't really know how well they were going to work. So it was a try.

For NASA 3, with John Blaha, our ops lead resigned, plus we had a change in Russian crews, so that was awkward. For NASA 4, of course, they had the fire. For NASA 5, they had the collision. For NASA 6, they swapped crews on the American side. For NASA 7, again we swapped crews, so granted we had a few more months' preparation that we didn't for 6, but still there was some new aspects in it, some things that he had been involved in, that Dave Wolf had been involved in, rather, that Andy Thomas had not, just because he served as a backup.

Wright: At least you can say it's never been boring from one day to the next.

Cardenas: That's true. So we've probably gone down every avenue. We didn't have a lot of backup systems because of our budget. We couldn't have a lot of contingency plans in place, but the ones we did seem to have worked, and a lot of times we had to be very dynamic and very creative coming up with a solution. Rather than spending three or four months going off and analyzing them, we had to come up with an answer usually within weeks.

Wright: That had to be very challenging, to come up with a real-time system in real time, without any planning to do any--

Cardenas: Yes. Basically you want to make sure you've got the process in place to address the issue, even though you've never seen the issue before. At least you have the right people in place. You have the right processes to deal with the issue. In some cases we've been kind of fortunate because with regards to payloads, the success criteria is a little different than you would, say, a vehicle system. So there's a difference between mission criticality and mission success. So we're fortunate in that. But, of course, the budget reflected that you're only working payloads, not systems. So we've had to tack on some things later in the life of the program, like getting additional engineers to develop timelines and following the actual Mir vehicle subsystems.

Wright: Were you involved in preparing the crew for the experiments?

Cardenas: Not directly, but I oversaw it. I didn't directly sit down with the crew and explain how this experiment will operate.

Wright: It sounds like a lot of what you did was making sure everything was in place for other people to take care of.

Cardenas: Yes. Basically we had to manage and we had to make sure the process was in place, that this is the way we're going to do business and this is what people are accountable for and these are the records we're going to keep and this is how we're going to track it so we have some idea of metrics and we have some feedback mechanism to follow this stuff through, so we know what improvements need to be made and how to prepare for the debriefs with the crew members post flight.

Wright: When we talked last time, we talked about how everything was prepared for the missions and the increments. What happens when everything would come back? You've got one coming, you've got one going. Could you explain some of the processes that took place for the exchanges?

Cardenas: In finishing one increment, there are a lot of things we have to do: process the data products returning. Any hardware returning has to be inspected. If there are any problems identified in orbit, they have to be inspected from that standpoint, about closing out any problems or any fault analyses done. So that's just closing one increment. But in fact, you have to jump right into the next increment, so our ops team, for the most part, the guys who do the daily console-sitting, basically would just roll over to the next mission. The leads for those groups basically would follow the previous missions, so they would do all the close-up paperwork, the reports that had to be written, leading the debriefs with the crew members, building on those lessons learned, and then rolling into the increment going on right now. So it was very dynamic. It was very important that you had good working relationships across the different managers and different leads on that, to make sure things got done and things didn't fall through the crack. Inevitably they would, but at least try to keep those things sporadic and minor. It's when things start stacking up on top of each other that things get carried away.

Wright: I can see why you'd see yourself coming and going, trying to get the one that's up being maintained correctly and then the one that was just finished, trying to finish that work up, but you're planning for--

Cardenas: Right. When you're talking about roughly forty experiments per mission, it's hard to keep track of what's manifested on what. Was that last increment, this increment, or two downstream?

Wright: Working in a group just in the NASA environment, I'm sure lots of people have different philosophies. But then we were working, as you said, with different counterparts. Did those philosophies mesh well when you started working with the Russians, or did you have to exchange ideas so that you could find the processes that they accepted upon the Mir?

Cardenas: Between ourselves and the Russians?

Wright: Yes.

Cardenas: Usually we tried to come into the situation very open-minded, somewhat naive, maybe, in the sense that we were there to learn from their experiences. We were to ask them, because not a lot was documented. You couldn't go to something that explained why this was done this way or even how it worked necessarily. You had to go to talk to people in terms of why they did things the way they do. What other options have they looked at? Had they even thought about certain things? For the most part, they had thought about 70, 80 percent of things. A lot of it was just difference in culture, with the American culture, about the way of doing things. Just different outlooks, different technology problems. And then also just different approaches in process based on their engineering approach. So we try to go in there fairly open-minded. We try to be fairly receptive, where we thought we could make improvements. We didn't try to install something just because it was the NASA way or the American way of doing things.

We tried to look at the benefits of doing it that way and if it had some roots in the way agreements were being made for Phase Two. We tried not to get into the mind-set of, "Well, you guys are going to have to do it this way because this is the way you're going to have to do it five years from now in Phase Two." We tried to say, "The arrangements and the processes that we can agree to now, we can have a positive effect on Phase Two," and help them tweak their system to be more receptive. So, rather than imposing Phase Two on us, we try to say, "We're going to try to take the Phase One lesson, carry it over to Phase Two." Because the feeling was, within Phase One, especially on the NASA-Mir Program, that was relevant real-time experience, whereas a lot of the Phase Two concepts were based on either a Shuttle or a Spacelab mentality, which was basically two weeks. The advantage of Phase Two is that you had technology behind it in the sense that any shortcomings from the Russian experience that were based purely on technology, you could probably overcome in Phase Two. But you didn't want to get in the situation of saying, "We'll put more computers on and that will solve the problem."

Wright: Was there a resistance to all of the change, or did people want to do things for the Mir as you had done them before for the Shuttle? Did they see that there was going to be a difference?

Cardenas: On the Russian side?

Wright: And American side.

Cardenas: There wasn't much resistance on the American side. They were fairly open-minded, the group that we were then. I think overall within Phase One, there was a little bit of a challenge because you had some of the more traditional groups, like, say, mission operations or safety came to it from a very structured point of view based on NASA's approach, both regards to payloads and the things that we control, especially between our working group and John Uri's. I think they were fairly open-minded. There didn't seem to be much resistance. We were just looking at getting the job done in a way that we could build for the future. One other thing is, we didn't want to spend a lot of time putting something in place that was never going to be used again, a concept or approach. Of course, there are things like that as far as certain documentation that the Russians would require, and it would be foolhardy to try to get them to change into a station way of doing business when they weren't going to manage that anyway. But we basically tried to get as short as possible distance on getting some things done and giving stations something to build on.

Wright: Do you feel like Phase One was as successful as everyone wanted it to be when it first started?

Cardenas: Let me put it this way: the way Phase One ended, the scope and the objectives of Phase One roughly, say, in the last six months [unclear], is different than what it started out to be. So there's been some, I would say, change in direction, but some mission creep in what it was responsible to do, what it set out to do. I'm not saying that's necessarily something wrong.

Wright: Sure.

Cardenas: It's just you're measuring the success of which criteria.

Wright: Right.

Cardenas: I think given the original criteria we set for ourselves, yes, I think it was successful. Given what we've ended up with, I would say, yes, it's successful, given that those tasks were added on either after certain events or late in the flow. And they're not diametrically opposed necessarily, but there is some slant there.

Wright: It just grew and grew.

Cardenas: It just grew into something else. So you can try to go back and say [unclear] we're changing the scope and direction of this program.

Wright: The point that you were able to meet those expectations as they continued to grow is a success in itself, that the team was able to rise to the occasion over and over again to meet the changing scope.

Cardenas: Yes. You could probably say that. Even though some people griped about these additional tasks coming on and not necessarily additional bodies or budgets, I think there was this [unclear], "We'll just throw another couple of million on it and we'll take care of these other jobs." Well, that's fine, but you don't find these people just off the street. It took us a little while to prepare these people, to train them. We can't just grab somebody out of school, or we can't just grab somebody, extra bodies from the Shuttle side to do this job necessarily, because there's a learning curve.

Wright: I guess when you were mentioning about trying to find people to train, the jobs were so many, you weren't just training people for payload.

Cardenas: Right.

Wright: You were training for all these different areas, is that correct?

Cardenas: Yes, because a lot of our training up front, the training that the crew member went through was somewhat, from a payload standpoint, from our responsibilities, was Mir in terms of on the ground, in terms of what we did for the flight controllers. So a lot of them would actually go to some of the crew training sessions so they could observe the crew interactions, so they understood what the issue would be two or three months down the line. We had the same investigators when they would come to test their hardware, to train the crew. They'd also stay over extra days to train our people. Question-and-answers-type sessions also, and bring the hardware. We tried to pattern it very similar so they were all on the same page.

Wright: Looking back over the years that you've spent, is there a high point that you feel for yourself as well as for the program that you've contributed for?

Cardenas: I guess it depends how you establish priorities. I think from a professional aspect, as we mentioned briefly, it's being able to address and to meet certain challenges that have come up in a timely fashion and how you handle those things, and seeing the process work, if you will. I think from a personal aspect, I think it's more just working with people, and working with people of different cultures in that sense. So that's somewhat independent of the job at hand, necessarily; could have been anything. Could have been building a water-treatment plant somewhere or something like that. That would be more on a personal nature.

Wright: You were able to visit with the Europeans as well. Can you tell us about those experiences, going over there?

Cardenas: It was kind of interesting at first, because they take a little bit of a lower-key approach to all this. They have a smaller team working, so trying to actually corner them and get some time was a little bit difficult, because they were also very busy and their mission was kind of further along than ours. But once we sat down, they came in with the same approach. They came in somewhat with the Shuttle mind-set and a Spacelab mind-set in working with the Russians, so they wanted to use the same way they had done business with NASA, they were going to do that with the Russians. So we were able, I think, to avoid probably 30 to 40 percent of the early mistakes just by talking to them, things that we obviously knew weren't going to work or just even faux pas that you don't want to get into with the Russians.

They also suffered the kind of same thing, they were looked at as kind of a little side project by the European Space Agency, and there was no real relations between what they were doing and what the Russians in the efforts for the International Space Station. So they were kind of under the same constraints in some cases. But it was very enjoyable. We still stay in touch with those guys. I'm sure we'll run into them again on station in some of these projects. So it was very enjoyable working with them, some common lessons. We actually tried to get into some cooperative efforts on some of the things, but just the schedules and the budgets [unclear], because it would have been a new task, and they didn't have additional monies, we didn't have additional monies to go out and work it. We were just hoping our things would converge at certain times and we could get some synergy out of that. It was going to require more effort and we just didn't have the ability.

Wright: Was it just the ESA? Were there specific countries involved?

Cardenas: We worked with ESA out of Noordwjk, Holland because they had two missions with the Russians. We also had a couple of discussions with Germans, with DARA, out of Munich and also in Cologne. They had flown with the Russians prior to the Europeans and they also had one flight during the NASA-Mir Program. So we actually sent a guy to Munich for some of their debriefs. The French had two missions during ours, so we met with them in Toulouse, in southern France, and we talked about some common areas of interest with regards to science, with regards to operations and engineering. So we tried to also kind of be the glue between them. If we were doing one thing with ESA, we wanted to see if we could then the next step piggyback on with the French or the Germans, etc. So, again, that was going to take additional effort to shepherd that through, and we always had that ability.

Wright: When you say "piggyback," is that for payloads?

Cardenas: Just on some of the projects in general. There was some actual payloads that have both PIs, for example, hardwares being flown with the French and was staying over there. The investigator was still involved as part of NASA-Mir. So from an investigator standpoint, they seem much more closely aligned about things they wanted to do. From the actual implementation, because it was done through different space agencies, national space agencies, I shouldn't say--I wouldn't use the word "break down"; there was just not as much continuous coordination on that. I think in some cases--and this is somewhat of a subjective comment--if you show that you can get somebody else to do this job for you and you're just going to [unclear], that means, of course, less budget for you or less task for you. So it's probably in your best interest actually to overload your plate initially.

For example, one of the things we were looking at is on computers, laptop computers and on-board crew systems that support that, and timelines and how they better manage the crew to manage their time on orbit, because this concept was totally different than the work they do on station, so we thought if we could actually develop and improve it on Phase One, it would have some carryover on station. But the problem was, this was an additional task. You were going to need programmers and software developers on this. That was beyond our scope for what we had to do, was beyond the scope for ESA. ESA had a plan to launch a laptop and have this version. They were upgraded to one version next to us. We were going to learn from it, build on that. The next version was going to be given to the French. So each time you could do it incrementally and, from a ground standpoint, you could compare notes on what you learned and continue to improve the product.

The problem was, though, on the ESA side, they were very interested in doing that. The French side, not really too much. And on our side, the astronauts weren't interested at all. So it kind of petered out.

Wright: The communications that you personally had with the astronauts or, I guess, mostly Thagard, were there comments that came to you? Were they issues that you could handle? Were you mostly a person that went and found answers for them? Could you tell us about those?

Cardenas: It depends on the nature. If they were detailed questions about a payload operation or something like that, usually I would just have to take notes. It depends on the situation. In some cases I was kind of thrown into it as a stopgap to cover some stuff. So I'd say about 60, 70 percent of the questions I could answer, depending on what he had. That was both for Thagard and for Blaha, because we also had to go over there for Blaha for some time. Because I had a lot of things to cover, it was hard to get in-depth knowledge on any one particular area. So usually we had the team there. Most of the crew members actually prefer

talking to a different variety of people, so basically what we did is we would put different people on the [console as Cap] Com, some of the other engineers and science support people. They like the variety, talking to different people. We just want to make sure whoever is on there is knowledgeable and they can conduct themselves to be somewhat expedient in a ten-minute pass. Sometimes the crew members just wanted to chitchat about different things. It worked out.

Wright: I can certainly understand that. I can't imagine that, but I can understand that they'd like to hear different voices.

Cardenas: Right. And there's a ham radio capability on board the Mir, so they use that a lot from a diversionary standpoint.

Wright: Were you involved in making sure all that worked well?

Cardenas: No. Actually, that's being done out of the Medical Operations Group. I don't know if you've got something scheduled with those guys, but they can give you more detail about some of that. Al Holland is actually the guy who's doing that.

Wright: We'll ask him. What do you see now for yourself or for the Shuttle-Mir Program in your involvement? Will you spend the next three or four months helping to close things down?

Cardenas: Yes. As I mentioned, the real-time operations aspect is going on through August. Shortly after that we have some baseline data collection, which will be done on the cosmonauts in September out of Moscow, so we have some hardware that has to be out there to support that. Then it will be returned. So once that comes back here, we have to disposition that hardware, close some of the final reports out, some of the things. So, roughly by September-October, even though the rest of the Phase One is essentially over shortly after 91, ours will go roughly through September-October, closing some things out.

Wright: I'm sure you'll be busy up until the last very minute, if there is a last very minute.

Cardenas: That's true. That's true. I think it will come to a graceful halt, but I don't think it will be abrupt. I can see now the workload diminishing some. It's not to say problems don't keep up, but the things that would consume you day after day, eight, ten hours a day, are kind of dwindling away and now it's a little more--I'd consider it just clerical kind of stuff.

Wright: Are you adapting to the slower pace after all these years?

Cardenas: Yes and no, because I'm not used to not having to work fifty hours a week, so it's like--what do they say in Chicago? If the winds stop, people would fall down. I mean, that's kind of what you feel like, because we're not used to--a couple of guys who have left, they said, "I'm not used to sitting around and wondering where I'm going to go for lunch today." We're used to catching lunch when we can a lot of times, you know, from seven to six very easily.

Wright: It's a heck of a diet plan.

Cardenas: That's true. That's true. And also the responsibility. Because it's a small group, especially on the Civil Service side, I think we've been given a lot of responsibility and authority within a very small group. I don't think you'll find that in too many other projects. I know you won't find that in Station. So I think some of the people who have gone over there have been a little bit frustrated: "I'm used to doing all this and having this authority and getting all this stuff done, and I come over here and I'm responsible for this little box."

Wright: I guess flexibility is real important in Mir as well as real-time decision-making.

Cardenas: Yes. And very early on, I think anyone who couldn't do that we had to kind of leave behind.

Wright: That expression "hit the ground running" just hasn't stopped yet.

Cardenas: That's true. That's true.

Wright: At least now you're to a jog.

Cardenas: [Laughter] Yes. Yes, that's true.

Wright: Get up and go again. That's all that I have. I was going to ask Mark or Carol if they have anything that they'd like to ask you, if that's okay.

Cardenas: No problem.

Wright: Do you have some questions?

Davison: I wanted to ask you what you miss the most when you spent the time over in Russia and went back to the States. That's a question we've asked some of the different folks.

Cardenas: Nothing, really. Of course, family and friends and stuff like that, but you weren't able to talk to people. I think what was maybe the most frustrating is because you're in a new situation and you weren't

able--you were able to talk to other Americans and people you worked with, but you weren't able to just go out and strike up a conversation with someone on the street, because our language skills were lacking. So, that aspect. You look at it as, say, like a trip or a vacation or something, but you weren't able to fully take advantage of it because of the language. It's not like going to Canada; you can just talk to people. You could get around fairly easy in Moscow, but as far as meeting other people and things like that, sometimes it would take a while. Plus I think there was a little bit of hesitancy because of the situation over there, not being always safe in certain areas and certain restrictions. You didn't always feel maybe like you had that freedom in some cases. Some people did. Some people who had traveled extensively didn't have that problem. There were even some people who had been to Russia before, so they just kind of picked up where they left off. But I think that was it.

I think the biggest thing that helped me personally about not trying to get too homesick or something is basically going over there, especially for the longer trips, basically when you go over there, is you'll be coming home when the job is done, whether that's in two weeks or two months, because if you say, "Okay, I'm coming home on the twentieth," and the twentieth comes and goes, you know, it's almost like you go into depression, it seemed like.

I had had that experience once before. I had a job at the Cape, supposed to go down there for three or four days for a test. Well, it turned into three or four weeks because they kept having problems and it kept being delayed, delayed, delayed. That was really grueling, because you always think, "Okay, in two days I'm going home." You can't get into that, because it's really hard to snap out of it if you do that.

Wright: We always laugh, "The twentieth of what month?" Or somebody will say, "We'll have it for you in two weeks." We always want to ask them, "Two weeks from?"

Cardenas: Two weeks from when.

Wright: We've learned.

Cardenas: I think that was it. You just looked at it as an experience, as an experience. I think it would have been a little bit different if you'd gone for two years. I think maybe the guys who had been over there longer, the ops leads who had been there for four or five months, they probably had a little different perspective on that. Some of the people from the embassy go there for two years' time.

Wright: Did you have any problems adjusting because you were there for whatever point of time and then you came back? I'm sure you did hit the ground running right back when you got here. There wasn't any time for rest?

Cardenas: I think the only problem was more physical in a sense, because the climate there was dry, especially during the winter. Your skin starts flaking and stuff like that. Then if you come back here, especially in the fall, in October, if you go there in October, it's fairly cool, you come back here, it's still humid. So you come back and it's--

Wright: Kinda? [Laughter]

Cardenas: You're carrying coats and gloves and stuff like that, and you're gasping for breath when you get back here, it's so thick.

Wright: And it's not going to go away, that we know for sure.

Cardenas: Yes. That's what I told the guys, "Gee, you're missing all this wonderful weather here with the smoke and the haze and the heat."

Wright: "Welcome to the Gulf coast. We didn't know we'd have to add to the list."

Cardenas: I mean, [unclear] to go to Russia. In this case, you'd miss some horrible weather in the last month.

Wright: Yes, that's true. You have more?

Davison: I have a follow-on to that. I think you and Rebecca touched on it a little bit. Do you feel like you were a traveling salesman living out of a suitcase?

Cardenas: Sometimes, yes. Actually, you just unpack the dirty clothes, because especially in like '95, when I was going like every other month, when you're gone for five, six weeks at a time, you don't really unpack everything, so you've got everything there and you kind of figure out what works, what doesn't work, what shoes not to take, that kind of stuff. It's hard, because the first time you've been there, and when you haven't been there in a certain month, you don't really know what the weather's like and how it's changed. So you're not sure what do I need to bring. Especially in the wintertime with sweaters. You almost double just the volume of stuff you need to take, because you need to bring more undershirts and sweaters and things like that. But I think as it is now, although with all the trips I've been there in every month, I kind of know what to expect. The thing is, it's really expensive over there, so you don't want to buy anything over there, if you forgot like a sweater or something like that.

Wright: And at least when you're traveling here, if you forget your toothbrush, you can go find a local store and buy it.

Cardenas: Right.

Wright: But I guess there, that was a--

Cardenas: Well, when we first went, it was really hard, but now you can find a lot of what you'd call the luxury items. They're fairly convenient and they're reasonably priced. It's not outrageous.

Wright: So you've watched the country change as well as you've watched the program change.

Cardenas: Yes, and you kind of wonder, though, because you see the average person on the street, and for us it's not a big deal to buy average things off the shelves, because it's in line with our prices over here, but you wonder if the average person can afford these kinds of things. There's a lot of markets, there's a lot of stores. Someone can afford it. There's obviously a demand somewhere.

Wright: The people that you worked with in Russia, were they what you would consider the average people on the street?

Cardenas: I would say so, yes. They're not paid very well. They may be more receptive and open to us, but I have not seen any change in their economic status. If anything, it's the opposite. We've seen some people let go, for whatever reason, because the money isn't there in the government and so on.

No one we've worked with very, very closely, but they're not there anymore. So you kind of wonder what keeps them going, what's in it for them. Usually, though, it's the older guys, because, to them, having worked through all their early space programs, some of those guys, their first job out of school, out of technical school, in the industry was like the times that we were being born. So there's a large generation gap in that sense. I guess to them this is a natural closure, part of their career as it's winding down, working together on something like this.

Wright: Do you see a progression within the Russia folks that you've worked with, different ages, or are they very old and your age? Is there a long line of people?

Cardenas: There's a group. I think, roughly, the guys we work with are over forty-five, over fifty, and then there's a big gap. There's some younger ones. There's not really too many what you would call middle age, say thirty to forty-five. There's a few. There's some younger ones out of school, but most of them are older

and all the information is locked up in their heads. There's not a lot that's written down. So there's not this influx of fresh blood, if you will, in that sense.

Wright: Mark, do you have more?

Davison: I've got one more question. When we first went over there, they told us not to drink the water, bring bottled water, bring little snacks. I was just curious if your diet while you were over there kind of evolved from "Bring your own food" to enjoying Russian Georgian food, how that kind of transpired.

Cardenas: Early on, we ate a lot of meals in the hotel just because we didn't know what was around. Not to say that we wouldn't have gone out; we just didn't know what was around because it was a fairly small group. So as more stuff came around, we got more familiar and then we would go venture around. So it wasn't any shyness on my part away from the food; it was just not knowing what was available. But once you start walking around and you find a store you can buy some things, you can just eat in your room, eat breakfast rather than going out. The only thing is, the restaurants aren't, but in the hotel it's very expensive to eat, so breakfast is like twenty, twenty-five dollars. It's a buffet, but that's a lot of food. Then you just to take a nap or something.

So I haven't really shied away from anything from the beginning. As a matter of fact, the only bad experience I had was in the restaurant because there was some mayonnaise that was sitting out under a heat light for a long time. I pretty much ate anything. It's funny, because I've been with guys who are sitting there watching me eat this stuff. We'd go out to the canteen, where the Energia facilities are, and they're like, "You're going to die." It's okay. It's just a different way of making it. Now, some of the stuff, it's very high fat and it's like a diet. You would think from a couple of hundred years ago they're going to work in the field all day and they need those kind of nutrients. So I don't think the Russian diet is kept up with the lifestyle today, but so far as the food, though, I haven't minded too much. I'll eat pretty much of anything.

Wright: Sounds like you've had such a [unclear] experience. You have any regrets, what you wish you would have done at some point?

Cardenas: Well, in the sense that you always wish you had six months. It's like in school. "Gee, I wish I had started this paper a week earlier," or something like that. You always think, "If I had an extra two months, I could have done a better job on this," or, "I could have done that." All things considered, I think we did a decent job for what we had.

Wright: From what we've learned from all the people that we've talked to so far, and I'm sure we'll hear it confirmed again, is that it was a great group of people that worked together to get a lot done.

Cardenas: Yes, I think so. I think a lot of people kind of bit their tongue and pulled together to pull it off.

Wright: You should be very proud of what you've done.

Cardenas: You know, it needed to be done, so--

Wright: Mark, any more?

Davison: I've already said I only had one more question.

Cardenas: We'll splice that part out.

Davison: Were you ever able to go into a Russian apartment of the people you work with?

Cardenas: Yes, and that's one thing that really interested me early on, but you didn't know how to do it. You didn't know, because they're very status or image-conscious, because we wear nice clothes and their clothes sometimes are older and they can't afford new things. So you're very hesitant about just asking to see or just inviting yourself over, kind of thing. So I went to a couple. They were what we would call fairly spartan. Anything you've seen in movies or books, pretty much like that, the average Russian place. Bathrooms bordering on things we would be accustomed to seeing in a gas station, kind of thing. But one thing I found is they are very generous with what they have. They don't hold back. I think, from my understanding, it's a big commitment on their part to invite a Westerner to their apartment, especially an American, who they think is going to judge them or look down on them for what they have or don't have. But they basically share everything they have. I guess if you give them a gift, they think nothing of, in turn, giving that gift to someone else, because it's very important to them to share what they have, what little they have. So there were actually, I think, about three or four occasions.

One of the interpreters at the Control Center, who was instrumental in bringing us a lot together, because he was actually on staff. He worked for Tsnimash, which is the facility that runs the Control Center. His English was very good, so he also worked as an interpreter. He was, early on, one of our interpreters and he also supported [unclear]. I think Bill Reeves knows him. He was very good. He invited us over to his house several times for like a late lunch. Unfortunately, the last time he did that, I could not come because my manager was with me, so I could not sneak out to go to lunch. And the fellow died a month later. He had pancreatic cancer. But he was very giving, very warm.

Wright: One of the things about the language, we're so comfortable just talking back and forth. Did you ever feel awkward, having an interpreter there, that you had to wait and hear the answers? Our thought move so quickly sometimes.

Cardenas: Yes, especially when it's in a social situation, because you can't just idle chitchat or you try to make it very brief. So that's what I'm saying. That aspect would be very frustrating. I think it was more indicative of us not having a better command of Russian, which I think, all things considered, we should send people off for six months to go learn and then send them, but there was no time to do that.

Wright: No six months to do that.

Cardenas: No, and I took the initial class and I tried to take the next level, which is about a four- or five-week, and I think two or three hours a day for three or four days. I only got halfway through because I kept being pulled out and paged and this and that. It made it hard to finish. Yes, it makes you somewhat, I think--I've seen how they live. To be honest, it's not they as opposed to us; it's probably the rest of the world as opposed to us. I mean, you look and you think if the majority of the world lives this way, or roughly the standard, we're the exceptions, yet are we the ideal? They're perfectly happy and content. They don't have all the material things. I lived in Germany a while and I saw that while in Germany, because from a material standpoint they're very well off, yet especially in the younger Germans--and I'm not trying to preach anything--but they're not overly a religious people, from what I could tell, because none of the neighbors I knew ever went to church or anything. But there seemed to be something lacking in them, whether it was religion or whether it was philosophy or something. There seemed to be something lacking, something more. I think in Germany the family is important also, but it doesn't have the same strength that it does in the Russian society and culture. So there's a balance there. I guess it's what you need.

Wright: Looking back, would you turn it down if someone offered this opportunity again?

Cardenas: No, no. No, not at all. Like I said, there's more things you would like to have a little more control over, more time or more money. I don't think there's any big goof-ups; I think a lot of them were like snowballs, things that got away from you. So, overall, I think we're happy.

Wright: That's great. You have one more?

Davison: Yes.

Wright: It's okay. [Laughter] I just didn't want to not have anything left. Is that it?

Davison: That's all.

Wright: Okay. Thank you so much.

Cardenas: Sure. Thank you.

[End of interview]