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EDITED ORAL HISTORY TRANSCRIPT

PEGGY A. WHITSON
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is August 8th, 2012. This interview with Dr. Peggy Whitson is being conducted in Houston, Texas, for the JSC Oral History Project. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright. Thanks again for taking time to join us.

WHITSON: No problem at all, happy to be here.

ROSS-NAZZAL: Tell us about your interest in the space program as a kid. Did you follow the Apollo program?

WHITSON: Yes, very much. I hate to date myself, but I was nine when I watched Neil [A. Armstrong] and Buzz [Aldrin] walk on the Moon, and as any nine-year-old thought, "Wow, cool job!" I think it became a real goal of mine, something more tangible anyway, when I graduated from high school. It happened to be the year they picked the first female astronauts. So that was at a time when I said, "Okay, it's possible to be an astronaut." I had no idea, being raised in rural Iowa, about the workings of how NASA or astronaut selection occurred. I just decided I wanted to become an astronaut. Luckily maybe, I had no idea how hard it would be. I just pursued that goal.

I didn't tell a lot of people that was what I wanted to be, because where I grew up that was not the kind of thing you talked about, bragged about, or wanted to say to anyone. My advisers in college wanted me to go to medical school, and I really wanted to do graduate research in biochemistry. They knew James [A.] Van Allen at the University of Iowa [Iowa City]. Since they knew I was interested in NASA, they said, "Well, we'll introduce you to James Van Allen, if you go look at the medical school."

ROSS-NAZZAL: Deal!

WHITSON: I agreed to go look at the medical school in order to get the opportunity to meet Dr. Van Allen.

I think it was late '80 or early '81. I told him that I wanted to become an astronaut. He said, "Oh, you don't need to become an astronaut. We have the Shuttle program but it's not going to last very long. You won't want to waste your time doing that. So don't worry about it. We're going to do all this robotically." That was my encouragement from Dr. Van Allen. Luckily I didn't really listen to him, but it was still exciting to meet him and get to go into his lab and see some space hardware they were working on. I was accepted into graduate school at Rice University [Houston, Texas] in biochemistry, rather than the MD thing. I think it was the right choice for me.

In part it appealed to me to come to Rice because it was close to the Johnson Space Center so that was part of the decision process. Obviously it was a very good school for biochemistry and they offered the best funding, so a lot of other factors played in that decision, but it was one step closer in my mind to being where I wanted to be eventually. After I finished graduate school, I did a short postdoctoral fellowship at Rice and then was accepted as a National Research Council fellow here at the Johnson Space Center. Before I got that offer, I also had another offer from an investigator at the Salk Institute [for Biological Studies, San Diego, California] to come and work in his laboratory. When I called him to tell him I was turning down his position for the one at the Johnson Space Center, he said that I was making the biggest mistake of my life. I sure I wish I'd remembered his name. I'd have loved to have called him from the Space Station.

So I started doing a postdoctoral fellowship here in the biochemistry laboratory, doing some independent research. A year and a half later I was asked by Krug Life Sciences— they were Krug International at the time, later became Wyle Life Sciences—to become the supervisor of the biochemistry laboratories. I did that for a year and a half and then became a civil servant in 1989. I did three years between finishing at Rice before I became a civil servant at the Johnson Space Center. So it wasn't long. I always have said I never had a real job, because I've always done what I wanted, which was work at NASA.

I started working just again from the civil servant side then as the supervisor of the biochemistry laboratories. My research then was involved in looking at renal stone risk in the astronauts. We had several publications on that over the years and culminated with testing out a countermeasure on board Space Station. So that was a great experience.

Interestingly, shortly after I became a civil servant, I was asked by Carolyn [L.] Huntoon to be the lead of a joint US-Russian Science Mission Working Group. At the time it was actually US-Soviet Union, in 1989. That was a very interesting time. My first trip to Russia we had 13 containers of hardware that we were taking over to set up a laboratory that would be able to do the similar types of renal stone risk analysis on their cosmonauts as what we were doing on the astronauts. I remember landing in Moscow, with the snow blowing sideways, and wondering "What am I doing here?"

ROSS-NAZZAL: Did you speak Russian at the time?

WHITSON: No, I didn't speak Russian at the time. We had an interpreter there with us. She was phenomenal. It was just really interesting learning about the Russian culture and just how very different some aspects were. At the time there was considerable bias against women. I joked, "Welcome to Russia, set your watch back 40 years!" They had a very different idea of what a woman's role should be, so it took some time to develop a mutual level of respect that allowed us to work together. I became later the head of the Science Working Group for the Shuttle-Mir program. I think that work that I did internationally was probably what made me stand out a bit when I was later interviewed to become an astronaut.

Of course all this time I was applying to be an astronaut. Over the course of 10 years I applied every year. After 10 years, I got my first interview, and was lucky enough to be selected then. So I always try and tell young people it might take a while, so you have to keep persevering to reach your goals.

The work that I did with the Russians, as part of the joint US-Russian working group, was very interesting. When we were developing a joint program in Russia to fly Norm [Norman E.] Thagard as the first US crew member on board the Mir space station and an exchange program to fly Sergei Krikalev to fly on board the Shuttle. We were involved in developing the training program, getting all the hardware to Russia in order to conduct comparable data collection on the crew members, and developing the procedures for the crew members to use on orbit.

Of course all of this was being worked through the Russians, in the Russian system, to be done via the Russian mission control. We had a very small team of people working that very first flight. It was a really unique time, because I had been told to just make it happen, and I wasn't really given much guidance. Just get it done. Right before the flight, at the flight readiness review, I had just only 11 science charts, so it wasn't a big portion of the flight readiness review.

Because people had been so unaware of what was involved and what we were doing, it took me three hours to go through those 11 charts. We had to have a delta flight readiness review to cover other questions that I couldn't cover just orally in the first presentation. It was a small group of people that made this happen. Although, it was actually one of the most challenging efforts/experiences that I've ever had to do from a leadership perspective, it was one of the best learning experiences, because I really was just out there with a very small team trying to make something happen, figuring out how to make things work, what to negotiate for, what to trade for, and what we needed to do to get everything done. So it was a really really challenging and exciting time.

I think as much as I was wanted to be an astronaut over the course of those 10 years, the experiences during that time made me a better astronaut later on. At the time, of course, I was impatient. That international experience was one of the most challenging times in my life, probably the hardest thing I've ever done, but the most satisfying. It was a very good experience, but not one I would ever choose to repeat! After Norm flew, we had seven other crew members lined up to fly similar joint missions. I had worked with a team of seven, and the next group had a team of 100 or so trying to handle all of the different things that were going on. In retrospect, it was very satisfying that we had accomplished so much.

ROSS-NAZZAL: You had mentioned when you went to Russia you should set your clocks back 40 years. Can you talk about some of those attitudes, and how you were originally greeted when you went over there?

WHITSON: Yes, on my very first trip it was wintertime, very cold. I showed up with a sweater on the first day and while we were having tea, the medical doctor that was my counterpart asked me, "So did you knit that sweater?" I replied, "No, I didn't knit the sweater, I bought it at a store." The next day I showed up with a different sweater and he once again asked if I knitted the sweater. Of course, I hadn't knitted that one either. It was very surprising to him, not only that I would have two different sweaters, because they didn't have a lot, but even more so that I didn't knit either one of them.

One other negotiation—this was as little bit later on, probably a year or two later, when it was actually Russia instead of the Soviet Union. A Russian male counterpart I was working with asked me to do something which I knew was not what the people in charge, which was Carolyn Huntoon and her Russian counterpart, had asked us to do. I told him that was not consistent with their plan and that we could not do it that way. He said to me in Russian, which I didn't understand at the time was, that I was too stupid to understand why we needed to do it this his way. The poor interpreter did not want to translate this, but eventually I explained that I needed to understand what he was saying in order to know how to work the issue. Eventually the interpreter told me what was said and I was able to get the bosses to verify their direction. The Russian doctor was a little upset with me about that, but we were able to move forward after that.

ROSS-NAZZAL: How did you end up handling it?

WHITSON: In that particular case, when I finally figured out there was going to be no logic that was going to win this argument, I just went back to Dr. Huntoon and asked that they repeat their directions to make sure we were all working from the same starting point.

ROSS-NAZZAL: "I'm the representative."

WHITSON: I was just trying to implement what we were directed to be working on and I just asked that they repeat what they had said previously.

ROSS-NAZZAL: So how long were you over there the first time, when it was still the Soviet Union?

WHITSON: I was there on two or three trips when it was still the Soviet Union. The first trip was just a week. I think all of them were a week, maybe the last one was two weeks. I was in Saint Petersburg the week prior to the coup. When I got home, all the news agencies were covering the coup, I told my friends it was because they're hungry. We had had porridge, a lot. During that time when the Russians came visit us in the US we paid for them and provided everything, and when we went to Russia they paid and provided everything. The food provided was porridge, porridge, and little wieners and porridge. I am sure it was a very tough time for the population then, and porridge was just a small part of it. Obviously things have changed dramatically in Russia since then. At that time there was no traffic jams. There were no cars on the street. In one instance a cosmonaut doctor who owned a car, was driving me to the hospital. He couldn't find it. We had to stop and ask for directions three or four times. It was obvious he'd not driven much and instead had used public transportation.

Now there are billboards and signs and everywhere, and back then there was occasionally just a sign that would say *myaso* for meat or *produkty* for other produce. You had to know where to go to shop, and people would be in lines all the time. It has changed dramatically since that timeframe, but it's really interesting to compare starting in 1989 and see how much things have changed in Russia.

ROSS-NAZZAL: Did you work with anybody who had worked in the ASTP [Apollo-Soyuz Test Project]?

WHITSON: Yes, I didn't work directly with a lot of folks. Some of the investigators were from the ASTP program. Many of the engineers involved in mission control who worked with our MOD [Mission Operations Directorate] had worked on the ASTP program with them. It's impressive that some of the guys that I still interact with, like the search and rescue fellows that pick up the Soyuz returning crew even now, some of those guys were involved as far back as the ASTP. It's a small group of folks. They do one thing their whole life, like me. It's interesting to talk to them now from their perspectives.

ROSS-NAZZAL: Were they welcoming? The fact that you were an American coming over to Russia?

WHITSON: During the initial phases they were very welcoming because we were bringing in hardware and capability that they didn't have, and so they were very interested in having us there. I feel that I was very successful over time developing relationships with the Russians and developing that respect. I don't think that's that much different than what happens here at JSC. When I first started at JSC there were many times I was in meetings and I would be the only female in the meeting.

I remember one big meeting. It was a big briefing to the Center staff about the Shuttle-Mir program and the science program. After I had completed the briefing, one of the guys, because it was all guys in the room, came up to me and said, maybe with a tad bit of surprise in his tone, "You did a really nice job." I was thinking, "I just did my job. You're just saying that because I happen to be a woman." I didn't of course confront him with that, but I did recognize that doing a good job can help overcome some biases.

ROSS-NAZZAL: This was in the early '90s.

WHITSON: Yes.

ROSS-NAZZAL: So JSC was still very much a male organization, you think?

WHITSON: It was at that time, but it has changed dramatically. Now if I'm the only woman in the room it's unusual, as opposed to at that time when I was the only woman in the room it was typical. So, yes, I think we have changed a lot.

ROSS-NAZZAL: Who was on your original team? You mentioned you had seven people working this effort.

WHITSON: Yes. They were all part of the Wyle, or at the time Krug Life Sciences contract. John [J.] McBrine, Matt Muller, Kathryn Linneger, Patti Holler, Amalour Veloso were the key players. Of those folks, John actually works here in the Astronaut Office as one of our chief engineers for ISS [International Space Station] operations. He was a phenomenal asset to our team, just an incredible workhorse to get things done and make things happen.

ROSS-NAZZAL: That's great.

WHITSON: Yes.

ROSS-NAZZAL: Tell us about coming up with everything that you had to come up with from scratch, plus working with people from a very different culture. Were you working here in Houston and then you would get together and meet and hammer out the details?

WHITSON: During that time we were getting a lot of things together. We shipped over three tons of scientific hardware to Star City. We received a truckload of it one time; we had two guys there [John and Matt] and myself. Some of it was pretty big hardware, big freezers and refrigerators and centrifuges. The Russians initially weren't helping us unload the hardware. However, as soon as I started to pick something up, one of the Russians would come over and take it away from me because as a woman, I wasn't supposed to carry anything. So I developed a strategy in which I would to go pick something up, and a Russian would come and take it away from me. I would tell them which floor we wanted it carried up to, because the elevator, of course, was broken.

It was very effective. I would go pick something up, wait for that guy to carry it away. Another guy would show up. I'd go pick up something else.

ROSS-NAZZAL: So being a woman could be powerful in some ways.

WHITSON: If you knew how to take advantage of it, it worked. I'm sorry. I don't remember the other question.

ROSS-NAZZAL: We were talking about working out some of those details.

WHITSON: Yes, so I would spend a couple weeks here working with the team here on procedures and timeline development. Then I would go spend a couple weeks in Russia. We would actually help with either crew training or assist in getting all the hardware set up and prepared to go. Simple things like power supplies that weren't working; all the nuances of starting something there in Russia without really having any infrastructure. We were basically starting from scratch to build up the capability to collect data and analyze some types of data there. We were doing neurovestibular studies, cardiovascular studies, biochemical studies, primarily focused on human life sciences. We had to have the basic hardware to either stabilize samples or collect data and then send the data back for analysis. It was a fun exciting time. I would spend a lot of time going back and forth from here to Russia. I'd spend a couple weeks there, two or three weeks here, and then go back, just to keep both ends of the train moving.

ROSS-NAZZAL: Were you working just on American experiments?

WHITSON: These were all joint experiments with the Russians. So there was a lot of getting the investigators together to agree on protocols and procedures, who was going to provide what hardware, who was going to take which measurements. We would have larger Science Working Group meetings where we would take over 15 or so investigators at a time and meet with the Russians and talk with their experts in the common fields to develop the experiments that we would do jointly during that timeframe, and vice versa. We would bring them over here to meet with bigger teams that were here, just depending on what topics we were working on.

We also had to work with all the hardware providers. The majority of experimental flight hardware was built here at JSC. So we had a group of folks working to get the hardware that we needed and get it shipped to Russia at the right time. One of the more interesting experiences I had as I went over there during the Shuttle-Mir program, the initial phase, the Phase 1A program, which involved just one Shuttle flight on which a cosmonaut flew and one Mir station flight on which an astronaut flew. That first phase was called Phase 1A. It was all quid pro quo; a matter of making trades that would make the team successful. That's where I think I had to develop most of my negotiation skills, because we didn't get anything done that we didn't talk somebody into or trade something for, the whole give-and-take thing of negotiation. So, for me, that was a real learning experience.

In Phase 1B we ended up paying for a lot of different services to get different things that we needed as part of the program. I went over to have a meeting about both phases of the program, because they overlapped. My Russian Phase 1A counterpart didn't show up to the meeting. I told the investigators that showed up to discuss Phase 1B that we couldn't work out our issues with Phase 1A then I don't really think there's anything to talk about in Phase 1B. I stood up and walked out of the negotiation. As I was walking out I said, "Somebody make sure the van is downstairs."

That got everyone's attention. My counterpart showed up at the hotel that afternoon. He came to me, and told me, unofficially, that they were going to have to delay the Spektr launch, which was where all our science hardware was being carried. He said, "I can't officially tell you that until Monday." I asked him what he envisioned my options might be, since the science program was the entire justification for the joint program.

He confided that we might be able to get 100 kilograms of mass up on a Progress in order to get the science hardware on orbit while our crew member was going to be there. So my team in Russia and the hardware folks at JSC spent the whole weekend working, coming up with what could we strip out of the Spektr module to put in a Progress. We ended up negotiating 200 kilograms' worth of hardware to be flown on a Progress. I had taken his unofficial target and I doubled it. We ended up getting it all, because they were not meeting their commitment to provide the Spektr module on time. It was not ideal for the science plan, but we were able to get a lot more out of the science program than we thought we ever would get after the Spektr slip. So that was an interesting example of negotiation during that timeframe.

Another interesting negotiation was here in the US. I was meeting with the representatives from the Gagarin Cosmonaut Training Center. Yuri Glazkov, a former cosmonaut, was the deputy chief of the Gagarin Cosmonaut Training Center at that time. We were discussing some details for what we needed to do as part of the training plan for the crew members.

We talked. Over the break I said, "Okay, I'll write down what I think we agreed to." I wrote it down, got it interpreted, and then handed it back to him after the break. He read it. He and his deputy started disputing loudly that they had not agreed to that. So I took the piece of paper, wadded it up, threw it over my shoulder, and said, "I think you should write it down this time then." Yuri in the end replied, "No, no, I think if you just change this word and this word I think it'll be what we were talking about." Afterward Yuri asked me "Where did you learn to negotiate like that?" I replied, "From you!"

ROSS-NAZZAL: Did you negotiate with any women? Were there Russian women on the team?

WHITSON: There very few women on their team. They still have—and she's an icon—one of their neurovestibular [scientists], Inessa Kozlovskaya. She has led their neurovestibular research since they've been flying guys in space. She has to be more than 80 years old now. She's a hard-nosed, go-getter, because she had to be in order to be successful there, but she is an amazing lady too.

ROSS-NAZZAL: So where did you stay when you were constantly going back and forth? Did NASA arrange to have some sort of space for you?

WHITSON: We had lodging in what's called the Profilaktorium, which is actually a little hotel that was built during ASTP. It's basically a small hotel at the Gagarin Cosmonaut Training Center. When we had big meetings, they were typically in Moscow, and we would stay at a hotel.

ROSS-NAZZAL: Was the food better?

WHITSON: By then we were paying our own way, and we picked our hotels and our food.

ROSS-NAZZAL: Probably a little better with the introduction of capitalism, maybe?

WHITSON: Yes, definitely. Initially, during the Soviet era, there were restaurants that we were not allowed to enter. You had to be the right party member, or have the right connections in order to enter certain restaurants. After the coup, restaurants started to spring up all over.

ROSS-NAZZAL: Talk about training the crew. I understand training in Russia is quite different from here in the States. Can you talk about how you came up with training procedures?

WHITSON: We actually trained the crew with our US trainers for the scientific investigations. We just had to negotiate for the time on the crew member schedule, provide what the training objectives were, in order to ensure that once they got to orbit our crew members would be able to perform these different procedures. So the payload training there was not that much different than what was conducted in the US. It was I would say rougher in the sense that we were doing a lot of things that were new and didn't have previously developed training flows. So we were starting out new training flows and moving them to Russia as opposed to doing them here and working the kinks out here. So that is another level of complexity.

Of course payload training was just a portion of what crew members had to know, since they also had to learn all about the Mir and the Soyuz vehicle. That training flow then for them was about a year long and they only infrequently returned to the US during that time.

Now the training flow for the International Space Station is that we train in five different countries, so it is a different experience. Crew members are traveling all the time. It gets to the point where we even call being in the United States a "US trip" in addition to the "Russia trip," "Japan trip," "Canada trip," or "European trip." So it's a different mindset since it's an International Space Station. Each country has some desire to have their training on their modules or their facilities in their country for political reasons and to get the support of their constituency to maintain their part of the space program. So it's an important thing to have, but it's really hard on the crew members.

When I was assigning crew members I'd say, "Welcome to the ISS training flow. Expect to not be sleep-shifted for 25 percent of your life the next two and a half years." It's a lot of traveling around internationally with very dramatic time changes. In most of the cases you're in classes one or two at a time so it's not like you can be the one taking a nap. Besides the fact that they're actually trying to teach us stuff that's going to save our lives so we want to be awake for it. But it's grueling. So I think in some senses training in one country as they did in the Shuttle-Mir timeframe was maybe a little easier from that perspective. But it was a huge hurdle for a lot of our crew members who hadn't had the Russian training and were getting thrown into having to do homework in Russian, reading everything in Russian, going to classes all in Russian. We still have to go to classes in Russian, but we have translated text books now.

Luckily when we get trained in Japan, Europe and Canada, it's all in English. So Russian is the only language that we have to have some knowledge of. This requirement is because the Soyuz launching and landing vehicle requires some Russian knowledge to be able to work safely in that environment and interact well with our Russian crewmates. That aspect of the language is particularly important.

ROSS-NAZZAL: Were you there for Norm Thagard's launch?

WHITSON: I was there for Norm's launch. It was the first Soyuz launch I'd ever seen. It was a really interesting experience. It was one of those snow blowing sideways kind of days. The vehicle launched and went almost immediately into the clouds so we didn't get to see a lot of the launch itself, but it was still an honor to be there. I had seen a Shuttle launch before then. So the difference in seeing a launch from Shuttle viewing is you're about three miles away but it's a much bigger impact, bigger engine lifting capability, bigger rocket, everything. Compared to the Soyuz, you're only a mile away but it's a much smaller rocket. It's impressive for both, to see either one of them launch. And it is especially meaningful when you know the crew inside.

ROSS-NAZZAL: So what did you end up learning from the Shuttle-Mir program as a scientist?

WHITSON: As a scientist, we got our first long duration data, for my particular investigation, on renal stone risk in cosmonauts. So that was an important data point for us, from my particular science perspective. Other investigators were doing a lot of comparisons too. Neurovestibular, cardiovascular, other biochemical data had been collected on short duration fliers because we had an abundance of Shuttle fliers, and we collected a lot of human life sciences data on them. But we didn't have that longer duration piece of the puzzle. So the Shuttle-Mir program provided us some overlap in that data collection. It gave us some long duration fliers, US and Russian together, that we were collecting the data on, and sharing the data.

This was a good learning phase before the ISS program started. These types of investigations are going to be critical for us in terms of taking the next step from a human life sciences perspective in going to someplace more distant like Mars.

ROSS-NAZZAL: I understand while you were working on this effort you still maintained a position back here as I think Deputy Division Chief for the Medical Sciences Division.

WHITSON: Yes, eventually near the end of my tenure, I think it was probably about a year, year and a half, I became the Deputy Division Chief for Medical Sciences. Basically it was maintaining all the life sciences laboratories. I had that perspective anyway from the Mission Science Working Group. Since that was the major thrust of the investigations at the time, it made a lot of sense that I would be in charge of the group as a whole and be the deputy for that group of people. So it worked out very nicely.

ROSS-NAZZAL: Not too much additional burden.

WHITSON: It wasn't, luckily.

ROSS-NAZZAL: Tell us about the phone call that you received once you found out that finally your desire to become an astronaut had been fulfilled.

WHITSON: I believe Jim [James D.] Wetherbee was the chair of the selection board and the head of Flight Crew Operations at the time, and Bob [Robert D.] Cabana, was the chief of the Astronaut Office and deputy chair of the selection board at the time. There were all kinds of rumors that if Bob called you that meant you didn't get picked, whereas if Jim called you were selected. So when Bob Cabana called me, he was making small talk with me and I was thinking, "Just tell me," because I knew I wasn't going to be selected. He finally asked me, "Well, how would you like to come work for me?" I very enthusiastically yelled "Yes! Of course!" I was so surprised because I was expecting that he would be telling me no, try again next time. So it was a very happy moment for me.

It was fulfilling because it had been something I'd wanted for so long. It came at a very good time in my life where I think I needed to do something different anyway. I had worked very hard on the Shuttle-Mir program, and I never assumed that I would ever get burned out, thinking that only happened to wusses. But I was there. I needed to do something different, and it was a good learning lesson for me physically to know that, no matter how strong I think I am, I could actually push myself too far. It is very important to take care of yourself as part of the process of doing your job. That was a good transition point for me, perfect timing in my life.

ROSS-NAZZAL: Tell us about the training that you undertook. I understand it was two years. That's pretty lengthy.

WHITSON: Well, actually the basic astronaut candidate training is about a year and a half, two years. Then once we are assigned to a flight, another 8 to 14 months additional training is needed for a Shuttle flight and 3 to 5 years (at that time) for an ISS flight. Training flows for the ISS were long in part because things were slipping but also just because the training program wasn't developed enough yet to know how much training we needed. So the initial phase, that first basic training phase during astronaut candidacy, which we call AsCan [Astronaut Candidate] training, we were doing all different kinds of things: flying backseat in a T-38, doing survival training, and Shuttle and ISS systems training.

We had to complete the Shuttle training as well as all the ISS training as part of the basic training so that we would be considered assignable. A lot of that training was pretty challenging for me. Coming from a biomedical background, a lot of the engineering stuff wasn't trivial. While ascent and entry were difficult new concepts for me, life support systems were relatively easy for me. Anything involving pumps and fluids and moving things, made a lot of sense to me. But the electrical power systems were more challenging, as was orbital mechanics. Of all those things, the hardest was Russian language for me. We've got some really really talented folks that picked up Russian language relatively quickly. For me it was an ordeal. I'm still searching for that language center of my brain. I tell the new guys, "After the first 10 years it gets a lot easier. Don't worry about it." So that initial phase of training it was pretty exciting just doing all the new and different things. As I said it was at a perfect time in my life to do something different.

After I got through that basic training, I was assigned to a technical job within the Astronaut Office. So most of an astronaut's life is not the fun glamorous flying in space part but it's actually supporting development of, for instance, procedures or being a CapCom [Capsule Communicator] or helping with training events or preparing training events for other crew members.

My first job was in the ISS Branch. I was involved in actually setting up a small group of astronauts who became part of our crew test support activities in Russia. We would interface with Russian hardware or procedures that involved US crew members, so for instance all the labeling, the dual-language procedure development. We had a US treadmill that was interfaced in the Russian segment, and we were involved in the fit checks with that and any other fit checks of hardware that US crew members were expected to interface with in the Russian segment.

So I got to be in all the modules before they launched, making sure everything was labeled correctly, and that the procedures accurately conveyed the procedures so that if US crew members would be successful.

It was an interesting time. At that time I spent probably about 70 percent of my time in Russia. I was in that position when I was selected to fly a mission. Probably a week or two before that I'd been in a meeting with Charlie [Charles J.] Precourt who was the chief of the office at the time. He had talked to me about a Shuttle flight that I might be on. I indicated that I would love but that the sooner I get to Station the better.

A couple weeks later there was some ISS crew change-outs, and a new opening. Instead of a Shuttle flight, I was assigned to an ISS flight. That was Expedition 5, backing up for Expedition 3. Expedition 1 through 4 had been in training for three or four years in some cases. So it was a little bit late to be going into a training flow.

I was flying with two Russian cosmonauts. We were going to launch and land on a Shuttle, and that's how it ended up being, however over the course of the training flow we iterated through all the options, launching on Soyuz, landing on Shuttle, vice versa, etc. The crew also ended up changing a bit. Originally it was supposed to be Elena [V.] Kondakova and Valery [G.] Korzun and myself. Elena ended up going into politics, and they replaced her with Sergei [Y.] Treschev. So that was the crew I ended up flying with for my first flight.

So I had a two-and-a-half-year training flow for my first flight, which was short for the time period that we had then for a training flow. It was a very exciting thing for me, one step closer flying in space.

ROSS-NAZZAL: Talk about the training. One thing that I'm interested in is the training here in the US and Russia. Also are you a generalist on everything on Station, or are you an expert in certain things? Everyone on the crew is an expert on this and that?

WHITSON: We have different levels of training: user level, operator level, and specialist level. Actually this was developed—I was involved in the different levels of qualification—after my first flight. We changed up the training program to try and optimize the training, because prior to that they had been trying to teach everybody to that specialist level. That was part of why the training flow was so long. So after my first flight I was involved with the MOD training team here to go back and revamp the training flow to really more accurately reflect what you needed to know.

So nowadays each crew member has their set of these things I'm a specialist on and then some others I might just be a user on. Then this crew member is operator on these things and specialist on this and user on this. Each crew member has their spreadsheet of different capabilities and different training. That was done also to try and reduce that long training flow.

I think it's worked a lot better that way. Our training is going to be evolving. It's not done evolving yet I don't think. Even though we've been flying the International Space Station for 10 years I see our training as still in work, and I think that's the right thing. We should be developing new things. Like right now our folks are working on what's called the just in time training where we're going to use video clips and little video descriptions to try and reduce total training time and on-orbit time to implement procedures. So I think we have to continue to change and improve our training flow. I don't think it should become static.

ROSS-NAZZAL: So you were training here in the US and also in Russia for Expedition 5?

WHITSON: For Expedition 5 I trained US and Russia and Canada. Expedition 16 was the first crew that trained in all five countries, because we had the European module arriving. We had the Japanese module arriving. Of course we had the Canadian arm that we needed to know how to use. On top of that we also had the Dextre [Special Purpose Dexterous Manipulator] arriving, which was the robotic attachment which has more fine control capabilities. So we were training in all five countries at that time. We would train in Japan, Russia, Germany is where the European Space Agency training was, Canada and here. For Expedition 5 we just trained in three countries, because it was just at that time Russia and US plus the Canadian arm.

ROSS-NAZZAL: Can you talk about some of the differences between the training in the different countries, and what was expected?

WHITSON: Canadians are like us, so I think probably I don’t see a lot of differences there. The training in Russia, they were initially much more big picture background, get your history, know all the basic knowledge, for instance, of how thermal systems work, how do you reject heat, how do you collect the heat, where do you need to reject it, all the minutiae of the details of all of that. As opposed to operationally here’s what I’m going to do on board. From the US perspective we would focus on how we can control those things on board. Without having to know the same level of minutiae of all just the physics of how this thing does this. The US is much more operational, here’s the things that we’re going to interface with, here’s big picture what we need to know in order to operate this. So it’s a contrast. I think over the years we’ve centered out a little bit closer together in what the right process is.

I think the operational perspectives obviously help you when you get on board, because if I have that operational understanding of how am I going to operate things and how am I going to fix things if something goes wrong, that is an important skill that I will actually have to implement. Now the really strong crew members are those that have that basic understanding of what goes on behind the scenes and what’s involved in all aspects of that as well.

ROSS-NAZZAL: Your crew ended up launching on STS-111. At what point did you become involved in their training, at least for ascent?

WHITSON: We started training with them a little less than a year before the flight. They were probably assigned about 11 months out from flight. Ken [Kenneth D. “Taco”] Cockrell was the commander on that flight and Paul [S.] Lockhart was the pilot, Franklin Chang-Diaz and Phillip Perrin were also on the crew. It was obviously a different dynamic than when Valery, Sergei and

I trained together vs. when we were with the 111 crew. Taco and Paco had a great sense of humor and we had a good time training with them. They were very good at including us in all aspects of the training, where they could. Time was a big issue because we were gone about half the time so when we were here [in the US] we would try and do as much together with them as we could in the training flow. We had to do some joint operations on the robotic arm together with them. They had EVA [Extravehicular Activity] guys, and we were moving their guys around on the arm. We had to train with them while they were at the NBL [Neutral Buoyancy Lab] and in the Virtual Reality Laboratory so that we could get our coordination together and be effective as a team, even though we weren't here for every training event for them.

It was really good. We had—it was probably a couple weeks' slip from our original launch date. In addition to being fun to talk to Taco during that slip timeframe, he talked about what to expect, what going into space was going to feel like, here's what you need to try and think about, here's what you need to do—little things that nobody had ever spent any time talking to me about. So that slip ended up being a good one for that exchange of information to give me just a little bit heads up of what I needed to expect going into space, because I was the first long duration flier that had not previously flown a short one from the US. They were trying to give me as much of a pre-brief as possible. "Think about this, do this, don't worry about this, it'll go away," all the different things that you're going to feel going into space. So that slip ended up being a very valuable time for me. I always look back on that and think about Taco's words of advice.

ROSS-NAZZAL: Well, take us back to that launch day, the day that you actually launched. You didn't scrub but that you were able to get up to [orbit].

WHITSON: Well, we had gotten all the way to the nine-minute hold I believe on our first launch attempt, which basically then became another what we call a TCDT, terminal countdown test, where you get fully suited up, you get in the vehicle, and you practice the whole countdown. Well, we had done that two weeks before the planned Shuttle launch. And then on our first launch attempt day, it was basically the same thing. It was interesting, because Mike L-A [Michael E. Lopez-Alegria] was on the STS-113 crew and a friend of mine. He frequently polled me and he would ask me at L [launch] minus a year, "So how close do you feel to flying in space?" I'm replied, "Ahh, 50 percent." Then after TCDT he said, "So how close do you feel now to flying in space?" I'm replied, "Well, maybe 75 percent."

On launch day we were inside the nine-minute hold and I was like, "We really are going to go today. I'm finally at 100 percent." I think each little step made it seem a little bit more real because we're in such this long long training flow. I became somewhat numb to the fact that yes eventually this is going to end in me being in space. Each day I would think, "I'm going to class, I'm going to learn about this today, I'm going to learn about that today, I'm going to review this today."

I would say you get into this almost—I wouldn't say grind, but it's just this routine of training and training and training and training. It took launch day to actually flip that switch and say, "Hey, I'm actually going to go into space."

ROSS-NAZZAL: What are your recollections of that whole eight minutes getting up there?

WHITSON: Well, there was a lot of vibration during the first two minutes forty seconds while we're on the SRBs [Solid Rocket Boosters], actually walking out to the pad even before that. Just hearing the vehicle hissing and the oxygen venting, it just feels like it's almost alive. I was on the middeck, so I didn't have a view of anything. Obviously during the six seconds before when the main engines fire up and they're testing to make sure they get all the way to the 100 percent, I felt that. Then when the SRBs light up there was no question in my mind whatsoever that we're going somewhere. It's very big push into my seat initially and then the G-forces weren't really all that bad until the last couple of minutes of the ascent, getting up to around 3-, 3 ½-Gs [gravity]. The G-forces were going through my chest, the best direction it can be, but it still makes it a little hard to breathe, which goes nicely with my story about where I got to do 8.2Gs on my reentry after my second flight.

The 3-Gs seemed dramatic at the time, and in retrospect I say, "Nah." Then zero-G. When the main engines cut off and I was floating—I had to quickly get up into the flight deck to get the camera out and the video camera out to photograph and videotape the external tank as we separated from it. I was so worried, since it was my first flight, and I of course didn't want to screw up. Thinking I've got to get my helmet off, got to get my gloves off, but had to hand them off to Valery on my right so that they wouldn't float away, while I unstrapped and floated up the stairs. I'd choreographed each little step in my head, because I had to be up there quick. And then to get up on the flight deck and actually get to see out the windows, Earth from space, it was so distracting. We managed to get the pictures of the tank, but I won't forget that first incredible glimpse of the Earth.

ROSS-NAZZAL: I can imagine it was an overwhelming moment for someone who'd dreamed of this for so long.

WHITSON: Yes.

ROSS-NAZZAL: So what happened next, the next couple days before you were able to actually rendezvous and dock with the Station?

WHITSON: Life on board the Shuttle is very confined, even though the Shuttle is much larger than the Soyuz. We were exercising a bit and were preparing things for the rendezvous and EVA. One of my biggest tasks was reorganizing the suit configurations because we were exchanging crew members. The Expedition 4 crew was coming home, and we [Expedition 5] were going up, but in order to save launching mass we had to piecemeal different suit pieces together to build suits that would fit the crew members that were coming home. So I was reconstructing suits in bags so that the crew members coming home would have a set of hardware and be able to get it all out and be able to do their reentry with no problem. We were just trying to do things to get ahead for that phase of the flight.

There were other activities going on as well. They were prepping suits for the EVAs. And then of course the rendezvous was very interesting. I was doing the range and range rate with the LIDAR, a radar, to the Station. It was a peripheral support task for backup to other systems, but it was still fun to be involved with the Shuttle crew in that phase.

ROSS-NAZZAL: What are your recollections of seeing the Space Station for the first time having been in those modules but actually coming at it from the Shuttle?

WHITSON: Well, to see it so brightly from such a distance was just impressive and then as we got closer and closer we're just amazed at how big it is. That was on Expedition 5. When I went back for Expedition 16 the whole truss was done except for two sets of solar arrays, one of which had been retracted in preparation for the next Shuttle mission where we moved it out to its final position.

So the football field sized truss was there, and it was just amazing to see how huge the Station had gotten in the time course between Expedition 5 and 16. The Station is just incredibly huge and it is difficult to convey complex. Each solar array is 239 feet long, and the internal volume requires minutes to fly from one end of the Station to the other.

It's big enough now that you could lose a crew member in there. As I would fly through the complex, looking into the modules, and flying to the next module and checking the adjoining modules, and sometimes had to go back in order to find someone who was behind a panel or stowage. It's amazing to see something that complicated, intricate, and sophisticated that we put together on orbit. I think ISS is miraculous as a technological achievement that all these pieces fit together when we got them to orbit, and most of them were not previously fit-checked on Earth. Elements and hardware were constructed in different countries, and they were constructed on orbit. I think it's actually amazing that we didn't have more issues and problems than we did in all of that, because it took a lot of Shuttle flights, and other flights, to get all that hardware up there, and then have it all fit together. Pretty amazing.

It actually works together. The software works together with all the different modules talking to each other and having a big one command and control process that works with all these different countries' hardware and modules. ISS is just an amazing technological feat, constructed in space.

ROSS-NAZZAL: Tell us about when you finally were able to dock with the Space Station, and then get to see the people on the other side in your new home. Is there a ritual for when a crew comes on board?

WHITSON: We were each time-lined for the various events required during the docking and hatch opening. One crew on one side of the hatch is doing a specific set of procedures, while the other crew on the opposite side of the hatch was doing a different set of procedures so that we could meet in the middle. Then we typically have a press event at that point for coming aboard crew.

The one interesting story, part of the reason I mentioned Paul Lockhart who was the pilot on STS-111. There was a late crew change-out on STS-113 so he flew his second flight six months later and came aboard on STS-113. He'd brought our crew, Expedition 5 crew, up and was bringing us home. His call sign was Paco. So he had a little sign that said Paco's Shuttle Service when he flew over the hatch. It was cute.

ROSS-NAZZAL: That's funny. So did you immediately start working on STS-111? Or were you trying to get acquainted with what was happening on Station and working on handovers and things?

WHITSON: We did some handover at the time. I was on the good end of the handover. I was being trained by two different guys. Carl [E.] Walz and Dan [Daniel W.] Bursch were trying to give me as much handover as possible during the docked timeframe. So one guy would have a few free minutes and would be showing me something, and later the other guy would show me different things.

It was worked quite well, but they had started in advance of my arrival. They both spent a lot of time sending me e-mails before launch, to give me heads up on what to expect for different things. They knew of course this was my first flight ever, and they wanted to make sure I would be successful. So they were giving me as much information as they could.

In the email handover, they'd send me stuff, and I'd send them back questions. "What do you mean by this?" They would explain in more detail or they would tell me it would be easier to show me how me when I got there.

So it was just a really really great exchange. It was much harder handover when I was the one that was trying to hand over to two people for Expedition 6. I was trying to get the same information to Don [Donald R.] Pettit and Ken [Kenneth D.] Bowersox. But it worked out, although maybe just is a little less efficient. Nowadays with the two sets of three crew with overlap, we have more time to do the handover, and we are not trying to cram it all into the seven dock days when a crew member was there. Now we always have an experienced person or two there for two to four months. Especially for me on my first flight in space, it was just so much new, so much different that it wasn't possible train on the nuances on the ground. So having that handover time was really critical for me.

ROSS-NAZZAL: Was there any advice that they gave you that was just so important—like there's a quirk with the toilet? Or there's something here in the galley that you really need to be aware of?

WHITSON: Well, that was part of the handover. They would go through and show me all the details that you can't teach on the ground. This is the kind of stuff that's stowed in this area. This thing, the procedure tells you to do it this way, but really this is how the reality of how you have to do it. It was very important timeframe. You're getting a lot of information. It just depends on how much of that you can absorb while you're trying to just figure out how to float in space, get from one place to the other, figure out how to wash your hair, or wash your body, and find your tennis shoes, all kinds of just little trivial things that living in space requires.

Even how to make your food. You can practice some of that on the ground, but that doesn't explain how you have to put your feet in the overhead handrail to hold your body in place while pushing the bag on the dispenser and holding it tight enough to get the water into the [pouch]. You have to learn that when you're up there on orbit, and somebody can give you suggestions or pointers, but some of it is just practice.

ROSS-NAZZAL: What are your recollections of 111 leaving, and your thoughts as you saw the Shuttle leaving?

WHITSON: Actually about flight day three or four after we had docked to the Station, and I was saying to myself, "I get to stay. I don't have to go away in a week." That takes some of the intensity off in the sense that I don't have to experience everything right now. I can do these things and take the time to really appreciate the view out the window, or the fact that I can just float and be amazed by that.

ROSS-NAZZAL: I was reading a lot of the letters that you have posted online from this expedition. You seemed to spend a lot of time working maintenance issues or housekeeping issues. Can you talk about some of those things that really seemed to occupy a lot of your time?

WHITSON: Well, there are a lot of maintenance issues. Some of it is preventative maintenance, and some of it is fixing things that break. It's a part of living there, as opposed to just visiting. On the Shuttle if something breaks, well, you've got two other backups, and you don't need to worry about it right now. We're landing in a week. You have flight rules to determine which of these things we can lose one of and still be okay with two or one string left. On Station we live there. We can't bring it home and have somebody refurb it. We've got to fix it while we're up there. A lot of things have broken that either we didn't have the capability or didn't expect to have to fix it. So we had to develop the capability to fix it on orbit, which is good for us. That's what we need to learn if we're going to Mars.

If we're going beyond low Earth orbit we need to know how to build hardware and how to fix hardware to make that process doable, because if you're going somewhere and spending three years on the trip you're going to have to fix things. I enjoyed doing fixing things and the maintenance. It was a lot of fun for me to do the large variety of things. The more hands-on, the more interesting it was for me. So some of the science investigations like doing the ultrasound, where it requires you develop a skill and have somebody on the ground guiding you real-time were the most interesting and challenging.

A lot of the repairs and the maintenance was very hands-on, obviously, because you have to get in there with tools and tear something apart and hopefully be able to put it back together again. So the hardest thing we ever had to take apart on the interior is the carbon dioxide removal system. During Expedition 5 was the first time we'd taken it apart. We've done it numerous times since then. Actually I did it again on Expedition 16. Dan [Daniel M.] Tani was with me on Expedition 16. I told him in advance that the task was very complex and would require a lot of attention to detail. When we got done he said, "Man, you were right, that was like taking a jet engine apart and putting it back together."

After we had performed this very complex repair, there was a payload that the ground team wanted fixed. They were all worried about whether or not I could fix it. I'm told them, "We just did the CDRA [Carbon Dioxide Removal Assembly]. This is one valve; that had about 15. I think we can handle this one valve."

ROSS-NAZZAL: Mission control uploads direction on how to fix things for you?

WHITSON: Yes, absolutely. They give us the procedures and the diagrams and tell us what to expect. It's great having mission control help you through a procedure. When something doesn't look the way the procedure describes it or the picture looks, you call the ground and say, "Hey, look at this. Is this what you're thinking?" Give them some real video. One of the funniest times that happened I was actually working on the carbon dioxide removal system, the CDRA, and Valery and I were underneath the rack. We had the whole rack tilted up, and we were trying to take apart a section on the back of it. I had the video camera on but the ground couldn't see much of what we were doing. We had been talking to the ground team and asking them questions, and they had the video on what little of us they could see. I had my toe under a handrail outside the rack. The CapCom said, "Peggy." Information on step whatever. "You need to do this. Wiggle your toe if you heard us," so I wiggled my toe. Then of course the whole mission control team starts laughing, and they keyed the mike so I knew everybody was laughing. Then I had to explain to Valery what had just happened, because he didn't understand why they were laughing.

It's special having the ground team be a part of the team on board. I never felt lonely. When I was the one solo US crew member and I had two Russian crewmates they spent 90 percent of their time in the Russian segment each day and I spent 90 percent of my day by myself. It was okay. I didn't ever feel lonely because I had this big ground control team that I would show things or talk to continuously. It was very comfortable. I never felt lonely or alone doing anything.

ROSS-NAZZAL: I also understand that one way you kept the crews entertained was you instituted a Friday night video session.

WHITSON: Yes, we did do Friday night dinner and a video. Food comes up in these containers with meats in one, breads and cereals in another, side dishes in another, such that we get different things in these different types of containers. So if I wanted to arrange a special Friday night dinner I would have to raid all these different boxes as they got opened, planning for a Friday night dinner a week or two from then. I'd stockpile from the newly opened containers as they were opened so that I would have all the components to make what I was going to make as a special treat, because I would try and make it differently than just in the prepackage. For instance, we would make hamburgers or chicken sandwiches and do something different that isn't just a packaged meal. We did apple turnovers with tortillas and an apple filling, just putting all the different pieces together in a different way. It's the same stuff, but trying to make it a little more interesting and special. So we would do dinner and a movie. We would then pick a movie and we'd take turns picking the movie we would watch. It was fun and a good way to have a planned break together as a crew.

I tended to pick more action, less speaking movies, since the nuances of language would make some movies too difficult for Russian speakers. They loved *Cast Away* because there wasn't hardly any speaking in that one, because the guy was solo most of the time and so he only talked to the soccer ball.

ROSS-NAZZAL: You also were up there over some holidays. Fourth of July, I think, Halloween and Thanksgiving. Did you do special events for those days as well?

WHITSON: We did. Thanksgiving actually we had again hoarded the food for the Thanksgiving meal so that we'd have enough. It was actually when the Shuttle crew was there. They had brought stuff too so we had enough Thanksgiving food. But it was an EVA day, so we didn't really get to spend a lot of time on that. It might have been an EVA day or the day after an EVA day. In any case, we didn't have a lot of time to spend on the meal as a whole. Usually when a Shuttle came and was docked we would invite them to have a group meal on the Station. Then they would invite us to have a group meal over on the Shuttle. It was just a way to share that hospitality.

ROSS-NAZZAL: While you were on board Expedition 5 you had a number of Progress vehicles that came. Can you talk about that and your role in accepting a vehicle?

WHITSON: For Expedition 5 I didn't have a large role in the Progress vehicles. I actually got to have the fun role of just observing. I wasn't running the TORU system [a backup remote control docking system in the Station's Zvezda Service Module] as either the prime or the secondary operator. During Expedition 16 I was the secondary operator for the Progresses and the ATV, the European Automated Transfer Vehicle. So for that phase I was the secondary operator. During Expedition 5 I didn't really have to do anything much except just help unpack. It was always fun be there as the hatch opens and you smell a bit of earth and to unpack all the fresh fruit. The first, I think, Progress arrived within three weeks of when we first arrived there. It was shortly after we'd left and so we got all this fresh fruit. It was like okay, nice. By the time the second one arrived we'd been up there for five months or so. So we really were excited about the fresh fruit. We also got onions and tomato. I told the guys, "Oh we're making hamburgers for sure because we got fresh onion and fresh tomato." It was a lot of fun to make a real hamburger, well freeze-dried tastes better with onion and tomato.

ROSS-NAZZAL: Not rehydrated stuff.

WHITSON: Well, the hamburger itself is rehydrated but other than that. It was nice to have the fresh stuff to go with it. They sent up fresh garlic. So I figured out a way to roast garlic by taking drink bags and cutting a hole in them, putting the garlic in, and then clipping it back off and then putting in a little oil, and then putting it in the food warmer. You'd roast it for three or four hours. It was good because all the other packaged food that you get doesn't have any smell. As we warm it up, it is only in cans or sealed up in the bags. Nothing has any smell. So when you put the garlic in, because the bag was not completely sealed, you just have this wafting fragrance of garlic. You don't think of the little things like the fact that your food doesn't have doesn't smell as it is cooking or you don't have that sensation going on as it's being prepared.

ROSS-NAZZAL: That's the exciting part is the anticipation of the food. You also had a Soyuz dock at one point for that expedition.

WHITSON: Yes. Our crew had trained in two different Soyuzes because that was the transition from the TM Soyuz to the TMA Soyuz. So we had to train in both vehicles. Even though we didn't launch and land in it we had to have the capability to do emergency descent in either vehicle. So that ended up being a little more training time in the Soyuzes because of that.

My role didn't change a lot in those two vehicles. I had a little bit less direct interaction in the TMA, but because my role was pretty well established as the life support person in any life support emergencies. So my role was pretty similar in both vehicles. There were a few less tasks I had to do in the TMA. So that made it easier for me from my perspective.

ROSS-NAZZAL: Tell us about the public affairs functions that you participated in on orbit.

WHITSON: We do a number of different types of public affairs, and a lot of it is based on how much crew time we've got, and what priority it gets. Typically it's a couple times a week we will have events, and they'll be scheduled. A lot of them are just media events, talking to radio stations or TV stations or reporters of some kind or another.

The ones that are actually the most fun are the educational events. It's gratifying to interact with the young people and get them excited. Doing space tricks for them and showing them a sleeping bag or food, and demonstrating how things float. These events are a lot more fun, interactive, and hopefully educational, and get young people excited about NASA and the astronaut program and us flying in space.

ROSS-NAZZAL: Were there any events or activities that really stand out in your mind from that expedition?

WHITSON: I don't know. Are you fishing for something?

ROSS-NAZZAL: No, not at all!

WHITSON: Did I write about something I'm not remembering?

ROSS-NAZZAL: No, I was just curious.

WRIGHT: Wiggle a leg.

ROSS-NAZZAL: Yes, that was new, I hadn't heard that. You of course worked with mission control in Houston but you also had mission control in Moscow. Plus you had the Payload

Operations Control Center in Huntsville [Alabama, Marshall Space Flight Center]. Can you talk about working with three of those different control centers and their different roles?

WHITSON: It was interesting working with the different centers because each has a different level of experience base and how they interact with the crew on orbit and between the crew and the ground. Houston, maybe because I hadn't been on a Shuttle crew, I was pretty relaxed in talking to them about things. If I made a mistake I fessed up and told them about it. That was not culturally what the Russians would do. In one case I had made a mistake. I'd put in several different batteries in the battery charging unit for the spacesuit, and the next day the ground called and said, "Hey, we think there might be a problem with either the battery or that block where you put one of those batteries." I pulled the battery out and I said, "There's Kapton tape on the back. I forgot to take the Kapton tape off of it. That's why it didn't charge." So I called the ground and told them. Valery happened to be there and he asked me, "Why did you tell them that? You should have just taken the tape off, put it back in, and it would have worked."

I'm explained to him that yes I could have done that, but the ground team would have spent days trying to figure out the specifics of the battery or the charger issue. I know it was my mistake, so it saves them time and trouble. The Russians get deductions, which translates into post-flight pay. So they don't tend to fess up to a lot of crew errors. I don't know if it's as bad these days. I didn't notice it as much during Expedition 16, but during Expedition 5 it was discussed more openly.

Marshall's Mission Control Center was less experienced by comparison. They were coming up to speed on how to talk to the on-orbit team efficiently and effectively. I think they've improved a lot from 5 to 16. I hope they're still continuing to improve. It's just an experience thing. During Expedition 16 we also had control centers in Cologne [Germany] for ESA and Columbus, in Toulouse, France for the ATV, and Tsukuba in Japan for the JEM. So it was a lot of control centers that we were talking to.

If I were doing work in the Japanese module and it was on a Japanese payload or Japanese piece of hardware then I'd talk to Tsukuba. Same in *Columbus*, I'd talk to Cologne. If it was about the ATV I'd talk to Toulouse. It's a lot of folks and different styles. Cultural styles [are] very different. That's a learning process for everybody to adapt to the different cultural styles but also to learn to be the most efficient and effective with the communication. So it's another one of those, I think, side benefits of working in an international program like this.

ROSS-NAZZAL: Talk to us about some of the experiments on board Expedition 5. You had about 25.

WHITSON: Yes. I always like to say I worked on everything from soybeans to superconductors on Expedition 5. One of my favorite experiments, although I didn't get to get it out very often, was the soybean experiment. Partly that's from my roots, being an Iowa farm girl, and my dad of course was growing soybeans at the same time so I would tell him about how many seedpods my soybeans had on them.

ROSS-NAZZAL: Probably a lot smaller quantity than his.

WHITSON: Definitely, but mine went up to the top of the light and then came back down. So I got to tell him about that. I mentioned before that I really like doing all the hands-on stuff.

Well, the superconductor crystal setup and the experiment apparatus was pretty complicated in how that was managed and conducted. I enjoyed working on that experiment too. Plus we had video cameras on it so that the ground could collect the videotape for the science community to monitor the re-crystallization. I always just turned the video camera out so that as I was floating by I could see what was happening on the experiment as it would melt, and then cool. We'd melt them up to 800 degrees and then let them cool off. Under different conditions of each of the crystal types you could see different things going on. So it was like my—maybe a little bit boring TV, but at least it was something to look at, as something else going on on the Station. Just as I was flying by I would check and see what was going on.

So we had a pretty wide range of different experiments. Some had more interaction than others in terms of how hands-on they were. We did another plant experiment where I was doing a lot of feeding, a little more hands-on, biotechnology experiment using cell culture, another experiment where we were looking at microencapsulation development procedures, which actually has been developed into some technology for drug delivery systems.

Some of the experiments, we just plugged in the samples and turn it on, like for zeolite or protein crystallization studies. But there was a pretty wide range of complexity in terms of how much crew interaction is involved in different experiments. Zeolite crystal growth is interesting not only from the perspective that zeolite has applications in pollution control but it was used in carbon dioxide removal on ISS. The experimental focus was to develop a crystallization procedure that would improve the crystal size and quality for ground development. A wide range of experiments was what I found interesting and exciting each day on orbit.

ROSS-NAZZAL: I think it was before [STS]-112 came up to dock, mission control in Houston was forced to power down because of a hurricane coming our way.

WHITSON: Yes.

ROSS-NAZZAL: What impact did that have on Station?

WHITSON: It was a real interesting time. We found out about it on orbit about one shift before it was going to happen. I think we were aware there was a hurricane but were not aware that it was predicted to go over Houston. So the ground called and told us they would talk to us tomorrow via Russian ground sites, which is only 10 minutes every 90 at most. We learned a lot from that MCC [Mission Control Center] power down experience. During a portion of the 10 minutes, then the ground would have me reporting on a lot of data that they were not getting down. For instance, the battery state of charge right before coming out of eclipse and other detailed data. Since that time we've changed many of the contingency MCC procedures of what data gets prioritized for down link. We've got backup now in Huntsville. So we modified a lot of our ground interfaces with the ISS as a result of that. That was, I believe, our first time we had to shut down MCC for a hurricane.

We've done it a couple of times since then, but also on the other two times, we were able to maintain voice with the crew the whole time. So we left S-band up and were able to maintain voice contact with the crew using US assets even though MCC had moved to somewhere up near Austin [Texas], Round Rock [Texas] maybe. Now they have the data that they need streamlined in order to collect all the critical info. From a crew perspective it was like, “Wow!” 10 minutes out of every 90 to ask all the questions I wanted. It gave a very different flavor.

Before I told you I never felt lonely or alone. It was very different during those two days during that process, because I didn’t have the same level of contact or interaction with folks. It was slower in the sense that they didn’t have as much that they had prepared for me that they needed me to do, because they were worried about MCC and getting everything safed and in proper condition. It was a slower time for me, but it also felt as though I were more distant from our planet because of the lack of free communication with the ground.

On orbit we have e-mail capability on board the Station and IP [Internet Protocol] phone capability. That was also down during those two days. I had less to do and no one to talk to. It was like “Hmm, this would be a little bit more challenging if you didn’t have that daily near continuous contact.” It’s a different mindset that you need.

ROSS-NAZZAL: Talk to us about preparing for 112. Were there certain things that had to be done before you accepted a Shuttle at the Station?

WHITSON: STS-112 was my first Shuttle to accept to the ISS. Obviously I’d arrived on 111 and then I sent 111 away. So I’d done the closeout procedures. This was the first one that I was accepting. It was nerve-racking. I was worried about doing everything correctly because obviously there was no handover for this phase. It worked out fine.

The experience that you get from doing it once is just huge in terms of how nervous or how much you worry about things, because after that for 113 it wasn’t nearly as big a deal and just having done it once made a huge difference.

ROSS-NAZZAL: When a crew is on board the Station, I'm curious, are you helping meet their objectives? Or are you focused primarily on Station duties and what's required to keep the Station going?

WHITSON: For each mission it's different depending on what the assets on each crew are. For STS-112 I was a robotics operator while we installed the S1 Truss. I was the prime operator for part of that, and then afterwards then there was EVA operations. Then the Shuttle crew member was the prime operator for those activities, Sandy [Sandra H.] Magnus. She and I had trained prior on the ground in each of those different roles and in the assist roles, because we assisted each other. It was actually particularly special with Sandy, a friend of mine. We had been selected in the same astronaut class. She had been one of the folks in Russia with the crew test integration group.

We had a lot of years of experience together and so it was particularly special to hang out with her. Not only during work activities, but I remember one evening we went around the world together and looked out the window.

ROSS-NAZZAL: Not many people can say they did that with their friends, can they? We're close to ending, but I wanted to ask Rebecca if she had some questions for you.

WRIGHT: Just two. I think it's an interesting decision to put someone that's never flown in space up on the expedition for a long duration flight. Was there a lot of conversation about that decision? Did you have any apprehension? Like you said, once that hatch was closed, you were there.

WHITSON: I did not have any apprehension about it. I'm sure it was discussed. I didn't know about it particularly. I think because I had so much experience with NASA that was part of the reasoning. It wasn't like I was new coming in. We have since flown rookie crewmembers first on a long duration mission. In this class, the 2009 class that we've most recently selected, they will all be rookies on their first long duration flights. They don't have that extensive experience with NASA, but we have tried specifically with them to get them the experiences that we think will be beneficial for operating on board Space Station, getting them CapCom training so they can see how operations work here on the ground before they're in a position where they are on orbit and they won't be surprised that "stand by" might mean we have to have four meetings first to make that decision.

Once a crew member has been in those meetings and seen how the process works, then they better understand when they ask a question from orbit whether or not this a short answer or long answer thing I'm looking for, should I expect an answer now or later. Just having that understanding makes it a lot easier to cope and work on board the Space Station as a rookie. But no, I didn't have any apprehension about it.

The one thing that I worried about with being with two Russian crew members, I never felt that we had the strong camaraderie. I was pretty close to Valery Korzun but not so much to Sergei. I was concerned about whether I missing out on the team aspect of the experience. I was in training in Russia once, and two Shuttle crews arrived for training just on some basic Russian segment systems so that they would understand the Russian segment. The first crew that arrived, I was thinking, "Oh man, they're just so close, so tight, they have so much fun together, they're a great group of people. Maybe I made a mistake when I said I wanted to be on an ISS crew."

Then another Shuttle crew arrived, and they were not quite as functional. They weren't the same. They didn't have the same level of camaraderie. I'm decided I was fine. "I've got some good guys I'm flying with." I felt like our crew was in between the two extremes, and we were good.

WRIGHT: In between is good. The last one, you mentioned about Carolyn Huntoon when you came. She chose you for that working group and then that lead. Can you share a little bit about working with her and what it was like? Being not many females in the workforce but yet being able to work with someone so much like Carolyn and her professional expertise.

WHITSON: Yes, it was actually a really interesting experience. I came here, and my immediate supervisor was Nitza [M.] Cintron. At that time she worked under Carolyn. I felt like I had a lot of opportunities maybe as a result of being in their chain. At least I never felt like I couldn't do something for sure. I always felt like well, hey, these women are doing working effectively at NASA, I should be able to do any of these things too.

I think that's reassuring. Not everybody has that positive of an experience. I think some people, because of the environment or the situation or the timing, might have a bit of a chip on their shoulder about being a woman. I never had that. I feel like I was lucky that I felt all I had to do is just do my job well and it'll be okay in the end. I never worried too much about any other aspects of that. I think a lot of the females from military background had a lot more actual bias presented in their lives. I didn't have that. I felt lucky because they were great role models and I just always assumed well, I can do it too. I don't think every woman is as lucky to have great role models like that around.

I don't remember. It was before the Shuttle-Mir program. It was actually when the big negotiations were going on for the Shuttle-Mir program. I was in Russia with Carolyn. She took me, but I don't really understand why she took me then. Maybe she had in mind that I was going to be in charge of it in particular. I was there with the NASA Administrator, who was making these big negotiations. I wrote a part of the protocol on the science section. I was exposed to a number of situations that I think I capitalized on pretty well.

Again I just think I had these role models that they were always there. The biggest thing they gave me was the confidence to know that I could do it too.

WRIGHT: It's a great compliment for those scientists. Thanks.

ROSS-NAZZAL: Well, thank you so much for your time today. We look forward to conversing some more tomorrow.

WHITSON: Sure thing.

[End of interview]