

NASA HEADQUARTERS ORAL HISTORY PROJECT

EDITED ORAL HISTORY TRANSCRIPT

W. MICHAEL HAWES
INTERVIEWED BY SANDRA JOHNSON
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JOHNSON: Today is August 1, 2018. This interview with Michael Hawes is being conducted at the NASA Johnson Space Center in Houston, Texas for the NASA Headquarters Oral History Project. The interviewer is Sandra Johnson, assisted by Jennifer Ross-Nazzal. I want to thank you for coming back and visiting with us again so we can get through your long career with NASA, and then your continued career.

HAWES: It's tough to be an old guy.

JOHNSON: Hey, don't say that. I think we were born the same year, so I'm okay with that. Last time we were talking about the Reston [Virginia, Space Station Program] Office and it being closed. But there were a few other things that were happening around that time we didn't really touch on, so I want to go back.

Part of it was the collapse of the Soviet Union in '92, and President [George H. W.] Bush, the first President Bush, and NASA began negotiating with the Russians. The talks in that time period, beginning to work with the Russians again, and maybe see if they would be interested in working with the Space Station.

That gave rise to what eventually was the [Space] Shuttle-Mir [Russian space station] Program, and then of course ISS [International Space Station]. Talk about those negotiations, and if you were involved with any of that at that time.

HAWES: There were a couple ways that the Reston office was involved. Most of that was being led from NASA Headquarters [Washington, DC], and one of the principals that I recall was Arnie [Arnold D.] Aldrich.

Arnie, when he was at JSC [Johnson Space Center], had been very involved in Apollo-Soyuz [Test Project], and so it made sense that Arnie in his role—and at the time Arnie was actually head of Space Station. He was in a position called the Associate Administrator for Space Development. They had gone through this development and operations split, with all the Shuttle stuff being in operations, and Space Station was considered development.

Arnie had a team of folks that started discussions with the Russians. The way that we at Space Station got involved is that they did look at “Could we simplify this assembly process and fly multiple elements of Space Station on a large Russian booster,” or something. There were a few discussions of that. They did conclude the deal which led to first Sergei [K.] Krikalev flying on the Space Shuttle, and then what emerged into Shuttle-Mir.

Sergei was going to fly on the Shuttle, and then we were going to fly on Mir. The first U.S. astronaut for Mir was Norm [Norman E.] Thagard. NASA started to build up a little bit of infrastructure in Moscow [Russia] to support Norm, although it was pretty basic in that era. I remember some pretty simplistic stories. Ultimately, it got built up much more.

We went through the first docking with Mir. Then the Russians had actually designed a docking adapter I think we called it, or docking module, which gave a greater separation for the Shuttle. We carried that up on a Shuttle flight, installed it, and docked to the Mir. That continued then, on through the rest of the crew stays. During that time, you had the fire on board

with Jerry [M.] Linenger. And then you had the collision with a [Russian] Progress supply ship during Mike [C. Michael] Foale's time.

The Reston office was really just in terms of "Can we simplify Space Station assembly and do more with that?" Then that morphed into the change of administration. The first deals for a flight on Shuttle, a flight on Mir, were cast during the George Bush—in Washington [DC], as you know, there's Bush 41 [41st President] and 43 [43rd President]. Oddly enough, they refer to each other that way. At least 43 in a conversation referred to his father as 41, which I thought was weird.

Then we went into the transition with the [President William J.] Clinton administration. At that time Space Station had cost overruns, it was a big debate during the transition. The new administration team pretty much said, "Here, NASA. You go give us options on Space Station." They specified a series of cost profiles. That led to the whole Space Station redesign activity. A bunch of us in Reston supported the redesign activities, on different teams that were set up to do that.

There was another activity then that also led to increasingly looking at "Can we do this jointly with Russia, can we bring them into the international partnership?" Again, we had folks that were involved in the beginning of moving from Shuttle-Mir to "Can we bring them into the Space Station Program?" Long story, but over time that led to the whole specification of Shuttle-Mir as Phase 1 of the Space Station Program, and learning how to deal with the Russians as the primary objective.

By the time of the accidents involving Jerry Linenger and Mike Foale, I had gone through a transition of being out of Space Station for a little while and back in. I was now the Chief Engineer for Space Station at Headquarters.

JOHNSON: During that time, like you said, there was a lot going on. In '88 I think the first agreements were signed that brought in the European partners.

HAWES: Initial partners—Europe, Canada, and Japan.

JOHNSON: Then when the negotiations started with the Russians, and when President Clinton came in, he wanted to bring Russia in. Basically he told NASA, “They’re going to become a full partner.” Talk about that and how the other partners reacted.

HAWES: If you go back and remember the bigger political environment—as Russia was transitioning from the Soviet Union, into the confederation of Soviet states, and then into Russia, there were a couple of notable instances of U.S. companies going out and employing a bunch of now available Russian scientists and engineers. The activities of NASA got cast in that same sense of, “Here’s a good thing.” We can build an alliance with Russia, the Cold War is pretty much done. We can go ahead and get some of their expertise in the space arena, and we can also hopefully help mitigate issues with arms control and tech [technology] transfer. If they are part of our program, then they are not part of someone else’s program, some rogue state’s. You had all of the political swirl going on.

The détente—if you will, to use an old word—with the Russians was really very much driven by the Vice President’s [Albert A. Gore, Jr.] office. Remember, at that time as we started with the Russians there was this Gore-Chernomyrdin [Russian Prime Minister Viktor S. Chernomyrdin] Commission. NASA was one of several entities that were involved in that. It

was all about building ties between the U.S. and Russia in cultural aspects, and science, and space. Space Station was probably the one thing in all of that that worked through the years. You had a redesigned Space Station; you had a beginning of an entrée with the Russians, which ultimately had to be formatted as all of the existing partners inviting the Russians to join. It wasn't just a U.S. unilateral action.

At times to some it probably felt that way, but in fact according to the MOUs [memoranda of understanding] it had to be the partnership inviting the Russians to join. There were lots of discussions and trades as to "How does that benefit the whole partnership?" That also drove some of the technical decisions relating to how the Russians came into the program.

But it was a major initiative of Vice President Gore, and particularly one of his key advisers, Leon [S.] Fuerth. I think Leon is actually still at George Washington University in Washington, DC. My visibility was when any NASA issues would get raised through [NASA Administrator] Dan [Daniel S.] Goldin, the Administrator typically went to Leon Fuerth in terms of discussion and resolution.

As we move down that path, all of that political background exists. NASA is trying to formulate "How can we incorporate Russia into the program?" And there are trades, we set some ground rules. We were not going to force Russia, for instance, to change their power standard to meet what the ISS was. There were a number of things technically where we were going to accept the configuration that the Russians brought, which was fundamentally their Mir configuration. In fact when we started dealing with them, the module that ultimately has become the Zvezda Service Module [SM], the flip side of it was marked "Mir-2." You could walk through it in the factory, and depending on which side you walked past you would see SM or Mir-2 on the side of it.

It was also apparent I think to many of us—I don't want to make an unattributable statement—we were going to have to put a significant amount of infrastructure in Russia to quickly incorporate the Russians into the program. To the point of what today seems almost way too simplistic. Phone lines, fax lines, just all kinds of basic items—up to, including staffing.

As we started to build up through Shuttle-Mir—and I wanted to go back to that. In this timeframe Shuttle-Mir, which had started as its own kind of program, transformed into Phase 1 of the Space Station Program. What was I think really critical in that transformation is Dan Goldin laid out a series of objectives—I think there were three—for Phase 1 of the Space Station Program.

First and foremost, he listed learning to work with the Russians. Second was learning about long-duration spaceflight. Then third, ultimately, was a science program that we would define and operate through the course of the Mir flights. Each astronaut had their science program that was unique from what the Russians were doing as well.

Casting the objectives in that path, so that it was first and foremost about learning to work with the Russians, really set the tone for how the U.S. side was approaching their tasks. It really was, and it helped build the relationships, it helped build the procedures and processes behind it. There are some really challenging discussions and debates in that both politically, programmatically, and technically.

JOHNSON: Can you give examples of those?

HAWES: I found a funny thing in my desk just the other day. It was politically expedient for us, the U.S., to say that we had the first element of Space Station. But the way that that was

executed was that we, the U.S., paid the Russians to build the FGB [Functional Cargo Block]. So it was characterized as a U.S. element. In fact, in the archaic Space Station assembly sequence language it became flight 1A/R to recognize that it was American but it was built by the Russians.

That actually was a very successful development, and it did show us that because of the financial situation of the Russian program, when they actually had funding they could do very well. They were very timely and they could respond to problems. So that was a very positive mechanism. Then everything beyond that was mostly their contribution, at least in terms of the other Russian ISS elements. Ultimately, later we got into paying for Soyuz seats and all of the business as we understand it today. There's probably a tortuous path through all of that, too.

But again, those objectives really let us focus on building the relationship, understanding how the Russians worked. We had folks over there supporting the Mir flights that were really the vanguard of that team. Folks like Bill [William H.] Gerstenmaier spent months in Russia. I think Bill was there for Shannon [M. W.] Lucid's tour. We really were building up that knowledge.

I would say we had a heritage of working with Canada, Japan, and Europe. It was through multiple programs for years and years. We had had 10 years just as a Space Station Program of working with them. There was an awful lot of background that we really had already resolved how to work with those partners. Accelerating the learning of bringing the Russians in I thought was really a positive. Not that it was without its potholes in the road, but it was a positive. The Shuttle-Mir Program itself of course had its challenges, like I said with the accidents when Jerry and Mike were on-board. That raised the whole visibility of the program in a political sense as well.

Literally the day that the collision happened with Mike, I was directed to provide a daily report on Mir operations to the White House by 8:00 in the morning. So we built a whole process, which then ultimately became the ISS Daily Report that Jesco [Hans Heinrich Max Freiherr] von Puttkamer put out for years and years and years. That's how it started. It started on the Progress collision while Mike was aboard.

The Mir of course got harder and harder to maintain. It was pretty clear that the Mir was going to reenter [the atmosphere]. We had a whole involved process of planning on our side for Mir entry. Obviously the Russians were in control and were doing it, but we had a whole government process that I was reporting to folks in the White House of how that process was going to be enacted, what the timing looked like it was going to be. We actually had meetings for several months that we would provide status to staff over in the White House. Obviously Mir landed in the ocean without incident. By that time our focus had really shifted to the full ISS partnership.

JOHNSON: There was a change of course when Reston closed and they were going to move the main focus to JSC again. Were you ever tempted to come back to JSC? I know you said in the last one that when you moved to Virginia your wife felt like she was a Virginian now. Was there any doubt in your mind?

HAWES: I think there was a little bit of a doubt. But it also had been a really challenging timeframe. I think for several of the folks—it was okay to take a pause. I think I mentioned last time I had arranged to go off to program management training in the DoD [Department of Defense], the Defense Acquisition University now it's called. That was a six-month course. So,

I wasn't even envisioning coming back to Space Station *per se*. I went off and did the training, and I came back. Arnie Aldrich was my AA [Associate Administrator] at Headquarters when I went off to school. That organization got collapsed again and I came back into an integrated Code M, Office of Space Flight, with Jed [Jeremiah W.] Pearson [III] as the boss.

Amongst all those turns I came back to a reformulated Code M, and ended up working in the Chief Engineer's office. And at one point in time I was also the Chief Engineer for the Office of Space Flight. But as people changed around after Jed, Dr. [J.] Wayne Littles from [NASA] Marshall [Space Flight Center, Huntsville, Alabama] was named Code M AA. Dr. Wayne had been the NASA Chief Engineer, and as he was assigned to take over Office of Space Flight, he determined that he wanted to have a Space Station Chief Engineer. Actually they called us senior engineers at the time. I was basically assigned as the Chief Engineer for Space Station for Headquarters, and did that for a couple years (1995-1999) until I moved up to be what was then called the Deputy Associate Administrator, or the Program Director, for ISS.

JOHNSON: Were you involved in picking the contractors for ISS or that process?

HAWES: Tangentially. When we started back in Reston they had already put out the RFPs [requests for proposal] for a program support contractor and four work package pieces. I was part of a team that went around and basically read all the proposals. What we were looking for was consistency and common content amongst the proposals.

The program support contract had already been selected. That was Grumman [Aerospace Corporation] and a whole series of teammates. The work packages were still in competition, they had not been selected yet. Work Package 1 was Marshall, and it was [The] Boeing

[Company] and Martin Marietta [Corporation]. Work Package 2 was here at JSC, and it was McDonnell Douglas [Corporation] and Rockwell [International]. Work Package 3 was at Goddard [Space Flight Center, Greenbelt, Maryland] and Work Package 4 was at then Lewis [Research Center], now Glenn [Research Center, Cleveland, Ohio]. I want to say at one point Work Package 4 was TRW [Inc.] and Rocketdyne [Division of Rockwell]. But TRW dropped out, and so they were basically a sole source kind of selection.

I had a role in reviewing the common content, but I wasn't selecting or anything in that role. Then later on, in my operations assignments in Reston, I had a whole series of folks that were of that program support contract, which over time we changed into an engineering and integration contractor. The theme at the time was that the government was really going to drive integration, and we would have a support contractor that would help us do that. As Space Station managers in Reston changed, it evolved into a stronger and stronger theme of, "No, we need the contractor to be not just us telling them what to do, but to have a much stronger engineering and integration role." So over time we morphed all that together.

When the redesign happened (1992), we also went through the President's blue-ribbon panel that was chaired by Dr. Charlie [Charles M.] Vest from MIT [Massachusetts Institute of Technology, Cambridge], they really took on the Space Station management structure hierarchy. One of their big messages was "You need a prime contractor. You have all of these peer contractors that don't listen to each other. They have to run everything up to a series of NASA project offices. You have a program office overall that can't force decisions."

There were lots of challenges that they saw in the structure, so they recommended that NASA pursue a prime. There was a whole process of going back and forth—and again I only saw pieces of that tangentially—that ended up with Boeing fundamentally being selected as the

prime. You could probably pick reasons why any of the others were candidates or not candidates. I don't really want to get into that, but Boeing ended up picked the prime.

I'm trying to think of the years, but I want to say probably the whole '93, '94 kind of timeframe was all about formulating that contract to where ultimately we had a Boeing prime contractor. Over time—and I can't remember the timing of that—Boeing actually went out and merged with McDonnell Douglas and bought the Rockwell space business. The content that was associated with the Goddard work package had actually dropped out of the program.

So Boeing ended up as the prime *de facto* because they actually bought the other pieces of the program, but it also led to a pretty dramatic restructuring of the program. Where we used to have these project offices at each of the Centers, those were dramatically reduced, and the program came back to JSC. You still had some pieces of Space Station offices, but it wasn't as hierarchical as it had been in the past. It was really much more driven from JSC.

At that point, like I said, we were more settled in the Virginia area. I wasn't really looking to come down to JSC and do the same kind of thing that I had been doing in Reston.

JOHNSON: During that whole time period, '92, '93, there was a lot going on politically with the Station being redesigned, everything that was happening with the changes in administration. But also there was going to be a vote in Congress. Representative [Timothy J. "Tim"] Roemer introduced a bill to cancel the program, and it ended up being saved by one vote. Talk about that specific time.

HAWES: Roemer never liked the big science projects. He was at the time a pretty influential member, and he had some strong allies. In fact one of them was [David R. "Dave"] Obey from

Wisconsin, who was one of the key appropriators. This was in the whole confusion of '92, '93. NASA was off doing these studies, and they came out with a singular option. The Vest Committee reviewed it, blessed it, recommended it to the President. We negotiated a funding profile with the Office of Management and Budget that was basically a capped funding profile.

That was the way that the plan emerged, but in the midst of this Roemer introduced a bill basically to withdraw funding for ISS. At the same time, in the same political venue, the Superconducting Super Collider was going through Congress. They had already dug quite a bit in Texas to lay in the Super Collider, and it did not survive.

NASA, I think responded to the political interest of adding the Russians—which at the time was not just a White House interest. It was broadly embraced by a lot of Congress, both parties actually. Again, it was in the context of the fall of the Soviet Union, and “How are we going to embrace the Russians and help stabilize where it might be on the world scene?”

We also had the other international partners, and those international partners were actually asked if they could come and testify to the Congress. They each have laws about how they can do that, so they each had different roles that they could play. But some of them did in fact testify. I think the strength of the original partnership was probably a strong portion of what saved the Space Station in that era, by the one vote.

Then at Headquarters, we really went from there to a much more focused outreach. Not just to our standing committee members, but a broad swath of Congress. In fact that was one of the roles that I played. I did lots of congressional briefings, just education. “This is what the Space Station is, this is how the partners play, these are all the launch vehicles involved.” You could just see over the years—I think the next vote was positive by like 20-some votes, and then

70-some votes. But, Roemer kept offering his amendment, but over the next couple years it finally became so that it was not an issue.

JOHNSON: As you mentioned, bringing the Russians in and being more positive dealing with international partners—the other partners, what were they testifying to? The importance of this as a worldwide program?

HAWES: Yes. The importance of it to their programs, to their stakeholders. The importance of the role of U.S. leadership in the program, how that was really the enabler for their programs as well. I think it helped convince some members.

JOHNSON: Bringing the Russians in, and especially during Shuttle-Mir there were issues like you said, there were accidents. Those safety concerns, because we were able to get past those accidents, did that help to convince people that it was going to be something that could be safely done for ISS?

HAWES: I think it was. Dan Goldin had a special study team go off and look at those issues, and interview all of the astronauts that had flown on Mir, and found that there were really different attitudes amongst all of them. They were really very different people. But he asked for that, and I helped with that little study before he committed to send Dave [A.] Wolf and Andy [Andrew S. W.] Thomas, who were the last two that were going to go after Mike [Foale].

I think the Russians viewed the U.S. commitment to look at all the processes, understand their procedures and what they had done to ensure safety as a huge vote of confidence.

Confidence maybe is not quite the right—it really was a statement of a partnership. I think that that did really help cement the partnership at that time. There were times when it got challenged later on, but at that point it was viewed from their side, I’ve been told, as a very strong positive.

JOHNSON: Shuttle-Mir was important, and a lot of people tend to forget that.

HAWES: They forget that. Like I said, we had a long history of working with Europe, Canada, and Japan. A couple of science fields kept up a dialogue with the Soviet Union through that whole time, but the main space infrastructure hadn’t talked to the Russians since Apollo-Soyuz. And they had developed in different ways, different paths. They had different tools. I mentioned some of the technical things. At the time, we were testing the Space Station modules for leakage by overpressurizing from the inside. You bag the element, you overpressurize from the inside, you then test and see if anything leaks on the outside. To the Russians that was unacceptable. You had to put it in a vacuum chamber.

We argued and argued and argued, and they just dug their heels in. The translation is basically “No, the metallurgy is different.” We ended up activating one of the old Apollo vacuum chambers in the O&C [Operations and Checkout building at NASA Kennedy Space Center] in Florida. The lab [laboratory] and the airlock went through that vacuum chamber.

We had debates about windows. Windows are—in my view, everything I’ve heard—really hard to design. You look at U.S. elements, and there’s not a ton of windows. You look at Mir, there’s windows all over the place. The Russians just accepted that the human spirit needs windows. It really wasn’t an issue of how hard it was, there were going to be windows. Whereas our system was just drawn from “Well no, that’s really hard.” We want to have as few

windows as we can. We had a big fight about having an optical quality window for observing in the floor of the U.S. Lab. It's there, but it was a hard design thing. So, we did learn something.

The other thing that we learned was to that second objective, learned about long-duration spaceflight. Everything that we had been doing on Shuttle, timelined out to the minute. Highly optimized, everything that you're doing. I had been raised in that system. Then when we started dealing with the Russians some of our team were just kind of like, "I don't understand it. They're not even at their consoles." The Russians would say, "Well, it doesn't change quickly, and if it does the crew has got to take action. We're not going to save them if it's changing instantaneously."

So, again, there was some learning of just approach and attitude of how are you going to do really long-duration flight. I think on the NASA side we exercised some of that as we built up Space Station. There was a point in time where Mission Control dropped down to just a couple of folks, when it was an uninhabited early Space Station configuration, at nights and weekends when it wasn't changing. If something started to look awry you called extra people in.

We definitely learned different approaches and different attitudes from watching how the Russians did things as well.

JOHNSON: Did you spend a lot of time in Russia during that time period?

HAWES: I never did any extended tours in Russia. I would go for events and major meetings. My first trip was in '97. Probably from that point to 2001 I might go four times a year, depending. I went for the FGB launch, I went for the Service Module launch. I went for periodic general design reviews leading up to those milestones, and then I had regular meetings.

When I was program director I had regular meetings with my counterparts in Moscow. I've been there lots of times, but I never did a long stint like Gerstenmaier did.

JOHNSON: I know in the early days working with Russia, some of the people that went over there during Apollo-Soyuz, and then the early days of working for ISS, they talked about the differences in the two time periods, but also differences in the way Russian engineers work compared to American engineers. As Chief Engineer did you notice any differences? You were talking about things you learned, like in Mission Control.

HAWES: We learned some different approaches. One of the things that we did was build—we called it a lexicon. It was literally, if we say verification, what does that mean to a Russian engineer? If we say validation what does that mean, if we say certification. We tried to go through a whole process of just understanding our common engineering-speak. What's the equivalent of that to a Russian? We found some little variations of that that you had to be careful of. Of course we were doing everything through translators, and that started up our whole translator corps, interpreter corps. It was challenging to learn the nuances in how we used words to mean slightly different things.

We also saw things that I think we probably knew. The Russians didn't have the high-speed computers that we did, so they tended to have really finely tuned algorithms that didn't need as much computing power. They had very clever mechanisms. But then with launch they build really powerful engines, so they can brute-force a lot of things where we're taking ounces out of a design on the U.S. side. They're like "This rocket can carry anything" kind of thing.

We definitely saw different approaches to things, and we had folks involved with them at different levels. Something like the FGB where we were the funding source, they responded quickly, they got their parts quickly. Things that the Russian government was paying for, like the Service Module was delayed a couple years, solely for funding. In those cases, you might get a different story every time you're there. It's all just kind of dancing around the fact that they don't have the money, and so they're operating much more slowly. I would say we learned a lot on all aspects. The political side of it, the programmatic side.

One of the stories—I was going down a path and got distracted. Naming the first [ISS] commander was a big deal. I think because of our commitment to fund the FGB, and I think our own need, we were firm that it had to be an American. The Russians as well felt, “Well, that's really interesting, but you guys don't really know that much about long-term spaceflight, you don't really know that much about space stations. So we think it should be a Russian.”

We went through that for quite a while. The thing that I found in my desk is a little laminated miniature of the protocol. On the front in English, on the back in Russian, signed by Wil [Wilbur C.] Trafton and Pyotr [I.] Klimuk—who was the head of Star City [spaceflight center outside Moscow] at the time—stating that Bill [William M.] Shepherd would be the commander, and that future commanders would be named based on the preponderance of the hardware at the time. This protocol established the flow for the first several expeditions to Space Station. Even naming our crews and their commanders was a contentious political challenge.

JOHNSON: When the Russians came in, they came in as an equal partner.

HAWES: Russia came in essentially as an equal because they had that history of human spaceflight and launching their own crews, having their own space stations. I think there were probably a variety of emotions from our other partners. Some of them, like the Europeans, were interesting, because through the Cold War the Europeans had continued to work with the Russians. They had actually flown astronauts on Salyut [space stations] and Mir previously, so they felt like they were in a pretty good position to continue to deal with the Russians on those kinds of things.

In fact, the Europeans had a side deal that they provided the main computer for the Service Module to Russia as part of an arrangement. So we actually had U.S.-paid-for computers in an FGB, European-provided computers in a Russian Service Module. We did a whole series of tests to demonstrate that all of those could talk together when they got lashed up in space, which is one of the miracles of Space Station.

JOHNSON: It truly is.

HAWES: It all worked when it got put together, without ever having been together before.

JOHNSON: You touched on it—there were delays because of the funding Russia had. Were there contingencies in place to deal with these delays, or did you just deal with them as they happened?

HAWES: I would say that we dealt with them as they happened. We would go to Russia for meetings and they would lay out their current schedule. It would be probably as favorable as

they could make it, and it would show the Service Module being just a few months delayed. But that would happen each time we would go and do that.

If you go back and relook at the early Shuttle manifest around that time you'd see the FGB launch, then you see STS-88 with the node docking to it. Then you continue to see outfitting flights that we would go and visit and do things, and maybe bring a small component, until we got to the Service Module. If you look at that period between STS-88 and the Service Module, it's about a year and a half. I can't recall it now, but there's three or four Shuttle flights in there that were basically just visiting and bringing outfitting and supplies. We filled in that time doing things that we felt could be get-ahead steps with the ISS configuration as it was, with just the FGB and the node.

JOHNSON: Just waiting for that next part to come up.

HAWES: Waiting for that next step. Then when the Service Module flew, it was really rapid-fire after that. The Service Module flew in the summer of 2000, and by I want to say the next winter we were flying the U.S. Lab, and then just continued on for several missions.

JOHNSON: Did you see the first launches of Zarya [FGB] and the Unity [module]?

HAWES: I did. Yes, I was in Russian mission control, or TsUP [RKA (Roscosmos State Corporation for Space Activities) Mission Control Center], for the FGB launch. I was in Moscow, I didn't go down to Baikonur [Cosmodrome, launch site in Kazakhstan]. I was at KSC

[Kennedy Space Center, Florida] for the STS-88 launch; I was at Baikonur for the Service Module launch. Yes, continued on through several.

JOHNSON: Can you describe what it was like to know that all that work, for all those years working toward this—like you said, seeing it actually up there and how it worked together, but seeing the launches themselves I would think would be somewhat emotional.

HAWES: Seeing the launches was definitely emotional. I would include Shep's launch in there, even though we didn't see much of it because it was all foggy. I'd been to lots of Shuttle launches, I had done a fair amount of things on Shuttle. I hadn't been to a lot of launches but I'd been to several, so I was kind of used to that.

I will admit, the first time I went to Baikonur and realized that I'm watching a Soyuz launch from the same [launch] pad that launched [Yuri A.] Gagarin [first human spaceflight] and launched Sputnik [first artificial satellite]—by the way, the same pad—that's a sense of history that was unique to me at the time.

Whether or not I felt a huge amount of accomplishment? I could have just been tired. It had been a long slog getting there. At the time you either went to Moscow and Baikonur several days ahead, or you got to Moscow, barely recovered, got on a plane to Baikonur, went through the whole launch process, got back on the plane to Moscow, and then recovered in Moscow. They were just really ruthless trips.

For Shep's launch we were actually held in Moscow for a few hours because of fog, and then they decided to take off anyway. It was still foggy. The landing was interesting.

JOHNSON: That's kind of a difference because in the U.S., with bad weather, you're not going to launch.

HAWES: Basically you would keep trying to ask the Russians, "Well, is there any weather you wouldn't launch in?" And they would pretty much say no. I said, "You've got to have some wind limits." They were like, "Well yes, but they're so high, it doesn't really happen." There's some pretty hefty winds in Baikonur. It's high steppe, it can be pretty brutal.

But they design systems—when you think about it, the Soyuz booster was their ICBM [intercontinental ballistic missile]. So it can't be bothered by weather, and it's very rapid to erect and integrate to get ready for launch. That's a fascinating process to watch in and of itself. By the time it gets trained out, and they start the compressors to start moving it up—it's about half an hour and it's done and ready.

So yes, I wasn't surprised that they launched in fog, because their view is it's pretty much automated. The crew and the machine are going to take it where it needs to go. The ground is not going to help it any. Yes, you saw a little bit of flame at Shep's launch and that was about it. Which was funny, because that was also the one that Pizza Hut [restaurant chain] had paid for the logo on the side of the rocket and you couldn't even see it.

JOHNSON: Again talking about some of the funding issues with Russia, in 2001 the Russians were going to launch [space tourist] Dennis [A.] Tito to ISS. You were involved with that.

HAWES: Just a little, yes.

JOHNSON: Yes, talk about that, what the objections were and why. I think you were the chairman of the ISS Multilateral Coordination Board.

HAWES: Yes, I was. The Russians had been, for a while, trying to formulate a tourism base in space. They actually started on Mir, they were trying to do it. There was a company actually formed by Jeff [Jeffrey] Manber. Jeff does NanoRacks [LLC] today. It was called MirCorp, and it was going to do the tourist flights. At the same time, another company who's also still active, Space Adventures [Ltd.], was working with the Russians to try to do a tourist thing on ISS.

When the Russians approached us about flying Dennis Tito, we had technical concerns. We didn't really have agreements on what ultimately we called our crew Code of Conduct in terms of behaviors. We had some fundamental safety questions, "Is this person going to be really trained? If there's an emergency, is he or she frankly going to be deadweight? Are they going to be able to participate in their own safety if there's an incident on board the Space Station?"

There were political considerations. There were folks on the U.S. side that felt strongly that the U.S. taxpayer had not paid hundreds of millions of dollars for a facility for tourists. This was a laboratory, this was meant for science. So we had all of those actions going on. The other partners had their own reservations, and didn't really have a strong support for the Russian plan from their own stakeholders in their countries.

We worked with the Russians trying to say, "No, it's not the right time." The reality in my view is that they may have been flexible on the time, but the fact of the matter was they needed money. So even though the partners said, "No, we don't think this is a wise idea," the Russians pretty much said, "No, we're going to do it."

Then we had a follow-on assessment done by General [Thomas P.] Stafford. He was already doing some ISS regular studies, and so we asked Stafford's team to look at the situation and make recommendations as to how we can improve its safety and execution if we're going to do this. They gave us a whole series of recommendations about training and procedures that they felt could mitigate some of the concerns about risk to the Station and its inhabitants, so we put those in place.

There were still contentions and issues down to the day of Tito's launch, and just before his launch—I'm trying to remember the timing, was he going to launch on Monday?—of course there was still contention. We disagreed with it, so none of us were going to the launch. I think the Russians moved the launch from like Friday to Monday. And on Saturday, all three of the hard drives in the computers in the lab failed. I think the Russians actually thought we were spoofing them.

I remember very clearly being on the phone with Tommy [Thomas W.] Holloway at one of my son's soccer games. And then getting on the phone with my counterpart, Mikhail [V.] Sinelschikov, while Tommy was trying to talk to his counterpart as well. Saying, "This is a real failure. We don't have a solution yet, we really don't think you should launch." To which the Russian response was "Well, it takes a couple days to get there anyway, so we can launch and you'll have it worked out."

We did, but it was just a fascinating experience. We figured out what made the hard drives crash, put procedures in place, and then we ultimately upgraded the memory on the Space Station to a different technology. But it was an interesting time.

JOHNSON: I had read that even the Soyuz commander, [Talgat A.] Musabayev, and [Yuri M.] Baturin refused to enter required preflight training when NASA representatives told them that Tito couldn't come in, because there was still some issues.

HAWES: There were issues. They had come to JSC for one of their normal training sessions, and they had brought Tito. We had said, "Hey, we haven't agreed to this so we're not going to train him." They said, "Well, then you're not going to train us." I think the political fight was at the highest levels, and most of the rest of the system was just trying to make things work.

JOHNSON: Tito actually went before Congress, before a congressional session. I think you were there, too.

HAWES: Yes, we both did. I had tried to reach out to Tito a couple times in this process—mostly really just to understand what was driving him and why and how—and were there timing issues with him. If I could have him convince the Russians that "No, I could wait a month." We never connected before the flight, but we had tried to connect a couple times. Mind you, I was totally on my own. Nobody would have sanctioned that at all. I would not have been viewed well.

After the flight—and actually Dennis had been home for a good while—Congress basically wanted a hearing on tourism. I was assigned to be the NASA person at the hearing by the Administrator. I clearly was meant to be the unthinking dinosaur representing NASA. It was Dennis Tito and Buzz Aldrin and Rick [N.] Tumlinson I think was the fourth. All focused on the "Space tourism is the reason we're here, everybody needs to fly, this is wonderful" theme.

I did manage to speak with Dennis that morning, we met for breakfast. And I took a handful of people out to LA [Los Angeles, California] and we met with Dennis to do an actual mission debriefing. We spent a day with him out in LA. “What did you learn, how did this process work out for you? What was the MirCorp versus Space Adventures, how did that work?”

We got some comments on them, about his whole training experience. How it was so hard, what he thought other people after him were going to have to do. I thought it was a pretty good discussion. But in the hearing, at that point it was all about “Tourism is wonderful, and so we’re going to try to continue the tours.” Actually, in the middle of the hearing I got a handwritten note from the chairman of the committee, Sherry [Sherwood L. “Sherry”] Boehlert, basically saying, “Mike, we know it’s not you.” Okay, but also it was during the summer, so I brought my kids. Somebody back at NASA Headquarters asked my daughter what she thought—so 2001, she’s what, 12 years old—and she was almost in tears. Her comment back to the person was, “Those men don’t like my dad.” Which I thought was pretty funny.

JOHNSON: She’s seeing what it was in her view.

HAWES: In that era, I can probably say that no, Dana [T.] Rohrabacher did not like me. But yes, it was an interesting time, one of my two wonderful fruitful testimonies to Congress.

To follow from there, the next one [space tourist] that came along, Mark [R.] Shuttleworth—as soon as Mark really decided he was going to do that, he reached out to NASA. We had gotten over the fact that the Russians were going to have to continue, and we understood their financial need too. So we actually had a Space Act Agreement with Mark to provide extra

services for his mission. So we flipped from “No, you can’t do this” to “How can we enhance your mission?” I think we probably had similar agreements with Greg [Gregory H.] Olsen and some of the folks that followed.

JOHNSON: But you came up with the criteria, right, for these tourists?

HAWES: We came up with a Code of Conduct which said, “This is how you behave on orbit, you follow the commander.” In that case they all had to sign up to “Yea, verily.” We were able to do that after Dennis’s flight and get that approved. We approved it first through what was the Multilateral Crew Operations Panel. At the time Charlie [Charles J.] Precourt was the head of the Astronaut Office, and Charlie led it. Then we took it to my Multilateral Coordination Board to bless it. Again, we got some positives out of the experience. We built a process that I think could safely handle the tourists that came to follow.

JOHNSON: Were the astronauts okay, “Yes, let’s have tourists” or “No, don’t?” Or was it just dependent on the person?

HAWES: I think you would probably find different opinions depending on the person, but I think in general they felt that, “We understand why the Russians need this from a financial standpoint, and we understand we’ve put protections in place that keep us all safe as crew.”

Some of them worked better than others with the whole crew. Dennis was very much with the Russians. Other tourists I think over time were a little better integrated into the full

crew. Some of that was their personality, some of that was the crew. I can't recall a singular no, we shouldn't do this kind of view from the crew.

JOHNSON: Just wondering how much it would affect what the crew was supposed to be doing during the time that the tourist was there.

HAWES: And that was part of what we worked with on the Code of Conduct and the timeline. If the Russians were going to enable this, the activities were going to be in the Russian modules. It wasn't going to use the Lab unless we agreed to it, it wasn't going to use another partner element unless it had been agreed to. We built all that process.

I do recall another funny thing. Charlie was one of our principals in the debate with the Russians about "Should we really do this?" In the middle of negotiations Charlie got emotional and started ranting in Russian at the Russians. I had to pull him and said, "Charlie, your team needs to know what you're saying."

JOHNSON: That's funny. But he could do it, so he did.

HAWES: Charlie has excellent Russian language skills.

JOHNSON: I imagine a lot of them that flew did.

The U.S. budgets changed a lot, depending on the President, administration, things that happened with the Station Program. Talk about some of those changes and how that affected the Station, especially over those early years, and the budget in general during that time period.

HAWES: We got past the one vote, and then part of what I think let the program be successful for the next I think three years—we had this flat budget agreement with OMB [Office of Management and Budget], \$2.1 billion a year. You can't build a development program on a flat budget, but we had basically agreed to squish things and let the schedule move.

Then it came to a point in time where it was obvious that it wasn't going to make it. We changed some leadership at Headquarters. I want to say Joe [Joseph H.] Rothenberg came in as the Associate Administrator [for Space Flight], and we went and argued for higher funding for Space Station, because there wasn't any other place to get it. Shuttle was trying to maintain itself, was trying to do upgrades. So we went and argued for other budgets. Didn't make people happy. At one point Space Station took a chunk of money from Aeronautics, which made a lot of enemies actually, and some that we probably didn't realize at the time that didn't really serve us very well.

We continued to have cost growth issues, and it really hit around the time that they flew the Service Module. We had been in a waiting mode, and then when we had to really start flying the US elements we saw some cost increases that weren't apparent. Those led to a spike in our request that led to a cost study that was chartered out of what was then a Space Station Advisory Committee, that was essentially part of the NAC [NASA Advisory Council] structure.

Tom [A. Thomas] Young chartered that. He was the chair of our Advisory Committee, and he chartered that first one, and that was conducted by a person by the name of Jay [W.] Chabrow. It highlighted the issues with cost and showed that schedule delays were building up a wedge that was going to be unexecutable. For the ISS era, that was the first big cost indicator of having some problems.

As we got a little further along, just about the time of the Clinton to Bush 43 transition—so this was still all within the Clinton team. I think they had bought off on Space Station, they had supported it, they were getting the foreign policy initiatives that they wanted. Actually that was all very successful.

Just as that era was transitioning, we were asked, “Okay, tell us what it’s really going to cost. Don’t give us this year-by-year ask for a little bit more, little bit more.” We went through an exercise—myself at Headquarters, Tommy Holloway down here (at JSC), the Boeing team, everybody. At the time the encouragement was, again, “Don’t sugarcoat this.”

So the number was big. The number ended up being \$4.8 billion. That happened essentially, and I think *some* people felt “Well, we’re going to transition from Clinton to Gore and we still have the same buy-in.” Well we didn’t. We transitioned from Clinton to Bush with a \$4.8 billion projected cost growth. We didn’t have that built today, but that was the projected runout to get to what we called assembly complete.

Obviously that kicked off a whole other round of cost assessments. Kicked off a whole other Tom Young led cost study, kicked off deleting the Hab [Habitation Module] out of the structure, a whole bunch of other elements. It was a pretty painful exercise. But within that context, to me, the difference that that made—if you look at the cost overrun when we transitioned from Bush 41 to Clinton, that was on the order of \$400 million to \$500 million. It caused this whole redesign, add the Russians, everything, but we hadn’t flown. When you get 8 years later to this new transition, we have a number 10 times what that had been, but we were flying. We had the Lab up, we had the airlock up. We were making progress. So if they bought into the Space Station, they could trim a bit around the edges. That was the context to me.

Dan Goldin announced he was retiring, and Vice President Dick [Richard B.] Cheney decided to send Sean O’Keefe to NASA. Sean seemed to be kind of his cleanup financial guy, looking at roles that Sean had played in the past. So Sean basically came in with like, “Okay, you have a \$5 billion problem to solve.” He took the Tom Young recommendations and did a bunch of stuff organizationally.

I went on sabbatical, Tommy retired. Somehow Gerstenmaier guided the program through the bumps to get back on track in a few months, and keep us flying and finishing out the rest of the hardware elements.

JOHNSON: Was it full-cost accounting, is that what Sean O’Keefe brought in?

HAWES: Sean brought full-cost accounting, amongst several other aspects. He actually had a whole plan of trying to find ways to contain cost on Space Station. One was look at the configuration and was assembly complete really the line? He invented a milestone that we ended up calling core complete, which it wasn’t everything, but was what you really had to function for long-term. If the other things floated in schedule, that was going to be okay.

He had a whole team of folks off dealing with the international partners. What he had charged Bill Gerstenmaier—and, funny enough, at the time Mark [S.] Geyer—with was, “Bring me the best systems engineering answer to the rest of the assembly sequence.” Mark was one of the principals on this international partner team that we started, as was Tom [Thomas E.] Cremins, who’s your Chief of Staff now, and Melanie [W. Saunders], and Donna [M. Shafer].

It was the Multilateral Partner [Program Planning] Team, so the initials were MPPT, which quickly we called “Muppets.” Then people didn’t like it because they didn’t think it had

enough gravitas. But somewhere Sean heard it and he started using it all the time. He would talk to Mark about the Muppet team. So they said, "Okay, that's fine." Mike [Michael F.] O'Brien and I were Waldorf and Statler, the two old guys in the balcony. The rest of the team all had Muppet names, but I won't divulge any. I don't think I even knew Mark's.

JOHNSON: Off tape we'll talk about the names maybe.

HAWES: But I remember specifically there were five major swim lanes, if you will, of things that we were going to do to relook at the configuration and formulate a plan that was going to help us improve the cost control of the Space Station Program.

JOHNSON: It's interesting how they worked through that.

HAWES: Yes, I would say the working through it part Bill Gerst is probably the best source for how we really got through that piece. I literally was out for six months working on my doctorate.

JOHNSON: Yes, I was going to ask you about that. You got your doctorate, and back in was it '96 you'd worked on your master's.

HAWES: Yes. When I did the Defense Systems Management College course, at the end of that course several local colleges came in and said, "Well, you just completed 9 credit hours of 36 for a master's in engineering management." That's kind of an interesting idea. So I went ahead and

went to GW [George Washington University, Washington, DC], mostly NASA-sponsored, and finished out the master's. Then just kept taking courses figuring, "Well, if I stop, I've stopped forever. If I keep taking the courses it's still a future decision."

After the Space Station financial issues, they were going to reorganize the Space Station Office at Headquarters anyway. Pretty much they said, "You can do other jobs. We'd like you to do this, but we have some people in mind, and we have a path that we want to do with this reorganization."

So I took that opportunity to say, "Well, actually what I'd really like to do is maybe take a year sabbatical and try to finish my doctorate." That was totally acceptable to Fred [Frederick D.] Gregory at the time and Sean, so that was the deal that I went out on. But that ended up terminating the day of the [STS-107 Space Shuttle] *Columbia* [tragedy].

JOHNSON: Of course my next question was the *Columbia* accident, if we want to talk about that for a while. Just the experience of that day and what your memories were. .

HAWES: I was officially on sabbatical—well, quasi-sabbatical, because Fred's deal was that I would still come to the office one day a week just to be available to help with Space Station things and transition.

JOHNSON: Is that when you were Special Assistant to the Associate Administrator?

HAWES: Yes. What they did is they created a position for me called special assistant. First it was to Fred, and then during that time while I was out Fred transitioned into the Deputy

Administrator role and Bill [William F.] Readdy took the Associate Administrator job. Most every week I was in for a day by our terms.

I had not been involved in the mission. By that point I was in the throes of doing dissertation research and I was not as focused on that. I knew about it from my previous time, but it also wasn't a Space Station mission so I wasn't as attuned to it as some of the others. I hadn't even been in the office for [STS-]112. The whole foam piece coming off, denting the aft skirt box—I wasn't really even aware of that history. A lot of the events that transpired during the mission—I hadn't talked to anybody, I wasn't even aware of any of the controversies, because nobody had reached out, and I was oblivious, doing my own thing.

I was up early that Saturday with my son. He had a soccer game. It was probably about 30 miles away from home, so we had been at that early. As I walked into the house coming back, the phone rang, and it was one of my colleagues from NASA Headquarters who was asking my advice, should he come into the office. I was like, "Well, I'm not sure. What's up?" He just said, "You need to turn on the TV."

I turned on the TV and of course it was replaying the scenes of an Orbiter not coming to land at KSC. I advised him that yes, he probably should go into Headquarters, because I would imagine that there was going to be an all-hands-on-deck situation. Then I called Readdy and just said, "Where would you like me to be?" He was still on the tarmac with the families and said, "Probably Headquarters."

I went to Headquarters and stayed for a long time. Given that I had been through—it was shocking, it was shocking. Nobody ever really expected anything on entry. I didn't know any of the mission, the foam piece, and the debate about whether the wing might be damaged. I showed up at Headquarters. Fred was actually there, Bill [William C.] Hill was there. Folks were

gathering at what we called the Action Center at the time, which was a room that Headquarters had set up with some comm [communications] lines and display screens to do the mission following that we needed to do. We actually had one for Shuttle and one for Space Station back in that era. That led to wiping out the walls and combining them into one room, which is still in use up there today.

Folks were gathering up in there, and people just started. “What do we need to know? What do we need to warn people? Who is operating?” It emerged that local police were taking care of things. A couple of us had the idea—things like the APUs [auxiliary power units] have some really nasty gunk in them. We need to warn people that this equipment, if you find something strange on the ground, it may well be hazardous. We can’t tell you what it is, but we know that there’s some stuff that’s really nasty inside the orbiter.

We kicked all those things off. We had a contingency plan that actually back when I was Chief Engineer for Office of Space Flight we had formulated as a response to [STS-51L] *Challenger* [accident]. That contingency plan had a standing investigation board, which became the *Columbia* Accident Investigation Board [CAIB]. The thing that Sean did was he added Admiral [Harold W. “Hal”] Gehman [Jr.] to it. But the other people, by position, it was one of the NASA Center Directors this and this. We had that. That was implemented that day.

The NASA team picked Dave [David A.] King as the initial senior executive out in the field. But we didn’t know where to send Dave. So when he got on the Marshall plane, he knew he was headed west but didn’t have his destination. We debated that while Dave was in the air, and ended up telling them to fly to Barksdale Air Force Base [Louisiana]. We hadn’t really had an awareness of what was going on in East Texas.

It emerged over hours—this is all emerging over hours—that FEMA [Federal Emergency Management Agency] and the other government agencies had decided to settle down in Lufkin, Texas. We had Dave at Barksdale, and we were thinking that that would be a receiving site for material. But very quickly, I think the next day, hopped him over to Lufkin where the rest of the agencies would be.

Dave became the lead executive over all of that in-field recovery process. Then we augmented him over time with Mike [Michael U.] Rudolphi and [G.] Alan Flint. Ended up being a rotation of folks, because the first few weeks Dave seemed overwhelmed. It was just constant, because stuff was going on every single day.

That day we were making those decisions. Sean was reaching out across government, getting word to the White House, helping get things prepared for the President to make a comment, getting Secretary Tom [Thomas J.] Ridge to declare the accident a catastrophe.

JOHNSON: Federal disaster.

HAWES: Yes, federal disaster. That enabled FEMA to actually go in and pay bills and take care of things. None of us had a clue how important that was, but it was obviously incredibly important.

That's all the memory I have of the first day, just everybody in the room brainstorming and taking their individual little pieces of what those had to be. Reads [Readdy] and I talked, and one of the things that he asked me to do was go and get all the *Challenger* stuff, talk to folks that I could reach. I talked to Dick [Richard H.] Truly and Bob [Robert L.] Crippen and J. R. [James R.] Thompson [Jr.] about that same early process. We already had an investigation

board, so it wouldn't be quite like the [William P.] Rogers Commission [Presidential Commission on the Space Shuttle *Challenger* Accident].

Sean was familiar with that plan, so he was already vested in that plan and didn't feel a need to create something unique. But did, from his Navy days, have a relationship with Hal Gehman, and chose to name Gehman as the chair of the board. Every day was just spent starting to lay out all the pieces. We had obviously a whole bunch of volunteers from JSC that could get to East Texas quickly.

We had Jerry [L.] Ross and a bunch of folks that started formulating what an air search would look like. Initially we had the National Guard, that wasn't going to last very long. Then the FEMA folks started talking about this Incident Command [System (ICS)], and firefighters. We were looking at each other like "What are you talking about?" But we quickly learned about this whole incident command structure and how it worked. In February, we were at a point where there was a workforce that was ready, willing, and able, and not tied up, because that's the low point for forest fires in the country. They established five camps along the route, and over time formulated the plan to literally walk a mile both sides, and fly I think 10 miles both sides to look for material.

Then we set up the receiving points. We ended up pulling the Orbiter-cognizant engineers from the Cape [Canaveral, Florida] into the receiving points, because it was actually the Cape folks that knew the hardware. You could bring in a piece of debris, and they would say, "Oh yes, that's that." Started tracking it. We had to work with folks on getting a common geolocation scheme. We felt that the geolocation would be useful in the investigation. We had to work on the rotations of the teams.

Then we started in a process of every week, every two weeks sending leadership down, enacting the whole Space Flight Awareness team, and having folks out in the field with the teams, just being there. We also sent this [JSC History] Office down with Roger Mellott, a psychologist that was doing a lot of NASA training. Bill and I had worked with Roger a lot, and asked Roger to go do that, with Rebecca Wright. I still have the disk of all those interviews.

JOHNSON: Yes, we did a lot in a very short period of time.

HAWES: Yes we did, yes we did. The formulation of all of that was really amazing, how well it came together, or maybe effectively came together, so that we had activities going—of course the search for the remains was its own process. We learned a lot about federal agency jurisdictions.

Our folks were obviously very, very protective of the crew and very focused on the crew, but they also had to learn that remains are the role of the FBI [Federal Bureau of Investigation], so you have to deal with the FBI. Everything had to also have an EPA [Environmental Protection Agency] person with it, just because of the potential toxicity of things. Then, as you know from the history, just amazing stories of the local folks that helped with the whole process. I don't get into that because I cry.

JOHNSON: Most people do. NASA has this experience working with international partners, working with other people that are interested in spaceflight, the people that have that focus. This was an experience working, like you said, with all these agencies—the FBI, the Forestry Service,

local people, local police, the EPA. These amazing incident camps that would come in, and I went to several of those. They were like small cities that came in and moved in.

HAWES: They were, they were.

JOHNSON: It all happened so fast. Like I said, this was a new experience, working with all these different agencies and organizing all that.

HAWES: It was an interesting thing, too. Within a couple days—it was about when they started talking about the ICS and the firefighters, and that was probably a couple weeks—we had a tag up with the agencies every morning, but it was at the senior leader level. I figured out about that time, and went to Bill and said, “They’re all having a meeting without us beforehand. I don’t know that they appreciate whether we should be there or not, but all you’re hearing is what they’ve already sorted out.” So we ended up going back and inserting ourselves into the earlier meeting as well, to understand more at the working level what was going on.

It was obvious that all of these folks were just reporting up to their bosses, the one that we were tied in to. They weren’t actually making the decisions or recommendations, they were just reporting up to the bosses. That gave us better visibility into what they were really talking about and how this process worked.

We also had a person, Amy [K.] Donahue, at Headquarters, who was a colleague of Sean’s. She had had some experience with the ICS structure in the past, so she was actually one of our ties to that whole process.

JOHNSON: I know you had copies of the oral histories. Weren't you working on a lessons learned?

HAWES: I was working on a lessons learned with Roger, and we ended up culling them down to a set of talking points. We developed it into a presentation that I used for a while. In fact, I used it in my teaching at GW a little bit. But we never actually published it in a formal sense. Shortly after that Roger passed, and so there wasn't really any path to collect all of those pieces together.

JOHNSON: Was it more lessons learned for NASA on what to do after an accident like that?

HAWES: It was both. It was lessons learned for NASA, but it was also leadership training kind of reflections. Using some of the incidents that we became aware of through the recovery and really could point to.

For instance, one of the people that advised us to first invoke the ICS—I won't remember his name now, but he was the guy from the Texas Forest Service. Frankly, folks just blew it off for days. But regardless of being listened to, he kept helping doing whatever it took, whether it was just getting copiers, whatever. He just kept at it, then all of a sudden, "Here's this incredibly brilliant idea, we need to exercise the ICS." And within 48 hours we have five camps spread across East Texas that are implementing the search process, and they know what they're doing.

JOHNSON: It was interesting, I think, one of the aspects that we learned, and I think a lot of people at NASA learned, was the community and the ownership that they felt and the pride that they felt, in being able to help NASA. How much it meant to them, and how much awareness

they had on what NASA was doing. It instilled a lot of interest. I know NASA has followed up with that too by going back to East Texas and talking to students and doing some different things to keep that interest and that focus going.

HAWES: Yes. Before I retired I'd been back to Hemphill [Texas] a couple times.

JOHNSON: But that involvement that they've kept going I think is important, especially to foster that environment. Because a lot of the stories we heard were people were talking about if you had a NASA shirt on—we even experienced that, because we would wear that. The reaction to people, “Is there anything you need? Just tell us what you need.” That sort of thing.

HAWES: You're right, the local people—I was pretty familiar with East Texas, so I can't say I was surprised, just knowing the people up there. I had friends that lived in Arkansas, so I used to drive [Interstate] 59 up through Lufkin [Texas] and all those towns for years. The treatment didn't surprise me. But everybody really bought into the recovery mission at that point, when we really could state it as a recovery mission.

There were some interesting things about it. From a NASA standpoint, it still hurt that you had lost friends. You did not want to deal with it that way. But the searchers and everybody—they asked us if we could make t-shirts. I still have a *Columbia* recovery sweatshirt. It was not something that NASA would have started, but it was because the folks that were working with us that owned the recovery mission really needed to feel a part of it in that way.

The other thing that I want to give Sean credit for is I think several of us involved in *Columbia*—we were much lower in the structure at *Challenger*, much more peripheral to what

was going on in *Challenger*. But I think many of us had a sense that the Agency wasn't very forthcoming.

Literally, from day one, Sean directed that he was going to talk to the press every day. When we started we actually started twice a day. We would talk in the morning as we learned stuff, and we'd talk at the end of the day just as they might need to meet their publishing timetables. I think actually we wore them out within probably about four weeks. They said, "You're not making enough news, we can drop back to once a day." Then over time it just kept dropping back. But I think the Agency was forthcoming.

Also, in terms of the legal aspects dealing with the families, he had Paul [G.] Pastorek dealing with the families. Usually through intermediaries just because of the sensitivity of things, but they were taking responsibility for dealing with the families. I don't know how any of that turned out, but certainly I saw their actions in trying to make that happen quickly. I was really pleased as a NASA employee that we really were reaching forward, we were telling folks what we knew.

I ended up getting a lot of weird little jobs in that timeframe, doing different things. Since I hadn't been involved, they asked me—usually it was a conspiracy of Readdy and Pastorek that would figure out what they needed me to do. Paul wanted me to advise his lawyers. Since I hadn't been involved, he wanted me to listen to all the Mission Management Team recordings. "We have these allegations of people being ignored. You know the business, you know how this works. You've lived in that world before, but you didn't do this." So I listened to many of the Mission Management Team recordings.

What I fed back is from what I heard. You had pretty unanimous opinion about how the material behaved, from the subsystem manager through the program management. It wasn't as if

there was a fight and somebody was shouted down about what they believed. Most of the time you had the same shared opinion of how the material reacted.

And obviously they were wrong, everybody in that chain was wrong. We didn't know that much about how the material—but I didn't see a lot of dissent, and I didn't see people being put down for their opinions in how that was going on. Later on I helped Paul and his staff prepare NASA folks for the eventuality of having to testify to Congress.

Just all kinds of processes, in terms of helping put the first processes in place, and then as the CAIB stood up I got assigned to help the management panel of the CAIB. So I was working with John [M.] Logsdon and Dwayne [A.] Day and others that were putting some of those pieces together. Then I was assigned to do a similar translation with the Stafford-[Richard O.] Covey team that was then looking at our implementation of that. One of the critical pieces was “How do we reach out to other government agencies for potential help?”

Frankly, those processes weren't exercised properly, so I rebuilt all those processes with help from others. Keith [T.] Sefton in the Office of General Counsel, Roger [D.] Simpson in Code M. We basically wrote new memorandums of agreement with all the government agencies that we dealt with. We had to get many more NASA employees cleared in terms of if you're going to deal with any information from that community, you need the appropriate clearances.” NASA had let a lot of clearances go, so we rebuilt that whole structure of if we ever need help from that community, we know how to go request it.

We know what to do with it, we have people that are cleared to deal with anything they can get out of it. We also teach people how to deal with sensitive information, so there's nothing revealed externally to any of those interactions or relationships. The special assistant tag had a lot of different jobs assigned to it.

JOHNSON: Other duties as assigned.

HAWES: Many other duties as assigned, yes.

JOHNSON: You mentioned the reports that you were giving to the press and how you're not making news anymore. Of course other things were going on in the world at that time, with the response to 9/11 [terrorist attacks of September 11, 2001] in 2003 right after *Columbia* came down. Yes, there was a lot going on.

HAWES: I would say I was pretty inwardly focused at that point.

JOHNSON: Yes, I can imagine. I think a lot of people were. We may not get to talk about all of it, but in the time we have left—President Bush's [2004] announcement for The Vision for Space Exploration, ending the Shuttle Program, finishing out ISS, and then creating some type of spacecraft to return to the Moon and on to Mars, which obviously you are very involved in now.

HAWES: I am now.

JOHNSON: But at the time—do you want to talk about that announcement?

HAWES: At the time there was a NASA team—Bill Readdy was involved with it, Sean certainly was helping push it—that was formulating an exploration program. It was interesting.

In my view, Sean did a lot of entertaining things. When he came in he pretty much would just tell large groups of people, “Stop fussing about destination. It’s not about destination. It’s about exploration. Just stop, calm down.” Then I think probably a lot of people were shocked that here’s the guy telling us to calm down, and he gets the President to announce a vision to go on to the Moon and Mars. I think Sean had that in the back of his head probably all along, but it was galvanized by the accident and the way that the CAIB I think stated, “We don’t think the risks of spaceflight really are balanced by the mission of just going to low-Earth orbit. We think that they’re commensurate with a mission exploring much beyond that.” I think that there’s a hook there. There’s this background team that has been working—and remarkably quietly—with the White House team to formulate what becomes the Vision for Space Exploration.

That gets put in place and rolled out. Now you can contend a lot, that it got rolled out without an explicit budget to go with it. They brought [Admiral] Craig [E.] Steidle in from outside to start to formulate the Exploration Program. Raddy assigned me as one of his deputies basically to be the interface to Craig’s team, which was funny, there’s another Mark Geyer tie. Mark and I have bounced off each other for years. Mark had come up to be part of the systems engineering team with Steidle’s team. I was the Code M human spaceflight liaison into that world.

At that point, there were still multiple options. There was an existing issue that we knew with the Space Shuttle Program, and there were a defined series of flights to finish assembly. We argued that it was more than OMB wanted to support. So, literally, I still have pages that I used to brief in Washington all the time that showed two shaded out flights at the end that weren’t budgeted, but in NASA’s view were fully required to support the ISS. I think AMS

[Alpha Magnetic Spectrometer] may have been one of those at one of those times too, that we argued fully that as a science payload AMS merited—but we also had the challenging complication. We had built this process after Return to Flight where you were going to have a Shuttle ready as the rescue. The timing of all these places, all of that factored into all that too.

Bill created a deputy for program management and integration tasks, which ended up doing a whole bunch of cats and dogs as well, so that's what I became. The interface to the exploration group was one of those tasks, but also doing Shuttle-based assessments was part of that task as well.

As we were transitioning, Bill had convinced Sean that we really needed to do a full-up assessment of a Shuttle-derived launch vehicle for exploration. Without the Orbiter but using the external tank, the SRBs [solid rocket boosters], and a shroud with a boat tail that could carry elements of an exploration vehicle.

I was named to do that, and right in that timeframe Sean left and Mike [Michael D. Griffin] was named very quickly to replace him [as NASA Administrator]. As Mike came in I was actually doing a trip to Russia with Steidle, helping introduce Steidle to all of the Russian folks. Mike came in and pretty quickly started rearranging the deck chairs. We were still working on Return to Flight, so we hadn't put any of these other processes in place yet. We were on the way marching to [STS-]114 with Eileen [M. Collins] and company, and Mike kicked off his ESAS [Exploration Systems Architecture Study] study pretty quickly, and he also told Readdy and me to stand down on the Shuttle-derived study. Basically Mike just didn't believe that architecture was ever right, so we pretty much were told to stand down.

That doomed any Shuttle variant continuing on into the flow, which a lot of people still have issues with. Some with strong opinions that we should have built from the Shuttle and maintained that infrastructure, and we would have been better off. We are where we are now.

There were a lot of things that were troublesome that came out of it. Having a gap in our own launch capability is one of the things that came out of it. We did have to argue—but Mike successfully argued for those flights that we weren't going to do, he argued for AMS, he argued for a Hubble [Space Telescope] repair mission. But we also had to pull funding from other places to get that done, so that harmed Exploration.

But we got the Exploration Program started. We got what was then the CEV [Crew Exploration Vehicle] awarded. We had done the prior studies, I was still on the NASA side doing all of that. Then obviously when the new [President Barack Obama] administration came in they decided they had other ideas.

JOHNSON: I think probably that'd be a good place to stop, because there's a lot of other things that were going on at that time we don't have time to talk about.

HAWES: Yes, that's true. That's probably a good place to stop.

JOHNSON: I appreciate you coming in today, and we'll continue.

HAWES: Okay.

[End of interview]