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EDITED ORAL HISTORY TRANSCRIPT

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INTERVIEWED BY SANDRA JOHNSON
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JOHNSON: Today is March 24th, 2010. This oral history with Bryan O'Connor is being conducted for the Johnson Space Center Oral History Project at NASA Headquarters in Washington, DC and is a continuation of his first three interviews on March 17th, 2004, April 20th and September 18th of 2006. Sandra Johnson is the interviewer, assisted by Rebecca Wright. I thank you again for joining us today and allowing us to have this time.

The last time we talked we left off in 1992, the time period after you came back from Russia. In '92 the Space Station Program was nearly canceled by the [United States] House of Representatives and was saved by one vote, and then the idea for the Space Station Redesign Team came about. If you will, talk about how you were involved in that and how that effort came about.

O'CONNOR: I think it was about this time of year if I remember right. At that time, my job was Deputy Associate Administrator, Office of Spaceflight. I was involved in various things, mostly having to do with human spaceflight and doing safety studies and trying to help the Administrator and the Associate Administrator figure out what to make of all the requests we were getting for Shuttle upgrades, for example.

We were trying to come up with some kind of risk-based approach to it, where when you take the big list of things that people would like to do with Shuttle and look at how much it would cost, you know you can't really spend all that money. So if there's a way to risk-prioritize

them, that's what we were trying to do. We were trying to figure out good ways, at the top level, to get the most bang for the buck and reduce safety risk per dollar.

There was one evening when it was somewhere around 5:00 [pm] or 6:00 or so. I was thinking about wrapping it up and going home. I got a call from George [W. S.] Abbey who was up on the ninth floor. He said, "We've got this kickoff that we're about ready to start on this Space Station redesign activity. Joe [Joseph F.] Shea is the leader of it and he's been doing some planning, getting the team ready. We're supposed to kick it off tomorrow with a bunch of events here in Washington, press, with the international partners, with the contractors and so on. Joe has developed an illness so he's not going to be able to make it. I want you to stand by; we may need you to step in for him. Not to worry, the agenda is all laid out. We just need somebody to run through and introduce the other speakers. Max [Maxime A.] Faget for example, the former NASA guy who was of course the designer of the Mercury spacecraft is a key member of this team. He'll be here later this evening and he can brief you on what's going on and get you up to speed, if that's what we need to do. But just hang in there, I'll call you back in a little while."

I stayed there for a while wondering what all this meant. I hadn't really been following that. The Space Station in those days was not under Code M [Office of Space Flight]. It was in Code D. Dick [Richard H.] Kohrs was the Program Director for the Space Station and Arnie [Arnold D.] Aldrich was the Associate Administrator, and they were in a different area. I thought, "Okay, I guess I'm not going to go home right now, just hang loose and see what happens." Sure enough he called back a little later and said, "Yeah, we're going to need you to step in and fill in for Joe to kick this thing off tomorrow."

A little later Max Faget showed up. I don't know if he knew who I was, but I sure knew who he was, of course, because he had been at NASA when I was at JSC. I just remembered

some really good briefings he gave us when we were astronaut candidates, and being in a few

meetings where he was there. The idea of Max Faget coming and sitting and talking with me

one on one, I thought, was a real privilege.

He pulled out a napkin, a paper napkin, and showed me some drawings that he had on

this paper napkin of how we were going to redesign the Space Station and how it would be

different kind of modules. Then he talked a little bit about how the next day was supposed to go

and how he and Joe Shea had been working to pull this off.

Another guy who was on this team was Mike [Michael D.] Griffin. Mike was supposed

to be the deputy to Joe Shea for this study. I'm not sure if he had actually arrived that day to

participate the next morning because I don't remember seeing him right away. But I know he

was supposed to be Joe Shea's number two guy in that study.

Then we had representatives from the international partners who were going to come in

the next morning, and the press, and if I remember right the CEOs [Chief Executive Officers] of

the Space Station's prime contractors were going to be there. So he briefed me on all that, and I

showed up the next morning and I started the whole day's worth of kickoff activities for this

study. I just simply introduced the key players, let them talk a little bit, and went over the outline

of what the study was going to do, how there would be 50 NASA employees, we would have the

representatives from the international partners, one of each assigned to this team, and that we

were going to spend a few months coming up with some alternatives for redesigning and

restructuring the Space Station program.

I don't remember if on that first day we knew exactly what the end of the study would be

like. It would be three months, or close to it. I don't remember if we knew then that the end

result would be recommendations from our team to a blue-ribbon panel headed up by the

president of MIT [Massachusetts Institute of Technology, Cambridge, Massachusetts], [Charles M. Vest], and that the President [William J. Clinton] himself would decide based on the study that we did, and the options and then recommendations by that blue-ribbon panel, or whether that morphed later. But that's really the way it was supposed to happen over time, that our team would come up with redesign options and not recommend one, but simply lay them out. Like the thing we just did with the [Norman R.] Augustine group [Review of United States Human Space Flight Plans Committee] where we didn't ask them to recommend an answer but to give options.

We were supposed to give three options. When we first started, I don't know if we had said three or two or just some. I know that when we first started there was no interest by the Administrator in modifying or using as a baseline the current Freedom [Space Station] structure, Freedom design and Freedom architecture for its program. I can tell you that that was off the table, it just wasn't going to be done. That was made pretty clear because the idea was to try to get away from this concept that had so little support on the [Capitol] Hill that they almost voted it out.

We were even going to call it something different. We were not going to call it Freedom anymore. There had been previous studies where they simply went in and redesigned the Freedom and changed its architecture. The most recent one had been called Kohrs Lite because Dick Kohrs, as program director, headed it up and he went in and significantly changed the architecture of the design and cut down the cost and the size and the number of flights it would take to put it together. But this time it was supposed to be a fresh start, clean sheet, don't modify that one, just start all over again. That's pretty much what we said in the briefing that day.

At the end of the day I remember feeling pretty bushed and a little bit out of my league, because I was not a Space Station guy. I was learning everything for the first time here,

introducing myself to new people, and of course reminding people that I was just a fill-in that day for Joe Shea.

The second day it became, "Okay, I'm filling in this day too." I began to realize that Joe is sick, and I may need to just think of myself as filling in until he comes back, and maybe it's a week or two weeks, I don't know. But let's get on with it. Of course George and the Administrator Dan [Daniel S.] Goldin were exactly in that same frame of mind. Let's press on; you're in charge temporarily until Joe gets back. Let's do what it takes to get it going.

I did all the normal stuff somebody like me would do if you're given a task to get something like that started, and delegated. I found people that looked interested and asked them to do stuff for me. That's pretty much what I did those first few days to get us up and running. There was a time crunch on it, and there were a lot of uncertainties. Max Faget himself told me when he briefed me that he wasn't really officially on the team yet, because, as usually happens on things like this, there are legal and procurement rules in place for non-government people who get onto studies like this. [Joe had long since retired from NASA.] They have to sign documents that say that they don't have conflicts of interest. This was a case where Max worked for a company that had some thoughts on how to do a Space Station, so when he read the contract and the requirements for him to be on the team, within a few days he told me he would not be able to sign off on that. He would not be able to meet the requirements for conflict of interest, and therefore he would have to bow out. So I lost him.

Then as a few days became a few more days, I realized that Joe Shea must really be sick. I remember at one point, after a few days, I went and visited him. I can't remember exactly where it was, but it was here in Washington somewhere, and I think it might have been at Walter Reed [Army Medical Center]. George went over there with me and we talked with Joe. You

could tell he wasn't feeling good at all. He wasn't really in shape, or considered himself to be in good enough shape to come in and start running a big project like that.

We both wished him well. It was the first time I'd ever met him. Of course I knew of him. He was the famous former program manager for Apollo. I knew that for a long time he'd been a university professor and had been out of NASA, but that he was pretty well known as a program leader type guy who could put together a program and make things work.

I wanted to be sure that the thoughts that he had on how to run the study were better known to me, not just what second or third people were telling me. I tried to get from him what are you really looking to do here, and how do you think this study ought to go. He gave me some thoughts there, but I could tell that I might be pushing on him a little hard there because he wasn't feeling very well. It was a little bit of a conflict for me to try to pull more out of him, because what I didn't want to do was have him show up after a couple, three weeks, and then find that I had gone in some direction that he would have to make a major adjustment, and wouldn't do it that way. So there was a little bit of uncertainty there after that meeting. But I found that I was getting plenty of advice and guidance from the Administrator and George, and that after a while I didn't really worry too much about maybe doing it the way Joe might not like, because it became irrelevant really.

Of course after three or four weeks I began to realize this is not temporary. I'm just going to assume that I'm going to take this right through to completion, because if he's that ill that he can't come back, he may not want to come back in midstream and pick up in the middle anyway. So I'll just assume that I've got the dot here.

By that time I had assigned people to jobs in this study. I had picked as my deputy [Porter Bridwell] a former external tank project manager from [NASA] Marshall [Space Flight

Center, Huntsville, Alabama] that I knew pretty well. I had Mike Griffin doing more or less general systems engineering oversight. I had team leaders, one from JSC and one from Marshall picked out. It really wasn't too long before we got some really strong pressure from Congress; the people who liked Space Station Freedom. We talked earlier about how Congress was on the verge of voting it out. Well, it turns out there were a lot of people in Congress who were very pro-Space Station Freedom. They felt like they had invested a lot of their time and effort and political capital to make the Freedom work, and were not too interested in getting too far away from what had happened to date.

So we heard loud and clear from that crowd that, notwithstanding a new design and a new restructure, you guys have to go and look at a Freedom derivative, we insist on it. There were some pretty strong voices in Congress. I know Dan was not too happy with that. Dan Goldin was not interested at all in a Freedom restructure or a Freedom delta. He really felt like it would be important to do something totally different in order to go forward. In fact some of the guidelines we had on what we wanted out of this restructure were violated at first principle by the Freedom itself. For example, minimize the number of Shuttle missions and EVAs [extravehicular activities] to put it together. If you're going to modify Freedom there's not a whole lot you can do about EVAs and Shuttles, because it was designed to be built by the Shuttle in increments and to be assembled by EVAs. To get away from fairly high numbers of both of those you'd have to go to a clean sheet, and that's what he wanted to do.

With all this pressure from Congress, he decided, "Yeah let's go ahead and have another team, and we'll get another Center that has pretty good systems engineering thinking." We picked [NASA] Langley [Research Center, Hampton, Virginia] for that. I asked Mike Griffin to head up that team. Mike and I had a discussion early on when he got assigned that team that this

is a dicey proposition. Our boss doesn't want to do this and has made it clear to us that he's not interested in Freedom redesign. We're doing it under pressure, and you get to be the guy who does the best job you can to make this option viable. How about that for a nice position to put you in? Mike said, "I'm up to that, I can do that." He had a good team at Langley, and he wasn't scared by that.

We had some integration folks on my team who were the graders. Each team would go off and do various things, and they'd bring their results back in. We had some people in the integration chief engineer role that would compare apples to apples to apples and make sure we were doing things the same way, looking at each accounting the same way, counting the cost and the schedule with the same approach. Mal Peterson was our resources guy. We had a procurement person, and we had a Safety and Mission Assurance guy. A chief engineer and several folks who were not working on any one option were looking at all three. That's pretty much how we were set up.

The pace of this thing was really high. There was a lot of pressure on our team. So much so that they felt like the best way to allow us to do our job without having to worry about phones ringing and all that was to get us into a place over in Crystal City [Virginia]. People came up from the Centers and various places to serve on this team. We got offices over there in Crystal City and did our whole study over there. That was good in a way because it did take me out of my office and showed me that they really expected us to work full-time on this and to be sure that we separated from our other duties. It made it easier to do that.

There were a couple other things about it that put it into a real boiler room activity. It's like when you serve on a selection board or something, you get into that same model. You go off somewhere, get away, you're totally dedicated to the selection board. The hours can be very

long. When people come from all over the Centers they got nothing else to do. They're motivated people, as people from NASA are. They felt privileged to be on such an important study. They didn't mind the long hours, at least for the first couple months.

We were working six and a half days a week. We usually tried to take off in the morning on Sunday, but there was always work on Sunday afternoons. All day Saturday. We just did that week after week after week because we had so much to do and so much pressure to get it done. We had an oversight team, which was Dr. Vest, the president of MIT, who headed up a blue-ribbon panel of a very distinguished group of aerospace leaders, managers, and academics, who served as our sounding board and received our information and then wrote their own separate report to summarize what they were hearing from us. We felt like we were doing the legwork, and then they were analyzing what we gave them and digesting it and writing a report that would end up going to the President. They had a schedule that demanded quite a bit of work to be done to be able to then go and brief them. There wasn't any tolerance for slippage here because the whole thing had, if I remember right, a three-month study. There was no interest in extending that.

We went out in public and said when it's going to be done. If I had gone in and said there's too much work to do here, let's extend it, I don't think I would have got a good hearing on that. I may have done that, because I remember worrying about people working too hard and working long hours and getting to where they were babbling. Late evenings. Also when you work with Dan Goldin, he was a guy who started slow in the morning and wound up fast in the evening. Just the opposite of me. In that regard I was a little out of sync, when in the evening I'm bushed at the end of the day, long day. Dan and George would come in every evening,

sometimes 7:30 at night, and want to talk for hours about, "What have you been doing, let's see the studies, let's talk to these guys."

It was hard for me to send everybody home because I knew that, "Okay, tonight they're going to want to talk about foreign transport options and Soyuz and Proton rockets. So I better keep Joe [Joseph] Nieberding here because he's my expert on that." But then sometimes in the evenings when Dan and George would—we used to call them Chief Dan George by the way, two people in one, they were joined at the hip—when Chief Dan George came over, they'd want to talk about any number of things, and they were always buoyed by what they saw. We were bushed by the end of the day, and they took energy from what they saw. In a way that was good for me to see that because I realized that these guys appreciated all the work our folks were doing.

But on the other hand the hours we were keeping were starting to grind down on us. I didn't think we were quite as effective as time went on as we had been earlier. Natural attrition of energy. After a while we had to give some people some breaks. Maybe okay you guys, why don't you take a day off, come back to this on Monday, that sort of thing. We went for a remarkably long time without having done that. I give credit to that team for the energy and the tremendous enthusiasm they had that they brought to that study.

The downside of these evening visits is that sometimes we'd get redirection pretty late at night after working for a long time. We've got to brief the Vest panel on Saturday, and it's Thursday night, and we get redirection. That really put a lot of pressure on us. My routine was at 7:30 in the morning I'd go and brief General [John R.] Dailey on what we were doing, because he'd want to make sure that we had the right support if we needed some help from anybody, or if we were getting into an area where we needed some legislative cover or brief some staffers or

whatever. He had his team there ready to support us. So I'd brief him in the mornings. I remember one time when I told him that okay—and I apologize, I don't remember the details of this so I'll just say A and B—we'd been going on a track for A to prepare for some big briefing with the Vest panel, then the previous night Dan had come in and said, "I don't like A, let's go and do B." That was quite a detour for us, to go do B. Are you sure, Dan? You want to go do B? We spent all this effort getting ourselves on this path towards A, and if we go B, that's quite a different approach here. I feel like we will have wasted a lot of time. "Yeah but I think you ought to do that."

The next morning, 7:30, I come in and say, "I've been briefing you every day, we've been doing this work on A. Now last night Dan came in and said he thought we ought to go and go this B path. So we're going to have to put a lot of effort into getting B to where we can brief it to the Vest panel next week."

Dailey said, "Are you sure he said that?"

I said, "Yeah."

He said, "Wow, that's quite a U-turn there, isn't it?"

I said, "Yeah it is, I'm a little disturbed by it myself."

He said, "Well, don't do anything; let me go talk to Dan myself." So later in the morning when Dan came in, General Dailey went and talked to him. That morning, he'd say no, B was just a thought, "I didn't give direction for B, they don't have to do B, in fact, that's not a very good idea, is it?"

So on reflection the next morning Dan changed and said, "No, I don't want them to change. Let them press on with A." So what I had heard as direction the night before turned out to not be direction. It reminded me of how good it was to have these morning meetings with

Dailey because he could go in there and pulse the boss and find out what he really wanted to do and did he really want to do this, and help keep us from maybe overreacting. For all I know I might have heard him wrong too, because it was late for me.

Whether Dan changed his mind, or just didn't remember, or was in a different mode of thought the next morning and it was no longer relevant, I don't know. But it was good to balance my evening meetings with the morning meetings the next morning with the boss. I always tell people that I really respected General Dailey for many things, including the way he was able to help us make sure we didn't under- or overreact to something, back in those days when the pressure was so high on us. When I see him I still thank him for that to this day.

When we got to the middle part of this big study, we were coming up to a day or two before briefing the Vest panel on what was a pretty important milestone in our study. First results, first real results on technical, the programmatic structure of the program office, the design concept, the cost, the schedule, the first things to brief the Vest panel. About two days before the briefing I got a call from Joe Shea. He said, "Well, I'm feeling pretty good now. I'm going to be there." He was up in Massachusetts. He said, "I'm coming down. I will take charge of this briefing to the Vest panel." I thought well, that's interesting. Pretty short notice. Not sure why he would like to just step in front of this, because I've been preparing for this with my team for quite a while. The challenge for me now is when he gets here tomorrow, to make sure that he's comfortable with what we've done so he feels comfortable in front of Vest, defending it and briefing it and introducing it. Total surprise for me. So I did the best I could the next day to prepare him to do what I would have done on the Vest panel briefing.

The day of the Vest panel briefing I felt pretty good that I though he was okay. He kicked off the meeting with a big philosophical discussion that turned out to be maybe an hour or

so. He was a professor teaching all of these distinguished people on this panel about systems engineering, fundamental stuff like that. Nothing about the Space Station redesign that we were doing. It was almost like it was a lecture that he was giving at school.

My guess is that he was planning to do that to help set the stage and give a little of his philosophy before then segueing into the pitches that we were supposed to spend all day giving on where we were on these studies. I could tell after a while that people on the panel were wondering how long this was going to go on. After a while we declared a break, and Dan Goldin and George came to me and said, "We want you to pick up from here on, and we're going to talk to Joe and just tell him that this isn't going to work out in the schedule."

I came to realize later that he was still sick. He was doing his best to come in here and pick this thing up. He was very enthusiastic about it, but he just really was in no shape to be doing this. He got off on a big tangent there and people were getting nervous and jittery, so they asked me to just pick it up from there. We went ahead and did what I had planned to do all along. It was just one of those funny people things that happen where you've got somebody that's a famous guy who has had his day, and now he's called upon to serve his country and he just wants to do it so badly but he really shouldn't have. There wasn't anybody that would say no to him. But it did show that there's a lot of heart there, even when the body is not quite ready. So it was an interesting day.

After that we did a couple more briefings, and as we got up to the end we briefed them on the final product. I remember at one point there was almost a mutiny with my team because Mal Peterson was the guy who was the cost analyst, and he was adding up the cost for each of these options. Each one of these option leaders had grown to be very competitive about his particular concept and was worried that one of these guys on my staff, whether it's the safety guy giving

them grades for which option is the highest reliability and the lowest safety, or whether it's the cost guy or the schedule person, they're grading us and comparing the three, one against the other. They can make or break our option here if they don't do it the right way, so we are very interested in how Mal is going to be doing the costing. Mal had been doing the costing on his own. He got data from all these people, but he wasn't collaborating with the team leaders on the cost estimates. He thought that would probably violate his independence I guess.

So near the end these guys got nervous, and they came to me, and they said, "Hey, we're not going to go to this briefing. We're not going to participate in it unless we spend a day with Mal going over all his assumptions. We don't want to hear this cost stuff right at the same time the Vest panel hears it. We want to be involved in this and critique it. If we think he's doing something wrong we want to be able to tell him that."

I said, "Okay, fine, Saturday."

The Vest briefing was going to be Monday if I remember right, and this is Friday. This is the final briefing. The end of the project. I've got my guys in there saying, "We are not going to participate." It was like a mutiny.

I said, "Fine. I was hoping this would be our first Saturday off in this whole thing and you guys have just allowed me to not worry about that. So let's all show up here first thing Saturday morning, and Mal is going to go through all three options and we'll take all day to do it." So we did. It turned out to be a good thing. I think even Mal would admit that it probably violated a little bit of the independent thing, but there were a few questions that came up that we benefited from. It was probably a good thing to do that, but it did wear us out, I'll tell you that.

Of course there were a lot of loose ends. We spent all day Sunday fixing that up. Came in there Monday just bleary-eyed, giving our final results with everybody with red eyes. So it

was a stressful time. There were some difficult situations for people who didn't feel that our final report was really ours, that there was too much editing going on in the ninth floor of Headquarters, and was that really fair? How can we say this is our study if we've got people up there editing it back there at Headquarters? What's that all about?

I relieved them of their worry about that. I said, "Look, I'll sign the report. Everybody's name goes in it but I'll sign it. Nobody else has to sign this thing." The original plan was that everybody would sign it, but we had some people who had serious reservations about too much editing going on back in Headquarters. That really bothered a lot of people, so I just said, "Fine, I'll sign it." That seemed to relieve their concern a little bit.

To this day I think you'll find people who look back on that as maybe an integrity challenge, or, "I thought this was supposed to be ours and then we find out there's other people writing stuff in there or crossing my words out and putting theirs in, that's not right."

It wasn't the first or the last time I've been in a situation like that at NASA. But for some people on our team, they were very distraught by that. I don't blame them really. It was supposed to be our report, it turned out to be ours plus a little on top.

It was a long effort and very intense. After presenting our case, the three options, to the Vest panel and they wrote their report, it got turned in by the agency to the President. I wasn't there for that so I don't know really what happened, whether the President was really personally involved at all. The quotes that come out of all this is that the President decided on Option A, which was the one that the Marshall team had suggested. The Marshall team had come up with brand-new smaller modules, but basically the whole thing was start from scratch. It's still modular. It still takes Shuttle to build it, to assemble it; still takes EVA, but not as much as Freedom. That's the one that the President picked.

The one that the JSC guys were working on was a totally different concept. We called it "man in a can" [Option C]. It was a single launch on a Shuttle-like launcher where you had two solid rocket boosters, you had an external tank, but instead of an orbiter with its main engines you had a great big cylindrical tank with three engines on the bottom of it. Those three engines would be jettisoned into the ocean, if I remember right, and that tank sitting on top of the external tank would be inserted into orbit. That would be the Space Station. It would be basically ready once it got up there. It needed electrical power, so I think there was a second launch that would take up solar wings. That was it, then you were done assembling it. It would be up fast, it'd be cheaper. Tremendously high-risk though in making it work right.

Of course it was a concept. It wasn't anywhere close to the maturity of the Freedom concept, which was at CDR point. We were at Critical Design Review for the first four, five elements of the Freedom when we started this team, so that was pretty well along. The credibility of a brand-new idea versus one that's at CDR is one of the things you think about. But it did have really good marks on certain things, like low EVAs. It didn't need any. Low Shuttle flights. There was only the solar panels. Up quicker.

You'd have to ask Dan Goldin which one he liked the best, but I could tell he liked that one [Option C] best. Just the body language, the way he talked about it. He hated the Freedom thing of course, because he didn't want to do that, he got forced into that. He thought that was a nonstarter. The Griffin team did a really nice job of laying out that option [Option B]. You could say, how good a job did they have to do, it was already at CDR, all they had to do was modify a few things and they were done, maybe they didn't have to do as much work. Well, that could be true, but they still looked at it and validated the goodness of it against the criteria that we had for the study. They did an excellent job. Mike Griffin doesn't know how to not do a

good job. That's the only kind of job he knows how to do. The same with the Langley team. If I'd told him, "Okay your job is to do the Freedom and I want you to drag your feet and make it look bad," Mike would have thrown his badge down. Of course if I was asked to say that to him I would have thrown mine down.

That's the point, is that he gave a really good option that made a lot of sense and had high credibility to it and low uncertainty. But I could tell that the Administrator would just probably shoot himself if that one got picked by the President, and that he would be really rooting for the one from JSC, and maybe the other one, the A option. That's the one that the President picked. There was some thought that maybe the President picked that one on advice of others, and notwithstanding that Dan Goldin may have suggested that the Man in a Can might be best, somehow the President picked the one from Marshall, the A option. It could have been because he thought that might be a good compromise. It's not too new and too different, with all the uncertainty that goes with that one from the JSC team. It looks enough like the Freedom that maybe the Freedom-loving people in Congress might say well that looks a little like Freedom, and I think we can go with that. There was a concern that if we picked the one from JSC a lot of people in Congress would not like that at all, and we'd have a lot of problems in hearings.

I don't know what went into his decision, but he picked the one from Marshall. We told our team okay, we're primarily disbanded, but there are a few people that George and Dan asked to stick around. They asked me to continue for another three months to take it to the next level and start putting some flesh on this A option that the President had picked. Part of the study was to do away with the program office at Reston [Virginia] and go down and set one up at JSC, and let JSC be the host Center for the new program office. The agency liked that idea so they went

with that. To get that transition going they kept some of us here in Washington to help with that before they actually stood up a real program office down in Houston.

That was a really tough deal too. That second three months was about how we take all this work that's been done by the people in Reston and move all of that to a new program down there at JSC, and what do we do with those people, and what do we do with the Grumman support contractor out there. That got to be quite contentious. We also had to pick a prime contractor.

We called in all the contractors' CEOs one day in that second three-month period to the Administrator's office. He said, "We're going to pick one of you guys, but only if you all stand here and tell me that you will accept who we pick." We had Rocketdyne and we had McDonnell Douglas and we had Rockwell and Boeing. "If any of you CEOs tell me that you're going to object to this then I can't really do it. So I need all of you to say yes, you'll go with whoever we pick." Grumman was there too in that room.

They said, "Okay, yeah, you pick one of us and the rest of us will be subs." Then we went and got permission to do that from Congress, because that meant no competition. That's how we got it done as quickly as we did. We said Boeing would be the prime integrator and all the other contractors would work for Boeing, including Grumman. Now Grumman wasn't too happy with this. It became real evident after a while that they had been the integration support contractor at Reston, and now Boeing was going to take their job from them. Sure enough, that's what happened. So even though the idea was the Grumman would work for Boeing, Boeing really didn't have much for them to do. After a while there wasn't any Grumman left. To this day they're still mad about that, but that got into the courts. I had to go on subpoena about who said what when; didn't the Administrator say that everybody would be in the game? How is it

that we wound up getting squeezed out? Isn't that violating the principle of what he said? All that. You could probably get some good stories from the lawyers on how that happened. I found myself in the middle of it a couple times.

There was also a big people aspect to this. A lot of good Reston people found themselves wondering what they were going to do. Some of them work here to this day in Headquarters. Some of them went down to JSC to become part of the program. The way we did away with that program office and started another one down at JSC is one of the things that I hope we never do again, because in a way I think we did it in a cynical way where we said these people are all bad out here at Reston. That's the way it came across to them. Now I didn't think that, and I'm sure people at NASA would never say that they felt that way, but that's the way it came across. We didn't do a very good job of dispelling that. They really felt like the agency thought they were a bunch of bad people because they had done Freedom. Right now on Constellation we cannot do that again. We've got to make sure they know that sometimes new groups come in and they decide to go different directions and it's not because you're bad folks. But we didn't do a very good job of that on that one.

JOHNSON: When you came on, as you mentioned Max Faget decided that he couldn't sign on. Were the other team members chosen before you came on?

O'CONNOR: Yes, I didn't have anything to do with it. The whole team was picked before I got in.

JOHNSON: Were there representatives from all the Centers?

O'CONNOR: Yes. Well, most of them, yes. Maybe even all of them. I don't remember if we had a JPL [Jet Propulsion Laboratory, Pasadena, California] guy in there or not. Sometimes they can't do the same stuff as everybody else because they're contractor. But, we had people from [NASA] Glenn [Research Center, Cleveland, Ohio] and Langley and [NASA] Ames [Research Center, Moffett Field, California]. People who weren't necessarily traditionally in the Space Station world, they were there. Good people too. The best and the brightest. It was hard for me to keep up with them.

JOHNSON: Did the final choice look anything like Max Faget's drawings on that napkin?

O'CONNOR: Little bit, yes. His drawings were modules, not the Man in a Can thing the JSC group came up with. What's ironic though is that the A configuration, little by little, starting fairly early after the decision, the more we looked at it, the more we realized that's not going to work, or it doesn't make sense, or that sounded good two months ago on a viewgraph but as we do the next level it's not going to work out so well. We wound up going right back to the Freedom. We may as well have picked the Freedom design. Right now today the [International] Space Station, the ISS is mostly the Freedom design with a lot of Russian stuff on it.

That was another thing that actually didn't happen during the redesign itself but happened right after that, was that we got marching orders from our Administrator to go and work closer with the Russians to see if they could help us with our Space Station and save us a lot of money. That was the idea. We can save a lot of money by having the Russians build part of it. After all

they had the Mir and all this long experience of running space stations. Let's do a joint effort with them and add them to the partnership. All of that happened after the study was over.

So Freedom plus Russians is what we have up there. It's not the one the President picked, because that one didn't work.

JOHNSON: During that time period you were on was the Space Station Name Committee. Do you want to talk about that just for a second?

O'CONNOR: Yes. The Administrator wanted a new name for the new Space Station. You'll remember that when it got picked it was the A thing, so the team said, "Let's call it Alpha." It became Space Station Alpha informally. But they wanted a formal name for it. So I put a team together and we outreached to the whole agency, contractors, government guys, to come up with ideas on names for the Space Station. We took the predominant suggestions and ranked them on how many people suggested those names. Of course the number one name was Freedom. It may not have been a majority, but it got the most votes. It wasn't like we asked them to vote on a bunch of names. We asked them to give us names, we just counted up how many times these names showed up.

The one that got the most votes, of course we ruled that out. The whole idea of this was something other than Freedom. So we went to some other ones. If I remember right Space Station Alpha was the one that got the next most votes, so that's what we called it. But Dan never really liked that. He thought well, we'll do that as a temporary but not as a permanent name. We've got to do something better. Then ISS came later; the International Space Station.

JOHNSON: After that, you moved into the position as director of the Space Shuttle program for a couple of years before you left NASA again. Talk for a few minutes about how it was to be in that position, especially since you were involved in those original negotiations for Shuttle-Mir and during that time period those first flights were going up for that, the rendezvous [STS-63] and then Norm [Norman E.] Thagard launching on the Soyuz and the docking [STS-71] and the docking module. How was that time period, and your duties during that time period?

O'CONNOR: Well, there were several things going on then. You just talked through some of it, how we were going to work with the Russians. We were going to have [Vladimir] Titov and [Sergei K.] Krikalev fly on two separate Shuttle flights. We were going to have some of our people participate in the Mir program, and of course that morphed. When it first started I think we were going to have one crew member on the Mir and spend some time on there, and then they would have two of their crew members fly on Shuttles. There would be some visits of the Shuttle to Mir. If I remember right it was going to be four. Four flights of Shuttle to dock with the Mir.

The big deal then was the docking ring. We wanted to make sure that we had a good docking system. This looked like a good system that the Russians had developed. I went over there and looked at it with Arnie Aldrich at some point. I don't know if it was then or earlier. But wow, it was a great piece of equipment, that docking system. We ended up canceling our own docking system design and decided that we would use that. We were also talking about using the Soyuz as a crew rescue vehicle for our Space Station. In fact we would take it up on the inside of the Shuttle and deposit a Soyuz, or maybe an American-licensed production Soyuz. A fellow named Jerry [W.] Craig headed up that activity.

That set of negotiations wound up, in the end, as ten flights, with four or five U.S. astronauts spending a long time on the Mir. We gave the Russians a bunch of money, $400 million I think it was, which to them was a huge amount. It helped them with their program. In return we got some science from our visits on station, on the Mir. We learned a lot about docked ops [operations] and proximity to big station and operations on Space Station. It was a pretty beneficial program. I think before I left we had flown our first three flights up there.

Other activities that were going on, ASRM, the Advanced Solid Rocket Motor, was something that was started after the [Space Shuttle] Challenger [STS 51-L] accident in the late '80s. That was still going even though we had—I can't remember the years, but I'm thinking it was like '95 that we canceled ASRM. It was pretty well along in its design. But frankly we just ran out of interest in it, because it was getting to be to where it was really difficult. I remember thinking about this and talking to a lot of people in Headquarters about it. We can keep spending money on ASRM and we can get it to where it's ready to go fly and get comfortable with it. But the first time we fly that thing we're going to be telling the crew office, "Okay, you guys, we're going to change rockets on you now because this new system has a better design." It's a single pour, so it doesn't have all these O-rings in the field joints. It's designed to eliminate some of the hazards and failure modes that the Thiokol RSRM [Reusable Solid Rocket Motor] has. In the meantime we will have flown 30 and 40 or so flights since the Challenger return to flight [STS-26] with remarkably low number of anomalies on the solid. We had a couple of times when something funny happened somewhere—nozzles. We had anomalies, little things, on every flight, but the kind that scare you were very limited. We were getting to where we were feeling really comfortable with that redesigned solid rocket motor and with the restructured

production capability out there at Thiokol. It was just a top-notch first-class activity out there, after all the lessons we learned from the accident.

I was as happy as I could be when we finally canceled the ASRM. When you demonstrate 30 to 40 flights in a row without a major problem and then compare that to a viewgraph that says let's go fly this new thing it's just tough. It's tough to do that.

JOHNSON: Did you have any role in Chris [Christopher C.] Kraft's Space Shuttle Management Review Team?

O'CONNOR: I was a recipient of it. Obviously Chris Kraft is a hero and a really smart guy and has been there and done that. But I tell you that team threw me off a little because they were talking about commercializing it and I just couldn't imagine that. The complexity of the Space Shuttle, what it was, how many people it takes to do their jobs perfectly every time. I just couldn't imagine us backing off of our oversight and insight. We were already doing that with the decision to go to the SFOC [Space Flight Operations] Contract, which was another activity that was going on while I was in that job, where we took the project office structure we had on Shuttle and we elevated up to the program office. What used to be a Shuttle Orbiter Project Office became a subcontract to USA [United Space Alliance]. Although there was a government guy that may over a period of time have called himself the project manager for Orbiter, he didn't really have an Orbiter project contractor anymore like he did before. Quite a few prime contracts got consolidated into that single USA contract that was managed at the program level, including ground ops and mission ops and like I said Orbiter and a whole bunch of other things, SRB [Solid Rocket Booster].

The next thing to go into that mix would have been the tank, probably. But we really decided fairly early on that if we do the solid rocket motor and the main engines it will be a while, then the tank wound up being that same situation. To me that was about as much as you'd want to do with something as complex as this in the way of oversight and insight, is to do this USA consolidation thing. Even with that we had a lot of people at the Cape [Canaveral, Florida], for example, that just thought we were doing a really bad thing. It was high-risk to put them in a situation where you guys give us insight into the contractor's activities but you're not overseeing [directing] them anymore. The contractor at the Cape is working for USA, who is the program's contractor, and you're no longer calling the shots on that contractor like you did when they were your project.

That really bothered them because they felt like they were stepping too far away from a very important high-risk activity. So we did it with some trepidation. What I saw in the Chris Kraft report was go even further than that, with the systems quite a bit further along towards eventual privatization, commercialization. I just wasn't there.

JOHNSON: Did that have anything to do with your decision to leave NASA in '96?

O'CONNOR: No, the Chris Kraft report did not. I was disturbed by the push to get the government away from it and cut the cost by backing out of it with the government folks, but that's not why I left. That to me was something that we could handle if we had everybody at level 3 substitute their oversight for just good solid insight. I thought we could do that if we didn't do it too fast. I didn't think we ought to do it to the solids and the main engines because those were very high-risk projects.

But the reason I left was different. That was when we had the February of '96 furlough. With the continuing resolution and not enough money, we got furloughed. They said that there were key personnel that were supposed to stay in Headquarters. I thought it was funny that the Administrator said he was not a key person. He was going to go and hold court in his hotel over there at the Watergate [Hotel], which was where he lived. He and Jack Dailey, [George Abbey and Mike Mott] and a couple other key staff folks would meet over there every day rather than in Headquarters. Is that strange or what? But that's what they did.

Anyway, during that time they came up with the idea George was going to be the Center Director down at JSC, and about that same time to go back to what I called Lead Center. Up until now, and as a result of recommendations and lessons learned from *Challenger*, we had gone away from Lead Center. By Lead Center, I mean where the Center Director is the supervisor and in the programmatic chain of command for the program manager. So the program manager's reporting line goes to the Center Director. That's Lead Center. Host Center is where the program manager reports programmatically to Headquarters, to an associate administrator. We're set up as host Center now, have been since Sean O'Keefe went to that in 2002. But in 1996, Dan decided to go back to Lead Center and that was one of those things that I thought was really not a good thing to do. I thought maybe it's because Dan wasn't here when we decided that Lead Center is a big problem for us and that we shouldn't be doing Lead Center. It had been part of the reason why we had communication problems between projects and program. When you get the Center Director between a project manager and his program manager, sometimes you lose something in the communication. We were trying to streamline that communication. That was a key finding of the Rogers Commission. That's how we dealt with it. So, I thought, maybe

Dan just doesn't remember all that, because he wasn't here then. Neither was Dailey. Neither was Mike [Michael] Mott and all the other people that were up there deciding this.

Now George had been here of course, but the other people hadn't. So I thought to myself this is just a bad idea. It's in the form of a directive that came out right as we came out of the furlough. No staffing, no running it around to get ideas. It just came out. We're going to do it. I took the new "Lead Center" directive to the Administrator. I said, "I'd like to appeal this. I don't think this is a good idea. Can I bend your ear on it?"

He said, "Of course." I told him what I thought. He says, "Well, look, let me think about this. I want to talk to you again about it. In fact let's set it up for next week, Monday or something." So I thought, "Okay, fine, I'll put some more notes together and I'll show you all the reports that were done." There was a [Sam] Phillips Commission and a [Robert L.] Crippen committee and a McDevitt team and all these various things that came after Challenger, all pointing to the need to have an independent check and balance model for programs versus institutional and technical people and not to put programs under Center Directors.

I got my stuff together and came back to the second meeting and gave it to him. I could tell he hadn't heard this before. Of course neither had Dailey or the other guys, and they were all there. I could tell that somehow these guys are really feeling funny here because they've decided to do something and published it and now I'm coming in and showing them how bad an idea this is, and now they're in a dilemma. So what do we do? Undo this decision? Or maybe they'd made promises to outsiders or something and now they'd have to go back. I don't know. I don't know what was on their mind. All I know is that they were dumbfounded by all this and obviously disturbed. So they said, "Well, we need to talk some more about this. Come back next week."

Well, the third time I came in, it was just me and Dan. I said, "Okay, I got some more stuff here."

He says, "That's okay. Don't worry." He says, "You've made a good case here, but I've decided anyway I'm going to do this. So thanks. I appreciate your appeal and all the effort you put into it. But I'm going to go with what I decided, and put the programs under the Center Director."

So I said, "Okay, well, I'm leaving then." I just told him right there. I said, "I just can't justify me sticking around in this environment. You really need somebody who will love this idea. I just can't quite get there. So I'd do a disservice to you and to my boss the AA [Associate Administrator] down there if I'm hanging around just to draw a paycheck when I cannot support this activity." I can support a lot and I've put up with a lot of stuff in my career but this was one where I drew the line and said I'm going to have to go. So I did. I left.

He said, "Well, I thought you might say that, and I feel bad about it." He was a real gentleman about it. There was no yelling or anything. It was professionally done on his part. Afterwards I was talking to Jack Dailey in the hallway about it.

He said, "You did what?" I told him. He said, "Okay. This is a big problem. Now we're going to have to figure out what to say about this." There was no time for planning ahead of time on it. I realized well, I just put the administration on the spot here by actually resigning with no prior warning. What are they going to say?

It's a little bit of a high-visibility thing here. It's not like I'm a GS-14 [Government Schedule pay scale] down there where the press wouldn't care because they're working on something that's not high-vis. This one is pretty high-visibility, so I felt a little guilty that I hadn't coordinated. To tell you the truth, now I think about it, I may have mentioned to him that

I would not stick around if he decided. I may have given him a little notice, but it really wasn't much. I know he was surprised when it actually happened. What he did was interesting. I supposed that there would have to be a press release that says something like, "O'Connor is going to go spend family time," or whatever the normal stuff is that people say.

I was fine with all that. But Dailey said, "No, no, we're not going to do that. What we're going to do is we're going to say that you left because you had a dispute, and here's what it was about, and you decided that you would not be able to support that, so you're going to go off and do other things. And we're going to be right up-front and honest about it and not put all that BS out there about you need more family time." He said, "The reason I'm saying this is because there's a lot of people who know what you've done here. There are a lot of people who know you have appealed. There are a lot of people that will feel strongly enough about it to go out and tell the whole story anyway. We're just going to anticipate that and just tell the truth." I guess he and Goldin talked about, and they all agreed that's the thing to do here, let's not be cute about this. So they did. I respect those guys for doing that. I would have been fine with the other way, which you always see. Whenever people leave with very little notice from places like the White House or other jobs in government it's always because they want to spend more family time. It's never because of a dispute. But it's always because of a dispute, you know that. But here was a case where they said let's just tell the truth. I thought that was pretty neat.

There were times when I second-guessed myself for throwing down the badge, so to speak, about something like that, but I never really regretted it. I did think about it. There were times when I heard people saying, "The agency has really turned over a new leaf on safety. They're spending a lot of time on it." I wondered sometimes when I heard those things if maybe folks might be compensating a little bit. If somebody leaves the agency saying they're

concerned about a safety risk, communication failures cause safety problems, reorganization in a way like this will cause communication problems, that's a risk to safety that we don't need to do. That was my point.

When George was down there running these programs and running the Center at JSC, he was renowned for his hard line on safety. He just made that a really important imperative. I often thought that he probably would have done that anyway, but maybe there's a little bit of that that came from making sure that nobody could ever say that this was a big safety problem. "When they transferred this program down there to that place, that was just like O'Connor said, it was a big safety problem." Well, I don't think it really was in retrospect, so I was wrong. It didn't turn out to be one. But you never know.

JOHNSON: You moved to Futron Corporation for a period of years.

O'CONNOR: Yes. I was there for three years. The first three years I did various things. I was on a board of directors and had a couple of titles for an entrepreneurial startup company that was talking about doing some work with airships. That was fun. But I found myself mostly involved in doing committees. I served on a couple of NRC [Nuclear Regulatory Commission] committees looking at NASA matters. I spent a lot of time working with the Defense Department on aviation safety matters for the Harrier [AV-8B] and then eventually another one with Jack Dailey and Norm Augustine. I was the senior technical guy on a panel that looked at the Marines' Osprey [V-22]. It was having serious safety problems during its operational evaluations. The Defense Department was considering canceling the program, so they asked this team to take a look at it.

It was that kind of work that I enjoyed doing most. I ended up being recruited by Futron. Joe [Joseph] Fuller is the president, and one of the finest guys I ever worked for. I really enjoyed working with him. I was in that company for three years. I was his director of engineering, and our big customer was the FAA [Federal Aviation Administration] people that do space. They were writing regulations on how to regulate launch vehicle public safety. We had a bunch of our people working that. We eventually got in some NASA work too. We set up the probabilistic risk assessment for the Space Station program. We had several different customers, mostly doing safety and reliability work and risk work.

JOHNSON: Why did you decide to come back to NASA in 2002?

O'CONNOR: Because I got so tired of saying no to Fred [Frederick D. Gregory]. He was very persistent. I told him I was very happy being a consultant. I enjoyed working with various kinds of problems and different agencies. Doing some work for DOE [Department of Energy] one day and then FAA the next and the Defense Department and a little NASA stuff. But he said that he'd been moved out of the Safety and Mission Assurance Office and was up in Code M as the Associate Administrator. He thought that I might make a reasonable substitute for him in this job. He called me three different times. He didn't take no for an answer. So the third time, by then I'd been thinking well maybe he's right. Maybe it could be something I could be useful at and enjoy doing. So I came over here and did that in June of '02.

I inherited a great operation, a great team here, because he really had one of the smoothest-running, finest organizations in Headquarters. All I could do was make it worse.

There was no way I could improve that. He really set a high bar. He and Michael Greenfield and their key leaders up here did a nice job.

JOHNSON: Not too long after you came back, the [Space Shuttle] Columbia [STS-107] accident happened. Would you talk about that for a few minutes and how that affected your position, as far as the recovery efforts and the investigation?

O'CONNOR: Yes. The Columbia story for me starts two FRRs [Flight Readiness Reviews] before the Columbia; one where we were talking in a flight readiness review about the STS-113. Jerry Smelser was the external tank project manager. He was talking about what they learned from a big loss of bipod foam from the tank that scared people on that flight, but would probably be okay because we lose lots of foam on every flight. It's a maintenance issue when it dings one of the Orbiter's tiles but it doesn't really do very bad damage. Even though this was a pretty big piece, after all it's only foam. So we went through all of that. In fact I remember when he said, "It's not a flight safety issue."

I remember asking him in the meeting, "Are you sure about that? I thought it was a flight safety issue. Don't we have an integrated hazard report?" Now I was going back from memory, because I think I told you in an earlier session that after the Challenger accident one of the jobs I had for about two and a half years was the Astronaut Office rep [representative] to the System Safety Review Panel. We reviewed and approved every single failure mode and effects analysis and hazard report as part of the getting back ready to go fly again. I knew a lot of those things from memory and what was in them and what they covered and what they didn't. So when he

said that it just didn't ring a bell, and I asked in the meeting, "Can we go and get that hazard report? I think it's listed as a flight safety issue, stuff coming off tanks."

It may have been a semantics thing more than a real eye-opener. He may not have meant that in a formal terminology like I did. I think I know what he meant, but still I thought of that as something that we characterized in our formal hazard analysis as something that required certain controls and mitigations because it was a risk that we accepted, but that we needed to make sure that we understood that risk.

So Mark Erminger, who was the Space Shuttle Safety and Mission Assurance manager at the time, ran out and came back about half an hour later when we were on a different topic. He produced this report and I looked at it, and sure enough you could easily make the case that foam coming off tanks is a flight safety issue, it's not something that we treat as a maintenance issue. As the accident investigation showed later, there were some discussions about different use of terms, and maybe not appreciation for how dangerous this could be, a lack of good modeling. All that came out of that accident investigation, which is really the story, not something in a hazard report.

When I think about that, I wish that I had gone further and gone to the next step. I thought of that hazard report and I read it while they were in there, but I didn't follow up with the next question that would say, "Well isn't this the biggest piece that we've ever seen, and shouldn't we go back and formally decide whether we want to continue to accept this risk based on this data." That kind of discussion or argument would have been appropriate in retrospect, but I didn't do it.

So I feel guilty, like so many other people do after we've lost our crews, for what I didn't do. That's always the first thought I have when I think about Columbia. There was something in

the Columbia report about how during the actual flight one of my guys came in and said, "Shouldn't we get the Defense Department to help us with some imaging requests?"

I said, "Well, I don't know how to do that. Let's ask the program. The program knows how to do that." I just deferred that. Again in retrospect I think about it, and if I'd known that the damage could be possibly that bad, I would have been the first guy to go down and help call the program myself, not just tell my staff guy to do it.

That little event right there is characterized in the CAIB [*Columbia* Accident Investigation Board] report as one of the things that maybe could have saved the day, or had a different outcome. I really don't think it would have. I don't think we could have possibly saved that crew, even if we figured out during flight that they had that damage, because we had so little resources for them to stay alive and so little chance of getting another Orbiter out to the launch pad and ready to go and fly and go up there and perform a miracle to recover the crew. But we caught a lot of criticism for not thinking in those terms, and from a lot of people that are buddies of mine that used to be in the crew office.

Story Musgrave to this day will tell you that we could have saved that crew if we'd just worked harder to run it to ground during the flight itself. I thought at the time, during the investigation, that that was a little bit of a red herring. The real story of Columbia wasn't whether or not we could have saved the crew or not, it was how to prevent the damage in the first place. That to me was the more important of those lessons. But saving the crew, coming up with ways to save the crew, ways to repair damage, ways to see if you have damage, those are all integral parts of our program now. We do that on every flight, and for good reason. We don't have enough knowledge of that tank, even to this day after 130 flights, to say that you're not going to get another catastrophic hit on the way up. At least now we'll know about it and we'll

be able to fix it with an EVA, or put the crew on the Station and go up and save them with another Orbiter.

Those are things that we arguably should have done on day one in this program, but we just underestimated the risk.

JOHNSON: There's a lot of talk about NASA culture after Challenger and then again after Columbia. What are your thoughts on not changing that culture enough before Columbia, and if it's been changed enough now. As you said, things are happening now that haven't happened before.

O'CONNOR: We had migrated before Columbia to a pretty powerful model for program manager. A very limited and semi-silent check and balance model, by comparison to how it had been in previous years. The program was pretty strong. The program manager was the king, to the extent that the institutional engineering and safety and mission assurance folks who were assigned to keep an eye on the program felt empowered to speak up or dissent, but it wasn't used very much. People might have suggested that you don't want to do that too much because you only get so many silver bullets, etc. In retrospect the program check and balance model was not really something that we would, today, say was a good one.

Now part of that is culture, part of it is organizational. There were some folks who felt intimidated. Rodney Rocha gives talks about how intimidation and fear of being put down by people who don't want to hear bad stories was actually part of his thinking back then. That's a culture problem right there. When people admit that's the way they felt, you've got to admit that there was a culture problem.

I don't think it was across the agency or even across the programs at JSC. I think it was relatively differentiated by that particular program, and really not nearly as bad as other programs I've seen. I've seen programs in the DoD [Department of Defense] where the stated check and balance model was laughable, because the program manager was so intimidating and wielded such a hammer. There was a program manager I remember talking to at NAVAIR [Naval Air Systems Command] one time who bragged about killing messengers. He did it for sport. Okay, that's one way to run a program. I'm not suggesting that NAVAIR has a bad culture. I'm just saying that I've seen other programs that were worse than the one that Ron [Ronald D.] Dittemore was running.

I would never claim that Ron Dittemore's program management style was really bad. I'm just saying that in retrospect it wasn't what we like to say we have today. It did need some improvement. Part of it was the organizational construct and the authority that we actually vested in people. It was not stated very clearly. If you asked the guy from the Safety and Mission Assurance organization at JSC who was responsible for keeping an eye on the Shuttle if he had the authority that we, today, call technical authority, he would have wondered what you were talking about. I have the authority to attend the PRCB [Program Review Control Board] meetings, yes. Well, can the program manager accept risk on a hazard if you say it's unacceptable? Yes, of course he can, he's the program manager. I'm advisory. So you don't have technical authority, you have technical advice authority. That's what I would hear if I were to actually go back in time and ask those people where their authority really rested.

That was because we didn't spell out what technical authority really means. They would have talked about, "Well, the program manager would listen to me, and if he and I had a big disagreement I would know that I could go to my director and get some help." There was an

appeal thing, if not formalized, at least understood, but it wasn't spelled out like we do today. That's the second piece of it, the culture itself, and then the organizational construct, that allows that culture to operate without question.

We've fixed both of those things since Columbia. I remember at the time I felt defensive when the Columbia [Accident Investigation] Board was making such a big deal about this organizational cultural aspect, because I didn't really think that was the root cause of the accident. I think it was a contributor, but the real root causes were some other issues that they didn't even talk about at all, including the way we did integrated hazard analysis and the way we closed the loop on anomalies with our hazard analysis. I thought that was very deficient. The reason I thought that would have been something they'd latch onto in the accident investigation was because I had my own memory of almost getting that close to preventing an accident myself, if I'd had a little more discipline in the hazard analysis world and asked the right questions based on that. They didn't even talk about that in the accident investigation. So I thought those guys were a little off base.

Then when I read the CAIB report, even though I have to agree with the fact that we had a culture issue to work on and an organizational issue to work on and that those are important, their write-up of that whole topic was just terrible. It's the worst root cause section of a major mishap investigation I have ever seen. I tell people that if you want to know how not to make your case for a root cause of an accident, here it is, chapter 7 of the [Harold W.] Gehman report. So if this statement I'm making here ever makes it to Admiral Gehman he can give me a call and challenge me on that. I really feel like they blew it on that chapter, and it caused us innumerable problems in return to flight, all unnecessary. Chasing our tail on what these recommendations are, how they're tied to the findings, and where's the facts that back these up that we can go latch

onto and actually do something with. In the end I think we've done a pretty good job of getting a technical authority model, but you just can't imagine the arguments and discussions we had on what they meant and what we thought they might mean.

I talked to various members of the CAIB and got different answers on what they're talking about here. I thought the technical part of their report was excellent; the proximate cause pieces of it, putting together the accident and showing what happened. But when they got to that other root cause piece where their facts were not there, and in their place were three benchmarks. They went out and asked how SMC [Space and Missile Systems Center] does their independent engineering work for the Air Force and how does the nuclear Navy make their decisions, I thought those were interesting academic exercises. But what do they have to do with this accident? What did they actually find about our organizational construct that inhibited the check and balance? They talk a little bit about it, and they have a couple of viewgraphs that showed an organizational structure that was just factually all wrong. I just really didn't like that very much. They had six months to work on it, and maybe they saved it for last and just didn't have time to work it. I don't know how to deal with that. I was very disappointed in it.

Especially in retrospect with all the beatings we took from that follow-up committee that we put in place to make sure we did all the things the board told us to do, the Covey-Stafford team. They had a management team on that that was just hammering on us to do what the CAIB had told us to do in the way of culture and organization. They had their own idea what the intent of the board was, and they were just all over us, making us spend an inordinate amount of time working on stuff that to me was just only partially relevant to the accident.

We wound up just saying no to one of the recommendations, for example. I can't tell you how often I got beat up for saying no to the accident board. They had recommended that we

have all the safety guys report directly to me rather than to their Center institutional organizations and I said, "No, we're not going to do that. Thanks for the advice but we're not going to do it, and here's why." That was our answer. Well, the management team headed up by a guy named Crippen just gave me hell for that. So that was not a fun time, recovering from *Columbia*. Recovering from an accident is never fun at all, but I feel badly about the time we wasted on stuff that really didn't matter that much. We could have set up a good check and balance system and gotten on our culture without all the harassment we got from that Crippen group after the fact.

JOHNSON: You finally did get back to flight, the return to flight mission, STS-114. Do you want to continue or do you want to stop for today?

O'CONNOR: I've got some homework I need to do.

JOHNSON: Okay. That's fine. Why don't we stop?

[End of interview]