

NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

ORAL HISTORY TRANSCRIPT

CHARLES F. BOLDEN
INTERVIEWED BY SANDRA JOHNSON
HOUSTON, TEXAS – 15 JANUARY 2004

JOHNSON: Today is January 15th, 2004. This oral history interview is being conducted with Charles Bolden in Houston, Texas, for the NASA Johnson Space Center Oral History Project. The interviewer is Sandra Johnson, assisted by Rebecca Wright and Jennifer Ross-Nazzal.

During our last interview, we talked about your first two missions and all of your activities around that time period. Today I'd like to begin by talking about your next assignment in August of 1990 when Administrator Richard [H.] Truly appointed you to lead an agencywide review of the policies and the process for honor awards.

BOLDEN: Oh, I forgot about that. You guys are smart.

JOHNSON: If you don't mind sharing some details about that.

BOLDEN: I can. As a matter of fact, Admiral Truly was concerned that there was not an equitable distribution of recognition throughout the agency, that some centers got more awards than others, that there was not an award that was available for recognition for people who weren't engineers but who did just as valiant an effort at supporting the agency. And if I'm not mistaken, what he had in mind was trying to build a system that would have two equivalent awards, or closely equivalent awards, like we have in the military, which are, in the Navy and Marine Corps it's the Navy-Marine Corps Achievement Medal and a Navy-Marine Corps

Commendation Medal, with very minor distinction between the qualifications for the two. What the committee was charged to do was try to evaluate all of the NASA awards, but specifically look for something that would be able to recognize people in nontechnical fields.

Long story short, after weeks of deliberation what we came up with was something that I think the final name of it was the NASA Exceptional Achievement Award, as opposed to the NASA Exceptional Service Award. When we talk about culture again, we had to advise the people in the chain of command, the NASA managers, that this was a new medal in the NASA awards system and that it was intended for this group of people; however, anybody who met who the prerequisites could receive it. But it was now their vehicle through which they could recognize people in the administrative field.

To my knowledge, as I remember, we may have tweaked the words on the prerequisites for some of the other awards, but we validated those that were in the NASA system. We decided that there would be no hierarchy. That was one of the things we discussed, whether there ought to be a ranking of awards just as there are in the military, so that you wear them in some ascending or descending order. And we said, no, you don't really want to do that; that's not necessary. But we did come up with an additional award, a brand-new award. And I hope I got the name right. Did that come close?

JOHNSON: It sounded good to me.

BOLDEN: I'll have to go back and look. I have my notes somewhere.

JOHNSON: How long were you there?

BOLDEN: I completely forget that. We met off and on. Boy, I want to say it took us about six months to finish all the deliberations. And it wasn't an ongoing—you know, we didn't meet every day for three weeks or something like that. We met and went back and thought about it and polled people, went back to the centers to try to find out what the level of reception would be. Interestingly, there were some people who were opposed to it, for a variety of reasons. You could not get people to understand that these were going to be two co-equal awards; it was just that the criteria for receiving one as opposed to the other was technical versus nontechnical. There was nothing for the nontechnical people up until that time. Although anybody could receive an Exceptional Service Award, it was always considered to be something for technical achievement.

JOHNSON: At what point did you learn that you were assigned to your next flight?

BOLDEN: Oh, my goodness. I really don't remember, because my next one, it was my first command, and that was being the commander of STS-45 ATLAS [Atmospheric Laboratory for Applications and Science]. And I actually think, if I remember correctly, much the same as I had learned that I was going to be on STS-31, the Hubble Space Telescope mission, it was in the latter phases of preparation for that flight that I was advised that two years hence I was going to get an opportunity to command my first mission.

JOHNSON: As you mention, this is your first as a commander. What were the differences for training and getting ready for this mission?

BOLDEN: Oh, huge. The biggest difference in being a commander and a pilot is that the commander has—we talked about this a little bit the last time—but the commander has overall responsibility for the organization of the crew, overall responsibility for conduct of the mission on orbit, and depending on how the commander views his or her duties, I viewed it as I had responsibility for organization of the training, including the training plan and the training flow, and then the exercise of the flight itself, once we actually got finished with the training and went on orbit.

I had no responsibility for the selection of the crew. I learned that, “Here’s your crew. You got any objections?” So I did have an opportunity to identify if there was anybody that I thought I would have a difficult time working with. I did not, and so the crew stayed intact up until about six months prior to the actual conduct of the mission, at which time we lost one of crew members, and that was Dr. [Michael Logan] Mike Lampton. Mike was one of the two payload specialists we had. We had Mike Lampton and, if I remember correctly, Byron [K.] Lichtenberg, as our payload specialists.

ATLAS was scheduled to be a nine-day mission and it was going to be NASA’s first space laboratory mission dedicated to the study of Earth. It was the first in a series of flights called Missions to Planet Earth. ATLAS was the acronym for the flight, and it was Atmospheric Laboratory for Applications and Science. It contained thirteen specific scientific payloads, ten of them were dedicated to Earth’s atmosphere, and three of them were solar studies experiments.

At the time, it was an international mission because the bulk of the experiments were international experiments. They were non-NASA. At the time that Mike Lampton, who had

been complaining of back problems, was diagnosed with having abdominal cancer, then he was removed from the flight by his doctor.

The payload community went out and elected Dirk [D.] Frimout, who was a Belgian engineer who had been responsible for the design and development of one of the critical experiments that we had on board that was a—boy, I'm getting way over my head here, but it was an atmospheric experiment that measured—I can't remember the name of it, but it actually measured aerosol content in what we call the mesosphere. We called it the "ignosphere," the part of the atmosphere that's ignored my most scientists and about which we knew very little.

In fact, it turned out the focus of the flight, really, other than the three solar experiments, was principally to help us understand the middle part of Earth's atmosphere, the mesosphere, because that's where everything gets mixed. We understand Earth relatively well, we understand space relatively well. What we didn't understand—I think we have a significantly better understanding today, but what we didn't understand at all back then was the middle atmosphere. And that's where a lot of the weather is made, a lot of pollution comes about, and we just wanted to understand exactly what's going on there. How does God do this thing in what we call the middle atmosphere? Ozone layer overlying it, a lot of other things.

So Dirk had gained the respect and admiration, actually, of the payload community. It was an opportunity for them to involve a real-live foreign payload specialist, and so although he was not a payload specialist, per se, he was elected from the payload community. He came on board about six months prior to the flight, came up to speed very quickly, and ended up flying as our second payload specialist and our seventh crewmember.

JOHNSON: You ran twenty-four-hour shifts on that flight.

BOLDEN: Exactly.

JOHNSON: Was this the first time that that was done?

BOLDEN: No. As a general rule, the space laboratory missions were twenty-four-hour ops [operations] because you had a laboratory there and you really wanted to optimize the scientific return on the mission, and the best way to do it was to operate around the clock.

Ours, being an atmospheric studies mission, we wanted to be able to take all the opportunities that we had to measure Earth's atmosphere, and so the advantage of working around the clock for us was that we had an opportunity to look at daylight and darkness in both hemispheres, and daylight and darkness in both parts of the world, north and south, and, well, east and west, even. So by having two separate crews that were up all the time, you got daylight in one part of the world that you wouldn't have been able to get had you gone to bed when it was daylight in your normal launch time.

And we had what—we called it Red and Blue Crew. I was blessed to have had just an outstanding crew of people, and so the way that I elected to do it was I made Brian Duffy, who was my pilot, my co-pilot, I gave him primary responsibility, on-orbit responsibility, for one crew, and then [David C.] Dave Leestma, who was our mission specialist number two, but was a Navy F-14 RIO, Radar Intercept Officer, I gave him on-orbit responsibility for running the second crew, which meant that he flew the vehicle, which was great for him. I felt perfectly confident in his capabilities and ability to do it, and he was superb, as I had expected.

[Kathryn D.] Kathy Sullivan was the—I used another position that sometimes we use and sometimes we don't, and I made her my payload commander. So she had primary responsibility for the organization and the conduct of the payload operations on board. I worked with the flight controllers in overall oversight of everything, but she had primary oversight of the payload side of the flight. So when there was a question about this experiment time that was going to be allocated to it, assignment of who was going to be the prime and the backup for each of the experiments, that was Kathy's responsibility and she just advised me of it, and unless I had some heartburn about it, then that's the way we did it. And it worked very well, again.

JOHNSON: Did you have any involvement in the experiments?

BOLDEN: Everybody did, and this is the way that NASA crews always do it. Everybody on the crew, you can't afford the luxury of having somebody not be involved, so everybody has some experiments for which they have primary responsibility, and some for which they are the backup. As a pilot, my involvement was really as a backup on the real hard science, and then we had a number of student experiments, so they were low-enough-level science that I could handle those as primes, so I did the prime responsibility there.

JOHNSON: Did you have any involvement with the SAREX [Shuttle Amateur Radio Experiment]?

BOLDEN: SAREX was my primary responsibility, although I hated it, to be quite honest, initially. I was not a ham radio operator and did not want to be a licensed ham radio operator,

but the counsel was that the commander really needed to be a ham radio operator to encourage the rest of the crew members to do it, and also because they would use my call sign on orbit for the crew.

So I went through the training and certification, became a licensed ham operator, and actually kind of fell in love with it. The big reason was because it gave us an opportunity to interface with students, just the ordinary man and woman on the street, and it gave you a way to just relax and enjoy yourself in the free moments you had, and also to turn working time into enjoyment. Because we had a set schedule of SAREX opportunities, or communications, that we were supposed to make with school groups, individuals on the various continents of the world, and I think it was Dave Leestma and Kathy actually established communications with somebody from every single continent in the world, so they became unique in the fact that they had accomplished that in one flight. And I'm not sure whether that had been done before. Owen [K.] Garriott was a very ardent ham operator, and so he always did it on his flights. But we ended up, everybody tried to add more SAREX opportunities as we went through the flight. Turned out to be a lot of fun.

JOHNSON: Were there any challenges during that mission that you'd like to talk about?

BOLDEN: I think the biggest challenge was organizing and integrating a diverse crew of very strong personalities and the like. And I did something that was probably considered strange at the time; I went to the NASA psychiatrist and I actually brought a psychiatrist in to do the—I forget what they call this thing where you get classified psychologically, but to spend time with us. And we actually did a written psychological typing test, and he sat and worked with us and

our spouses on what our psychological profile was, what kind of things would set us off, what kinds of things would cause us to be not at our peak under stress, and the like. And then we spent time, crew and spouses, getting to understand what characteristic each of us had so that if we got into a stressful situation, whether it was the spouses on the ground or us on board, that we'd have some idea of where to turn or what to do to try to alleviate the problem or whatever it was that the other crew member was having.

For us, at least for me as a commander, I found it invaluable because it helped me to understand little quirks that you saw in the crewmembers, both in training and on orbit, and I thought it was good. Although I didn't go to that extent on my next flight, we did spend time at least talking about psychological factors of flying.

It's something the Russians—and I'd heard about it—either something that the Russians put a lot of stock in—they do a lot of psychological profiling, because their whole program is geared toward long-duration space flight. They had a couple of bad instances where, at least reportedly, they actually had to terminate a mission early because of just psychological conflict among two crew members. Now, whether that's true or not, I don't know, but that was good enough for me. And although nine days is not a long time, I had learned from my first two flights that things do happen to crews once they get on orbit, and I wanted to optimize our chances of being very successful and not having any problems. So for me it was invaluable to have done that.

JOHNSON: And the rest of the crew?

BOLDEN: The rest of the crew said they were happy having done it, the spouses were happy having done it, and I think the other thing was it really made everybody—again, I’m probably saying this because I thought it was great, but I think, at least my perception was, it really did make everybody feel like they were a family a little bit more than you ordinarily get when you’re training together as a crew.

I think every crew comes together in a lot of different ways. If you look at the STS-107 crew, while I did not know many of them intimately, the one thing that struck me in getting to know them through their friends and their families and everything was how close they had become in comparison with other NASA crews, other flight crews. I think Rick [D.] Husband is credited by everybody that I’ve ever talked to concerning that particular crew with having been a master at molding a team and getting them all to feel like they were family, to include the spouses and kids and all that. And I think that’s one of the reasons that their loss was so traumatic to the agency, was because everybody recognized how close they were as a crew, but also that because of how close they were, they had pulled the training team in, the flight control team, people in the community, and that really makes a difference.

JOHNSON: Is there anything else about that flight that you’d like to share?

BOLDEN: It was fun. It was a tremendous amount of fun. It gave us an opportunity—I will share one other thing, and that’s post-flight. As a general rule, on every flight you go somewhere that you get to share your story and your experiences with people who helped you get there. My first two flights we didn’t do a lot of international travel, but after ATLAS, one of the most enjoyable trips we did was a ten-day trip to Belgium because Dirk Frimout had become

Belgium's first astronaut. He was the Alan [B.] Shepard [Jr.] of Belgium. The Belgium government invited us to ESA [European Space Agency], and the Belgium government invited us to come over. We operated mostly out of Brussels, but we got a chance to travel around and visit the country and everything.

I think the highlight of the trip was actually being a guest of the King and Queen of Belgium. The King was actually a scientist/engineer, amateur astronomer, and everything. Unlike a lot of monarchies, Belgium's government is such that while it is a democratically run government with the structure of a cabinet and all that kind of stuff, the monarch, the King, actually has some input into what the government does. While we were there, in addition to the brief that we did for him personally, we went into the royal viewing room, if you will, like a small theater, and we actually did our post-flight presentation for the Cabinet, for the Belgium Cabinet, and Ministers, and everybody.

The King intended for us to provide food for thought for those people in the Belgium government who were going to make decisions about how their budget was going to go for the next year, and it was interesting to see him interact with them and put demands on them for having some vision and thinking about where the country should be going with reference to science and technology. I was impressed. And it was also kind of a big deal to be there in the presence of the King and having some influence on what a country's going to do.

JOHNSON: Certainly an opportunity.

BOLDEN: I had not seen that on either of my first two flights. When you come back, you go to the White House, you go to the Congress and you brief Congress, but it's form more than

substance. If you find somebody like a, back then, Senator Al [Albert] Gore [Jr.], who was very, very keenly interested in the environment as, I think, he is still now, when we went back and briefed Congress after this flight, he had worked with Franklin before, with Franklin [R.] Chang-Diaz, and so he had personal interface with astronauts, so he had a very keen interest in what we had found over the course of our flight. Of course, being flight crewmembers and not the researchers, we couldn't give him any hard data, but we at least knew what the scientists had told us about the findings from the mission. So there you felt like you were giving somebody some useful input.

JOHNSON: Your next opportunity after that involved NASA Headquarters [Washington, D.C.].

BOLDEN: Unfortunately, it did. I'll say that with all sincerity. Another one of the unpopular decisions that I made as the commander was I agreed with the medical community. We had done, as do most crews, we had done a lot of space and life sciences, human medical research, and for that the life sciences folk really preferred that we not go through a significant amount of re-adaptation to the gravity environment when we came back. The way that they wanted us to ensure that we would not re-adapt was to get on a gurney as soon as we got out of our seats, be wheeled off the vehicle, and go in for the initial post-flight medical exams without any significant gravitational re-adaptation.

So I talked it over with the crew; they didn't really care. There were some thoughts that, "Well, but we're not going to get a chance to walk around the vehicle and kick the tires?"

And I said, “No, we’re not going to get a chance to walk around the vehicle and kick the tires,” because it’s symbolic more than anything else. So I agreed that we would be wheeled off on the gurneys and go in and let them do whatever they wanted to do.

As a result, as I was waiting for my time to come off, I was laying there with my eyes closed, relaxing, and all of a sudden I hear this voice that I didn’t recognize, and I look up and it’s this guy I’d never seen before. And it was a gentleman by the name of [Daniel S.] Dan Goldin, who on that day had become the new NASA Administrator. So this was his first official act was to come to the Cape [Canaveral, Florida] and greet the crew of STS-45 as they came back. And so I’m sitting there, and he says, “I want you to come to Washington [D.C.] and work, and I’d like to talk to you about it.”

And I said, “But I don’t have any interest in coming to Washington to work. I’ve avoided it all this time, and I don’t want to do that.”

He said, “Think about it and then come talk to me.”

So I went, and we went through our post-flight and everything, and then Mr. [George W. S.] Abbey, who at the time was now up in Washington as a Special Assistant to the Administrator, he said, “You know, you really ought to come up and talk to him, at least, and see what he’s got to offer.”

And so I did that, and went up. And I was impressed by him, to be quite honest. He was, I thought, a visionary; I still think a visionary, and had some great ideas, things that he felt the agency should be doing and places we should be going to help the nation go in the right direction in terms of space exploration. So I agreed to go and work for him for, I said, a year. And what he really wanted me to do was assume the duties of the Assistant Deputy Administrator,

working, actually, for Dr. Aaron Cohen, then, because Aaron had left JSC as the Center Director and had gone up to Washington to be the Acting Deputy Administrator with Mr. Goldin.

So I went up, and my primary task was to lead the effort to reorganize NASA, to figure out how we were going to get our budget in order and how we were going to decide what should be our major thrust, both in, well, whether we should continue to have any interest in human space flight, what we should do with all the different areas of scientific and technological research and expertise that NASA had.

The two big things I did was establish and organize what NASA then called the Red and Blue Teams. We kind of patterned it after the way that the military does things. They put—and I will get it wrong—but one of the colors, I think the Red Team, is actually a grouping of outside people, outside experts, who take a look at you from the outside in, kind of look at your plans and evaluate them and say, “Yeah, we think that’s okay. That’s not okay.” And then the Blue Team was internal organizations, internal teams of people from within NASA. And we got—I can’t remember exactly how many we did, a significant number, but we looked at every primary area of the agency, whether it was robotic exploration, planetary exploration, space and life sciences, human space flight, aeronautics, and the like. I think we organized ourselves along the same lines as the principal codes at NASA Headquarters. So [Code] R, D, S, T, whatever we had back then.

The Blue Teams—if I remember correctly, we allowed whoever happened to be that Deputy Associate Administrator select the head for that Blue Team so that there was at least some representation from the hierarchy of the organization. But we got people from across the board; the makeup of the team was primarily not from that area. They looked at major projects that were under way, opportunities for new projects, opportunities for budget cuts, opportunities

to do away with projects that were costing NASA money and getting no return because we had to shrink the budget.

I think that was the [George H. W.] Bush-[J. Danforth “Dan”] Quayle early years, Bush-41, and that was our charter, was to find ways to—we were under the mantra, “Faster, Better, Cheaper.” Mr. Goldin had decided that NASA would be the trailblazer for government, that we would set the example for all other organizations in government in demonstrating that you can do bigger and better things for less money, and you can do them quicker. So that was our undertaking. So I organized the Red and Blue Teams, kind of oversaw how they went.

And then the other major thing we did was six town hall meetings around the country. I think the sites we selected were Tampa, Florida; Pasadena, California, for southern California; Portland, Oregon; Washington, D.C.; somewhere else in the South, I don’t know, so as to get the geographic regions as well as the centers of expertise. And they were open fora for anybody. Anybody in the American public who wanted to come to a town hall meeting came out. We had, preferably, all the codes, their Associate Administrators, not a representative of them, but the people, the NASA leadership. And they each gave a very quick pitch, I forgot what it was, like fifteen—these were half-day events. They gave a quick rundown on what was going on in their particular code, what they envisioned in the future, and then the floor opened up for questions and comments. And people from all around America came in. It was all televised over NASA Select [Television], so people could e-mail in comments and questions, they could come up to the mic [microphone] and do comments and questions.

We amassed all this information from the town hall meetings and presented it to the Administrator and said, “Okay, these are some programs we think we need to get rid of. These are some new directions we think the agency needs to go in, and here’s how much money we

think it's going to take to do this." And then I left. So I think what he did with it was took it to the White House and to Congress and to the Office of Management and Budget.

But anyway, between the Red and Blue Teams and the town hall meetings, that formed the basis on which the first Dan Goldin NASA budget and the first Bush-Quayle NASA budget was formulated to turn the agency around. It looked like it was working for a while, but I think something went awry somewhere.

The overarching organization that oversaw NASA at that time was the National Space Council, and it appears that although it started—to my knowledge, the first National Space Council came under a Democratic administration. I know when [John F.] Kennedy was President, there was a very strong National Space Council. And then after that it seemed like every Democratic administration that came in did away with the National Space Council. A Republican administration came in and they stood it up again. And it gave the Vice President of the United States something that he could hang his hat on and for which he was responsible.

The interesting thing about the National Space Council under Quayle was, since you started seeing talk about him becoming a presidential candidate should President Bush not choose to run again or something like that, I got an opportunity to see the infighting between candidates, and the likely candidates coming to the fore were the Vice President and the Secretary of State, who was Mr. [James A.] Baker [III], Secretary Baker. So we had the Vice President and the National Space Council pushing one agenda, and the State Department, through whom everything has to go when you're talking about international negotiations and the like. If it was the Vice President's idea, they kind of said, "No, we don't think that's a good idea. We're not going to let that go," and then other things rising from the Baker part of the

House. So that was interesting during that, it seemed like a year. It seemed like a long time that I was up there. It was only eight months, to be quite honest.

I spent most of my time back and forth to the Hill. In addition to doing those things, I was one of NASA's principal lobbyists on the Hill for support for the International Space Station. That was the big thing we were trying to push. And it was interesting because I never got the feeling that the Administrator at the time, Mr. Goldin, was a big Space Station fan. And much as happens every time any Administrator comes in, there's always rumors as to, okay, this is their mission. And the rumor at the time was that his mission was to kill the International Space Station, any concept of it. And yet here was the Assistant Deputy Administrator heading to the Hill every day, lobbying Congress to fund the International Space Station. It was interesting watching how it ebbed and flowed, and how we added money to the cost of it over the—just over the eight months I was there, I think we were doing our fourth or fifth revision of the International Space Station Program, and it was really frustrating.

Back then we had Code X, I think it was called, that was Mike—former Air Force guy who has been in the paper here lately talking about the [George W.] Bush-43's initiatives to the Moon and Mars. But Code X was going to be our planetary exploration code. They were looking at the kinds of stuff that the President mentioned in his speech Wednesday. Was that yesterday?

JOHNSON: Yesterday.

BOLDEN: How we lose track of time. So back then we were talking about Moon and Mars. We were beginning to increase our—although our ties to DoD [Department of Defense] had waned

after the [Space Shuttle] *Challenger* accident and the pronouncement from the [Ronald W.] Reagan administration that we would not launch anything on Shuttle unless it absolutely required human interaction, so the synergy between DoD and NASA went away in the Reagan administration after the *Challenger* accident.

Under Bush-41 and Dan Goldin, I saw a resurgence of, an attempt, anyway, to put NASA and DoD back together again. It didn't work very well, but you see it again now under Administrator [Sean] O'Keefe. Because of his former relationship both with the Department of the Navy, his time in the Office of Management and Budget, and then maybe some of his aspirations, you see NASA and DoD, especially under the umbrella of the President's vision, you see them potentially coming back together again, for whatever that's worth.

So that's my time in Washington. I tell people, in thirty-four and a half years wearing the uniform of a United States marine, it was the only time that I didn't like, that eight months. It just wasn't me. Either you like Washington or you don't. It's for power people, so if you go there and you like being with the power people and at least pretending that you're wielding a lot of power, it's a good place to be. If you're not a power person, you don't like it. I didn't like it.

JOHNSON: Did you already know about your next assignment while you were there?

BOLDEN: No, I did not. As a matter of fact, I learned about my next assignment about halfway through my time there, which gave me some hope. In fact, that was what I used as my reason for having to leave when I did, because Mr. Goldin was beginning to feel like—I think he was beginning to feel like I was making some contribution and so he wanted me to stay longer. And

I said, “No, I’ve got to get back because I’ve been told that I’m going to command STS-60, and I really need to get back to my crew.”

Ironically, it was a flight that I did not want. I think I mentioned this when we talked earlier. I think everybody has something in their mind that they would really like to do. Because I had participated in STS-31 where we deployed Hubble, and we had subsequently found that Hubble wasn’t whole, I kind of harbored some desire to have an opportunity to command the first revisit and take part in that, and that wasn’t to be. I ended up getting offered the opportunity to command STS-60, which was going to be the first joint Russian-American Shuttle mission and the first flight where we worked cooperatively with the Russians since Apollo-Soyuz. My initial reaction was, “No way.” And it was just my upbringing as a marine; I did not have any desire to work with the Russians. Period. And again, Mr. Abbey said, “Well, why don’t you just at least meet the guys and take an opportunity to meet the two prospective crew members.”

And so I said, “What the heck.” And so when it was announced that we were going to fly a Russian as a mission specialist, not a payload specialist, was going to actually fly for the first time as a mission specialist, Sergei [Konstantinovich] Krikalev and Vladimir [Georgievich] Titov came through Washington on their way down to Houston, and I had an opportunity to meet them and have dinner with them and talk a little bit with them, and I was very impressed by both.

Vladimir was a MiG-21 pilot, Colonel in the Russian Air Force, had actually flown once prior to that, had had two missions. The first one was aborted on the launch pad when the vehicle caught fire and he was ejected, in their escape capsule and everything. So a very short flight. But then he came back and flew 366 days aboard Mir [Space Station], which, at the time, he was a co-world-recordholder for long-duration space flight.

And then Sergei Krikalev had flown twice before, had actually flown a five-month mission on Mir, and then shortly after the wall fell [collapse of the Soviet Union], he had flown a ten-month mission on Mir. I'd actually had an opportunity to communicate with him in space. When I was flying ATLAS, he was in Mir, and we talked via the ham radio, so we had never seen each other, but we had at least communicated. He spoke fluent English, Sergei did. Vladimir spoke none. Zero. Nada.

So I kind of took a hankering to both these guys right away, and I said, "Okay, I'll do it," and we got started in trying to figure out how we were going to integrate them into the crew, but more importantly, integrate them and their families into the American way of life. And it turned out—when people ask you what was your most rewarding or most interesting or most memorable experience, they mean on orbit, what was the most interesting thing you saw or did. And I always tell them the thing that I remember the most was not a flight, but it was the preparation and post-flight activities involved with STS-60. And it was the opportunity to bring people from a really foreign culture to the United States and introduce them to our way of life and help them adjust and adapt, and getting to know them as true friends and establishing a lifelong bond with them that exists today. And then, after the flight, having an opportunity to visit their country and for a very brief period of time see how they lived and have an opportunity to interface with them in their own environment.

JOHNSON: You mentioned that Vladimir Titov didn't speak any English at all.

BOLDEN: Nada.

JOHNSON: And later, once Shuttle-Mir got going, the astronauts did learn Russian. Did you or your crew study any Russian?

BOLDEN: We were really bad. Because this was the beginning, this was the leading edge of this movement, this was the first flight in what became phase one of the Shuttle-Mir Program leading up to the International Space Station. We hadn't thought it through well enough, and so there was not felt that there was a need for us to learn Russian. English was the official language, was going to be the official language of the International Space Station, everybody had already determined that. We had, anyway; I'm not sure the Russians had agreed to it. But that was what we had determined in our own inimitable way, and so there was not a feeling that we needed to be able to converse in Russian.

As we started going thorough the training and thinking of things that we wanted to do on orbit, it became very clear to us very quickly that while we didn't need it for flight, it would be really a nice gesture if we could at least communicate some simple things in Russian from on orbit. And the fact that almost all of us on the crew really liked kids and liked schools and liked visiting schools and the like, we wanted to be able to interface in some way with Russian youth, and we felt the best way to do that would be able to converse in their language, if only briefly.

So we went to NASA and told them that we really wanted to learn Russian. We realized that we wouldn't have an opportunity to become fluent in it, but we would like to learn at least enough conversational Russian to be able to say hello to kids from orbit and maybe do something cute. And so the "cute" became sing a song. It was easier said than done, we found, but actually we ended up, we were put with an independent contractor, and it turned out to be company with whom I work now, TechTrans International [Inc.], was just starting in 1993, they were just

getting founded. And so TechTrans found us a Russian teacher who came down from Houston and met with the crew a couple of times a week for about an hour, which was not anywhere close to sufficient time, but he taught us rudimentary Russian terms and taught us a Russian song that was actually a traditional Russian lullaby that was sung every night in Russia at eight o'clock, and it was the official "Go to bed now" thing on Russian TV, on state television, for Russian children.

So we learned that song, [Tired Toys are Asleep], or something like that. My pronunciation is horrible. But we were told that every Russian child would recognize the song, and if we did it right, we could sing it at eight o'clock Russian time and they would be impressed. So we learned the song; we cheated and had notes, since most of us didn't learn it very well and most of us couldn't sing. But, anyway, so we sang "Spyat Ustalye Igrushki" to the children of Russia, and learned a couple of other terms that we could say to them when we did our space-to-ground press conference.

JOHNSON: You mentioned that you felt that it was part of your responsibility to bring the families and get the families involved, and you also mentioned the [STS] 107 crew and how close they were. What ways did you do that? What methods did you use to get everyone involved?

BOLDEN: The first thing we did was when the families came they were initially put in an apartment complex right here on the corner of NASA Road 1 and El Camino [Real]. We took one look at that, and—in fact, what I did was in the division of labor, since I knew that I wouldn't be able to adequately have oversight of the Russians and the oversight of the crew,

[Kenneth S.] Ken Reightler [Jr.], who was my pilot, my co-pilot, I made him responsible for the Russian interface. So he really took both of them under his wing and saw to it that everything that they needed was taken care of.

Ken came to me after the first couple of days and said, “We’ve got to get them out of those apartments.” Not that there was anything wrong with it, but they really weren’t going to get a good feel—they were going to get a good feel for American life, but not the feel that we wanted them to have. So we wanted them to be in individual family homes, so we went back to NASA and said, “Hey, it’s going to cost some more money,” because we were paying the bill, “but we really think we ought to put them into local communities and let them get a taste of Houston, real time.”

And so Sergei and his family were moved into—I’m not sure which subdivision it is now, but it was an area in Clear Lake City [Texas], maybe Middlebrook or something like that. And then we moved Vladimir and his family to Friendswood [Texas]. We kind of took them around and put them with a realtor and let them pick the place where they wanted to live, and the two families selected the areas that they liked.

Sergei and his wife, [Elena], were both very technical people. She was a controller in Moscow in the Mission Control Center, and they had a four-year-old daughter, and so they didn’t really see a need to be in a community that there would be a lot interface for kids. Whereas Vladimir, his wife was a nontechnical person, she was very astute socially and everything. They had spent time in, I think, three years in Paris where he was the air attaché to Paris, to France, from Russia. So she was very cosmopolitan, wanted to be able to get out and interface with people, whereas the Krikalevs were relatively quiet. They had an eight-year-old son who we enrolled in public school in Friendswood; had an eighteen-year-old daughter, she spoke fluent

English, so she enrolled herself in San Jac [San Jacinto College] in a pre-business curriculum and all that. So it worked for both families. The Titovs, their son began to speak fluent English after about six months, became a cowboy. And the daughter is still here, worked for Enron [Corporation, Houston, Texas] for a period of time, and is now still working in business; that's her area of expertise and interest. But it worked real well.

In getting them into the communities, getting them to do the kinds of things we did, happy hour, church if they wanted to, but those kinds of things, we just kind of took them by the hand and let them see and do as much as they wanted to. And we had social functions as frequently as we could, generally tried to have at least something once a week where we got the families together and that kind of thing, and their kids met our kids, and began to feel that they were a part of the overall STS-60 family.

We had a tremendous training team. The training team, as always happens, they become very close to the crew because they live with them, eat with them, sleep with them. You're just with them all the time. So they became very close.

JOHNSON: Because of the obvious Russian presence on this flight, and the day of the launch NASA announced that [Norman E.] Norm Thagard and Bonnie [J.] Dunbar would be training for a mission to Mir. What type of media coverage did the crew have to deal with? Was there a lot at that time?

BOLDEN: There was a lot of interest from the Russia media pre-flight, when we did our pre-flight press conference. As I remember, a tremendous turnout of Russian media for the pre-flight press conference to hear Sergei's take on what he was going to do. I think Vladimir did

participate in a pre-flight press conference with us as the backup. Because the Russians decided which of the two was going to fly, and I think we knew prior to the pre-flight press conference that it was going to be Sergei, but we still, as I remember, had Vladimir participate in the pre-flight press conference. So it gave the Russian media an opportunity to ask them about training differences and the way we do things, their impressions of life in America and all that kind of stuff. So there was a significant amount of interest from the Russian media.

The American media, quite obviously because Bonnie and Norm were getting ready to move to Russia, they had an interest in how we had treated the Russian crew, so they would have something to compare it with when Bonnie and Norm went over.

JOHNSON: How did the training differ, as far as you're aware of, between the way the Russians were used to training and then the way they trained for this flight?

BOLDEN: Because their thrust is long duration, they are much less—we are very regimented. I mean, our flight schedule, for example, in Shuttle, was what we call the Crew Activity Plan, the CAP; the flight plan for every day was laid out in fifteen-minute segments. There was very little margin for going away from the schedule, because every experiment was given *x* amount of time, and when that period of time was over, you were supposed to move on to the next thing.

That's not the way the Russians train. The Russians give their crews a number of tasks for each day, or maybe a number of tasks for a week and then leave them alone. It comes out of necessity. Back before we got involved with them, the Russians, because of the communications system that they had in place, their infrastructure, they could only talk to the crew for a limited

amount of time each day. They had a number of very short communications opportunities on each pass, and so they didn't do a lot of just talking.

In the United States, we use the tracking and data relay satellite system, so it was only for a very few minutes each hour, very few minutes each day, that we couldn't talk to the ground. So we talk all the time. You know, in fact, you frequently just say, "Give me a break. Just be quiet so we can go work." And you got a lot of help from home. The ground was constantly looking over your shoulder. If you were trying to work an experiment and the ground wasn't sure where you were, they didn't hesitate to come up from the payload community. They'd say, "Okay, how are you doing on this experiment?" or that experiment. "Have you done so-and-so?" And you say, "Yeah, it's in progress. We'll let you know when it's done." But frequently they weren't happy with that.

That was something that bothered Sergei, as a matter of fact, not only during the training, but one incident that occurred on Flight Day One. When Franklin Chang-Diaz and [N.] Jan Davis went back through the tunnel to open the hatch for the space habitation module—we actually had our own laboratory. We had a half-module, which was called a space habitation module, built by SPACEHAB [Inc.]. They went back and opened the hatch so as to activate the SPACEHAB [module]. When they did that, they noticed that there was a hose about the size of a hose going into your dryer, coming out of the back of your dryer, very similar in form and substance. Its purpose was just to allow air to flow from the air system on the Shuttle into the module so we could live back there. Franklin and Jan noticed that the hose was crimped. It wasn't shut off, but it was significantly crimped that they were just concerned that there would be some constriction or restriction in the airflow into the module.

So we called the ground's attention to it. They said, "Okay, we'll work it and get back to you." Days passed while they worked it to get back to us, but we didn't say anything, so they didn't seem to worry about it. And Sergei, as soon as he found out what had happened, he said, "Why don't we fix it?"

And I said, "Well, because that's not the way we do it. We've advised the ground, we'll give them an opportunity to come back and tell us what they think, and then we'll go around to it."

He said, "This stuff you guys do doesn't make any sense to me." He said, "On station, on Mir, I wouldn't even have called them. I'd have just fixed it and then I'd let them know what we had done."

And I said, "Well, we just don't do it that way." And, fortunately, it didn't cause any problem.

But Franklin, several days into the mission, was conducting a tour, a video tour, of the Orbiter in Spanish for Costa Rican television. And as he went through with the camera and everything, he paused at the entrance to the SPACEHAB module and put the videocamera down on this crimped air line, and said, "This is a line that's crimped, and we're working on this and waiting for the ground to give us some stuff."

Mission Control Center saw it and went, "Holy jeez." So they called up and they said, "Hey, you guys didn't tell us it was *that* bad."

So we said, "Well, it's not a big deal. If it had been that bad, we would have either fixed it or told you." So they stepped up their efforts to find a solution and they came back within a few hours, and we looked at what they had proposed, and right away it just was a nonstarter because they wanted us to cut some—it was just flexible rubber, like rubber from an inner-tube,

almost, and kind of put it around this thing to fill in the area where the crimp had been. And we took one look at that and said, "Not going to work. All it's going to do is just collapse on itself, and then we are going to shut the line off."

Fortunately, as things would happen, while we were evaluating what they had sent up, we lost com [communications] with the ground. We had one of these rare blackouts because the satellite wasn't in position and everything. So we had about ten minutes, and Sergei said, "Look. I told you. My recommendation, days ago, was we should have fixed this thing." And we had a plan to fix it. The ATLAS in the Shuttle is about this big and, about roughly fourteen inches across by twelve or fourteen inches that way. So if you took just the plastic cover on the ATLAS and rolled it up and stuck it inside the hose, then it expands; it wants to go back to being flat. So it expands and makes the hose stand out. And so that was the solution we would have proposed to them if they had asked us, but they didn't.

So we took a look at their solution, we didn't like it, and so I said, "Okay, what the hell." So we took the hose off, stuck the little plastic in there and it stood everything out and we put the hose back on. And when we talked to the ground again, we said, "Hey, we just want to tell you what we did and show it to you." And so we took the videocamera back in the back, showed it to them, and said, "Hey, this is what we did."

And they said, "Okay, we'll get back to you." And they evaluated it, and we never heard anything. And then post-flight they said, "Well, we wish you hadn't done it that way, that you hadn't just gone ahead and done it. We wouldn't have disagreed with it if you'd told us that's what you were planning to do."

We said, “Well, we told you the first day that we needed to do something and we had a plan, and you all chose not to listen.” And so that was a real-life example of the difference in the way the Russians work and we work.

We’re seeing it every day as our experiences on the International Space Station evolve. We saw it with the initial experiences on Mir. We saw it with Bonnie and Norm as they went to Russia. Accommodations, you know. They were initially unsat [unsatisfactory] for an American crew. We didn’t want to live the way the Russians live, because we didn’t have access to a washer and a dryer, and we didn’t have access to this and that, all these amenities that of course an astronaut crew should have. So we put demands on the Russians they couldn’t deliver, so we spent a slight fortune to go and build things and make them look Western for us. So, just some differences that we had.

JOHNSON: During this flight, you had communication again with the Mir.

BOLDEN: Yes. In fact, Sergei, he talked back and forth quite a bit with his friend there. And I can’t remember whether it was a former crewmember of his, I don’t think so, but it was a very good friend, and they talked back and forth about things.

JOHNSON: One of those conversations was on television. *Good Morning, America* telecast it live.

BOLDEN: Yes, I’ve got to remember if it worked. Ideally what we were going to do was that we were going to do split screen, or tri-screen. And I think it was [Charles] Charlie Gibson, but I

can't remember. I think it may have been Charlie Gibson was going to do the interview, and we were going to have us on [Space Shuttle] *Discovery*, and the Russian cosmonauts on Mir, and Charlie Gibson on this tri-screen thing. And we did have the conversation go on. I'm not sure that we were able to get Mir simultaneously with us, other than voice. But it went pretty well, and they talked back and forth and among each other and compared notes and all that, as best I can remember. You have the advantage of the transcript.

JOHNSON: You also received a phone call from the [Russian] Prime Minister.

BOLDEN: Oh, that's right. That is right.

JOHNSON: Do you have any memories of that phone call?

BOLDEN: I do, because we knew it was coming and so we set it up such that Sergei would be able to talk to him because he was the only one that spoke Russian. As I remember, it went very well, and that was the time that the invitation was extended that we come to Russia, the invitation on the part of the Russian government from Prime Minister [Boris] Yeltsin. I think it was Yeltsin.

JOHNSON: [Viktor] Chernomyrdin?

BOLDEN: No, Chernomyrdin was the Deputy Prime Minister. And Chernomyrdin I knew because he had come to Houston during our training and I had had the opportunity to

demonstrate the Remote Manipulator System to him over in Building 9. We had him in a simulator. Pretty sharp guy, as a matter of fact.

JOHNSON: So they extended an invitation to go to Russia for post-flight?

BOLDEN: Which we took. We accepted, and we went to Russia post-flight. That was another one of the highlights of that particular flight and my time down here, because it gave us an opportunity—it was the first time I'd ever been to Russia. And for Ken Reightler and me, I think more so than anybody else on the crew, because, as I remember, we had Ken and me, [Ron Sega], Sergei, Franklin.

JOHNSON: And Jan Davis?

BOLDEN: And Jan Davis. So Ken and I were the only [active duty] military guys, and when we went to Moscow, one of the first things we did was tour the Kremlin. And there we were standing on the wall of the Kremlin, looking down on Red Square, and we both looked at each other and kind of went, "Pinch me. This can't be real." Never in our lives did we, as military guys, did we ever envision that we would be standing on the Kremlin wall looking down on Red Square peacefully, as a partner, so to speak. For the two of us it was pretty spectacular. The whole episode of coming together as a crew, bringing the Russians here, training, flying together, and then going to Russia and having exposure and an opportunity to go into the things that formerly had been verboten was pretty impressive to us, to the two of us.

JOHNSON: Quite an experience.

BOLDEN: Stayed in the old KGB [Russian Committee for State Security, Komitet Gosudarstvennoy Bezopasnosti] Headquarters, which had been converted to a hotel; very ornate hotel, by the way; hardwood floors, lots of marble all over the place, chandeliers hanging and everything. We had been told that even though the wall had come down and things were different now, that you still should expect that there would be some remnants of the old Soviet Union. And sure enough, my wife and I were in our room and I said, “Let’s try this.” And so I said, “Boy, it sure would be good to get a Coke.” And about five minutes later, a knock on the door, and it was the bellhop, and he said, “Would you like Coke, water, something else?” And he had it there. “Oh, thank you very much.” So we knew that there was still some semblance of the old Soviet Union left over and everything.

But the Headquarters probably had bugs all over it. It was about the same time that we were discovering that the new American Embassy in Moscow was completely bugged. We had hired a Russian contractor to do the construction, and every inch of it was covered with listening devices and all kinds of stuff. We were naïve enough to think that we could have them build an embassy and it would not have any of that.

JOHNSON: It’s amazing. Is there anything about that flight or any of the experiments that you took part in?

BOLDEN: Oh yes. The best part about it—and Franklin and I both hated it. The flight itself was principally medical. It was a medical research flight, for all intents and purposes. It was an

opportunity for the Institute of Biomedical Research in Moscow and NASA's Space and Life Sciences Directorate, along with places like the Medical Center and everything, so a lot of the principal investigators for this flight were medical people. We divided ourselves into two components on the crew. One portion of the crew, in fact, I think it was Sergei and Jan, if I remember correctly, did most of the neural sensory experiments; balance, effects of the lack of gravity on vision and your eyes and all that kind of stuff.

Franklin and I had principal responsibility for the human body parts, just the normal human body functioning parts of it. I'm just having a brain fart right now; I can't remember what it's called. But there is a medical term for it. Neurovestibular was one side, and we did metabolic studies, that's what it was called. So Franklin and I were the guinea pigs. The blood draws were done on us, the urine samples, saliva samples. We drank liquids that contained isotopes to measure how fast stuff went through your body and all that. We were looking at things like renal functions, the functions of the kidney; is there a difference between the way your kidneys function here on earth and the way they function in a microgravity environment.

Franklin and I underwent a year of training to become certified as phlebotomists. A phlebotomist is the person that draws blood when you go to the lab or go to the doctor. Although we were going to do it on each other, we still had to be certified. And so for a year, a couple of times a week we'd go over and the docs would bring in volunteers, just, there'd be a line of people outside the door who'd come walking in and sit down and we'd put a doggone tourniquet on and stick them, or try to stick them, and we got trained on how to draw blood and do all that stuff. Both of us hated it because we hated sticking people. And you do anywhere from, jeez, a half a dozen to a dozen people a day just until you got it down and understood how to do it properly and all that.

Then on orbit what we would do would be, when I was the subject, he would take my blood, and when he was the subject, I'd take his blood. We have some video to prove it. But it was pretty interesting doing it on orbit because you got an opportunity to see all this stuff and everything. So that was fun, really, when we look back on it.

Ken Reightler, being the person that wasn't involved in either experiment sequence, became the person that ran our centrifuge. So for all the metabolic studies, he took our urine samples, made sure they got in the freezer, he took our blood samples, spun them down in the centrifuge and then got them in the freezer. Same thing for saliva samples. So he was the datataker, the repository for all of the samples and everything, and then he oversaw the collection of data for Jan and Sergei as they put themselves in spinning things and blindfolds and all this kind of stuff. So he was the recordkeeper.

We actually had a furnace on board and Franklin was the principal investigator for it. I think Sergei was his backup. There was another experiment that we did that was looking at microgravity effects on something that Sergei was the principal and Franklin was his backup. Franklin and I were each other's principal, prime and backup, on the metabolic study stuff, and then Jan and Sergei backed each other up on the neurovestibular studies and the like.

As with all flights, a lot of photographic documentation, Earth observation stuff. Sergei was really good at that. He was good at everything because of the long period of time that he had spent in space. So he became sort of a mentor to all of us. Although he didn't have as many flights as I had, he had vastly more experience than I did. So we relied pretty heavily on him for the expertise about living in space.

What else happened up there? Something.

JOHNSON: The Wake Shield Facility.

BOLDEN: Wake Shield Facility. Ron [Ronald M. Sega]. I forgot all about Ron. How could I forget Ron Sega? Ron was a co-principal investigator on the Wake Shield Facility. This was about a twelve-foot-diameter satellite that was manufactured in a storefront right up across from Ellington Field [Houston, Texas]. The company that did it at the time was Space Services Incorporated, and it was a company owned by [Joseph P.] Joe Allen [IV], who was a former Apollo-era astronaut, had flown on Shuttle and everything. Dr. Joe Allen was my first officemate that I talked about earlier.

Joe had gone into business with a couple of friends, and his company actually built, manufactured, the satellite to the specifications of Ron Sega. The co-principal investigator was a guy by the name of Dr. Alex Ignatiev, from the Center for Epitaxy Research [Space Vacuum Epitaxy Center] at the University of Houston. Basically the principle behind the satellite was, as its name implied, Wake Shield, it was in the form of a shield and it created its own wake as it went around Earth, flying like a flying saucer on end. Theoretically what would happen, even in space, although it's a vacuum, there are still a significant number of measurable particles out there. And as these particles go around the shield, they create a hyper-vacuum on the backside of it. So whereas space in itself is a vacuum, you get an even purer vacuum back right behind the shield because all those little particles are pushed away from that area right behind the shield itself. So there there's nothing and it's truly a vacuum.

So the theory was that we could produce extremely pure semiconductor materials. The material that we were trying to produce was gallium arsenide. We were trying to produce gallium arsenide wafers that could then be used in semiconductor research and development.

Again, the theory was we would lift this satellite out of the payload bay with a remote manipulator system, make sure everything was working, and then turn it loose and let it fly itself as an independent satellite for a couple of days and then we would re-rendezvous with it and pick it up, bring it back in the payload bay and keep all of the samples.

A side benefit of it was that we would get the first batch of data, real live impact data, for use in the design of the International Space Station. As the Shuttle flies toward or away from anything, every time you fire one of its small jets, it sends out a wave from out of the jet. Every time it comes out, the thruster puts out stuff and it generates a force on anything that it hits. We had concern that the force, the thrusters from the Shuttle, if they were strong enough, might cause damage to the solar arrays or to some other component of the International Space Station.

We had built models to tell us whether it was going to be okay, but we didn't have any in-flight data. So what we were going to do was take advantage of the Wake Shield. It had some very, very, very sensitive accelerometers on it, and as we approached the Wake Shield Facility, we were going to put the Shuttle in different attitudes and fire different rockets at it so as to measure the amount of force that the Shuttle imparted on the Wake Shield Facility in order for us to help the designers of the International Space Station make it better.

The unfortunate thing was, in the "faster, better, cheaper" mode, when they designed and built the Wake Shield Facility—like I told you, we built it in a storefront across from Ellington Field—it was a \$12 million facility, the Wake Shield itself, compared to several hundred-million-dollar satellites for other programs. One of the ways that they saved money was limiting the amount of pre-flight testing that they did. One of the crucial tests that they did not do was something called an EMI test, an electromagnetic interference test, whereby you put the satellite

together in its flight configuration and turn it up and see if there is interference among different components in it.

What they satisfied themselves with pre-flight was that if we ran this test, if we powered it up when it was down on the floor of the integration room down at the Cape and everything seemed okay, then we'd go with it. And it did. It worked superbly in the test site down at the Kennedy Space Center [Florida]. But when they bundled up all these feet of electrical cable, what we were reminded of post-flight in analyzing what the problem was, was that you get a current generated around an electrical cable. Even the things here going to your camera generate a current around it, and that generates a magnetic field which, if it comes in contact with another electrical cable, it generates a current inside that cable.

Well, when we powered up the Wake Shield Facility on orbit and tried to turn on the attitude control system, there was a 5 Hz signal that was generated by the power cables inside the electrical components to the Wake Shield that shut down the attitude control system and it wouldn't let it run. So every time we tried to power it up, it would start spinning and cut itself off. We didn't have any clue what was going on, we just knew we could not reliably release the Wake Shield. We didn't know what would happen to it. If it got out of control, we may not have any way to control it, and so the option was to just put it out on the end of the arm and take as much data as we could, which we did. And we got some pretty good data; not at all what you wanted, but what we missed was the approach to the Wake Shield that would be used to gather data for Space Station.

The good thing was Wake Shield lived on because it flew again a year later on a flight very similar to ours with Vladimir Titov. So Vladimir flew a year after Sergei, and the flight was essentially the same. It was the Wake Shield Facility 2. The profiles that they flew and

everything were the ones that we had designed and tested, and they did get an opportunity to measure the forces from the thrusters on the Shuttle and it went into the design of the Space Station. So we finally got it, it just took a year extra to get it.

That was a disappointment to us, mainly because I had not flown a rendezvous mission and I was really excited about being able to rendezvous with something since I wasn't going to be around for the International Space Station. I knew I wasn't going to be around because my wife and I had talked, my family and I had talked, about my future in the space program. And sort of a combination of things; the fact that we were starting to get more astronauts in the office, it was starting to take people a little bit longer to fly, and the backlog of astronauts flown was increasing. The other thing was the fact that we had been here for fourteen years. I had been offered an opportunity to go back to the operating forces of the Marine Corps, actually go back to the [United States] Naval Academy [Annapolis, Maryland] first, as the Deputy Commandant of Midshipmen there.

The fact that after I came back from my experience in Washington I was never the same, to be quite honest. As the Assistant Deputy Administrator, whether you can or can't, people think you have some effect on things and that you have some influence and that you can make things better. I think I did do some positive things for the agency, but when you come back to Houston and you're in the Astronaut Office, you're just another astronaut. I think there's a biblical verse that says something about a prophet is never more despised than in his own home town or something like that, so you come back to Houston, just as another astronaut, you can't do anything. And it was very frustrating being here and having people who would confide in you and give you ideas and expect that you could make a difference, and you couldn't.

And then the combination of the fact that I was growing more and more out of sync with the NASA leadership at the time. My wife and I talked about it a lot, and I have been one who always believes that if you're in an organization and you can't support what's being done, you can't be a spokesperson for it, then you really ought to pack your bags and go somewhere else. You shouldn't expect the organization to change. You just ought to leave. And so a combination of all those things, we decided, approaching my last flight, that it would be my last flight. A very difficult decision, but we made it.

I can't remember how soon before the flight, but at some point several months before the flight I felt an obligation to let the crew know. That was hard. That was really hard. It kind of felt like you were walking out on people. But we got through it.

So the flight became extremely special because I knew it was my last. But hard. The fact that it became special and all that didn't make it any easier. But we did the best we could do and had a great time and then left. We left the agency after that flight. In fact, we left NASA a week after my daughter graduated from high school here. We flew in February, came back and did all of our post-flight stuff, we went to Costa Rica with Franklin, and I think I told you about that, and then we went to Russia, and finished up everything I had to finish up, I thought, and left. Went to the Naval Academy. But that was very difficult.

JOHNSON: I can imagine it would have been a difficult decision.

BOLDEN: Well, it was good preparation, however, because nine years later we determined that—my wife and I had always said that if you're not enjoying something, if we're not having fun, we're going to quit. And we said that about everything. And so I had spent thirty-five years,

almost thirty-five years, in the Marine Corps. Even while I was here, I was still an active-duty Marine. We were never not Marines, she and I.

I eventually became the Commanding General of the 3rd Marine Aircraft Wing out at Miramar in California, and that became the most rewarding thing I'd ever done in my life. But, again, it took its toll on your family and stuff like that. My wife asked me one day, she said, "You know, I thought you told me when it quit being fun we weren't going to do anymore." And I was still having fun, but she wasn't. So I said, "Yeah, you're right. You know, we did say that."

So we had orders to leave that duty and go to another position, another command, as a matter of fact, on the East Coast. The day before the movers were supposed to come, we talked about it as hard as we could, and it was sort of reminiscent to talking about leaving NASA. And we made the decision that the right thing for us to do was, again, because I didn't think I was fully in sync with the hierarchy in the Department of Defense at the time, and, really, if you're going to tell young men and women that you want them to put their life on the line, then you really need to believe in the people that you work for. And I had gotten to the point that I wasn't comfortable with that, so we decided that we had given the Marine Corps the best we could give. And so told people we were leaving. That was hard.

JOHNSON: I can imagine.

BOLDEN: But I had had the preparation because we had been through that once. So that was it.

JOHNSON: As one of the astronauts that flew before and after *Challenger*, can you share with us some of the significant differences between the suits, the launch?

BOLDEN: A big difference, huge difference, that's visible to everybody is what you wear. When we went into orbit my first flight on [Space Shuttle] *Columbia*, we wore a plain old flight suit. The only difference between my flight suit and the one that I wore as a marine was color and I think it was a little bit more expensive. They were made on some Indian reservation in New Mexico or something like that, so they were tailormade with a gazillion measurements, whereas my flight suit, you go over and say, "I wear a thirty-eight short," so you got a Nomax flight suit. But these were Nomax flight suits, but tailormade. You put on a helmet to protect your head if you bumped it or something like that, and also it had a visor that came down so if something happened in the cockpit and the atmosphere got bad, you had breathing oxygen for an emergency or something. That was the way we went to orbit on STS-61C.

As I mentioned, ten days later, after I came back, we lost *Challenger*. And then in hindsight, some people decided that had the crew had some other form of protection, what became the launch and entry suit, that they conceivably could have survived. I never bought into that, I don't believe it now, but that was the decision that was made. And it was, I think, as much to placate the American public. We decided we'd stick this eighty-five-pound suit on everybody. And so that was the way I flew my second and subsequent flights.

Boy, the oversight, the safety oversight. I felt, while I didn't think it was bad prior to *Challenger*, I think, some of our earlier conversation, when I got into the safety organization there were some modifications we made trying to get some operational input into the safety

oversight itself. I thought it was improved when I went back and flew the second time. Did it make it any safer? I don't know. Space flight is risky business.

We had made some definite material improvements on the system itself. The O-rings were different. The way we oversaw the construction and assembly of the Shuttle and the system, that was a little bit different, but I didn't feel unsafe the first time I flew, so I didn't feel any safer the second time. We had done a lot, but I didn't fool myself that maybe there was some modicum of improvement in the safety, but contrary to what people will tell you, that the Shuttle is not safe and it's already been proven to be not—I heard a lady on television, on radio, this morning talking about the President's plan, the fact that, well, it's been proven that the Shuttle's not safe. Not true. The Shuttle is very safe, relatively speaking. The level of safety on the Shuttle, it's 99.99999 percent assured that you're going to return. After *Challenger*, it became 99.99—maybe we added one more nine out there somewhere, but it still wasn't 100 percent. Nor will any other vehicle that we build. Human beings cannot put anything together that's 100 percent safe. The only way to be 100 percent assured that you're not going to lose somebody in space flight, in exploration, is don't go. And I don't think we want to go there.

So there were some things that we did that I—while I could live with them, I just thought it was a waste of time and money. If you look at what we're doing now, people that demand that we have a crew escape mechanism, we did that. We put the pole on the Orbiter, we designed this mechanism, it was good. I felt a little bit better about it. But when it's your day, it's your day and you can have all that stuff. It would not have helped this crew; it didn't help this crew because if you don't know that you're about to lose the vehicle, you don't have time to activate the crew escape system and go jump out. So life is like that.

There's always going to be something that you didn't expect that's going to bite you. And the way that we do things in the NASA culture is you put a team together that what-ifs. And we do it in the military, and I think you do it in industry. And you what-if and you Red Team and you Blue Team and you Pink Team and once you've satisfied yourself that, "Okay, we've thought of every bad thing that can happen, it's okay to go turn the valve now," and you go turn the valve, and six days a week it works. Six days and twenty three hours and fifty-nine minutes it works, but one day you go and turn a valve and something you never expected goes wrong. And if you're lucky, somebody gets hurt. If you're not lucky, somebody gets killed. And that's the way space flight is and is always going to be. So, for somebody to think that we're going to build a new vehicle that's going to be significantly safer than Shuttle, they're smoking dope, to be quite honest.

Now, we do need a replacement for the Shuttle, but not because of safety. I think we need a replacement for the Shuttle because we need a vehicle in which we can go to the Moon and to Mars and on to other places the way that we envisioned it when the concept of a space transportation system was briefed to President [Richard M.] Nixon. I don't think there was anything wrong with that. And I think you could still fly that system, but add the third component, the orbital maneuvering vehicle that we didn't have enough money to build, and don't have enough money to build now, and you could have been flying Shuttle for the next thousand years to an International Space Station and the orbital maneuvering vehicle, or orbital transfer vehicle as it used to be called, from Station to the lunar surface, or from the lunar surface to Mars, or wherever you want to go.

That's essentially what we're going to do, but what we're going to do now is we're not going to have a Shuttle. We're not going to have a vehicle, a reusable vehicle, that we can use

for routine access to space. So we'll make the same tradeoffs that we made back when we decided to go with Shuttle as the first of the three components to the space transportation system. We'll now have a space transportation system that doesn't give us reusable routine access to space. And that's okay. I'm not sure we saved any money with Shuttle, anyway. I don't know.

JOHNSON: I think we're going to stop and take a break real quick, and then I just have a couple more questions after that.

[Tape change]

JOHNSON: When we stopped, we were talking about the uncertainties of space flight. And, of course in light of what happened to the *Columbia*, on your last flight there was a problem with the Thermal Protection System [TPS]. Were there any concerns about reentry?

BOLDEN: Boy, I've got to remember this. See, I always remember the good stuff. Refresh my memory.

JOHNSON: The TPS blankets around the forward RCS [Reaction Control System] thruster began to peel back.

BOLDEN: Oh, I think I do remember that vaguely. Yes. Okay. What was your question?

JOHNSON: Just if there was any concern with that as far as reentry was involved.

BOLDEN: No, no. Just as I think—and I can't speak for anybody else, and no one will ever know—but my suspicion is the crew of 107 didn't have any concern about their safety because they depended on the team and figured that people had looked and done the best job they could. I know hindsight is always 20/20, but I didn't have any concern, not during our reentry.

JOHNSON: We talked about the launches and we talked about the flights. Let's talk for a moment about landing.

BOLDEN: Yes.

JOHNSON: As a commander on the last two flights, what was that experience like?

BOLDEN: Landing's awesome. It's awesome, period, no matter where you are on the vehicle. I can't speak for a mission specialist sitting in the mid-deck, but I would imagine that even for that person who can't see anything, just the physical changes have got to be pretty doggone awesome.

But when you're sitting on the flight deck looking out the front window, the most spectacular period of time during the reentry, especially if it's night, is the initial reentry heating when you come into the atmosphere and the vehicle just—it heats up and it glows. The way I describe it to schoolkids, it's like being inside a lightbulb and you're the filament in the lightbulb. You're just glowing and you can't see outside the window. You see this dull, sort of a dull red glow start at the base of the windshield and then what we call St. Elmo's fire. You see

that in a normal airplane, where you get static discharges going up the window, kind of eerie-looking stuff. And then before you know it, it gets orangeish and then pinkish and then the whole windscreens in the front are obscured, like you're in a cloud, or like you're inside a lightbulb. You can't see out of them because of the bright light that's coming off the tile.

If you look out the overhead window, it's a different world. Up there you see the plasma going just [demonstrates]. It's charging and discharging and it's like there's this monster up there, and this thing forms and then collapses. And it's an absolutely fascinating light show. So you've got that going on up there, and then you can't even see out the front window. And it lasts about ten or fifteen minutes, and then as you get deeper into the atmosphere, the temperatures stabilize and the vehicle, the tiles begin to cool down again. They've been able to dissipate all the heat, and then you can see out the front window.

The range over which you can see is unbelievable. My last flight we did, I guess it's an ascending entry. We came up over from the southern hemisphere into the northern hemisphere and then I say turn south—you don't really turn south, because the way Earth is tilted, it appears that you're coming like this and then going south to the Cape. But we came down from Canada. And we had been waved off at least once for weather. They had a storm system off the coast of Cape Canaveral, and the weather guys judged that if we had come in on our first opportunity it probably would have been right in the middle of a thunderstorm. They were pretty right. Those guys had gotten really good, and so what they saw was two waves, one that they figured if we didn't come in on the first opportunity, we'd be able to sneak in between these two waves. And they were absolutely right, because everybody said it rained cats and dogs on the orbit opportunity we were supposed to land, people who were down there waiting.

When we came in, because it was the middle of winter in the northern hemisphere, there was snow, all kinds of stuff all over Canada, huge weather system all the way over the U.S. from northern Florida all the way up into Canada. So you couldn't see the ground, but you could look from over northern Canada up around St. John's and all that kind of stuff, and you could see Florida, you could see the Florida peninsula, and you went, "Oh, that is really impressive." You're a hundred-and-some-odd-thousand feet, but looking at the Florida peninsula sticking out from under all these clouds and you say, "Oh, those guys are pretty good." But you could see the other storm system coming from off the Atlantic, but you figured, okay, we're going to make it. And so we came back.

The entry and landing is unlike almost anything you ever experience in any other kind of aerospace machine because it's relatively gentle in exact terms. In terms of G-forces [gravitational forces] and stuff like that, it's very docile. Unless you do something wrong, you don't even get up to 2 Gs during the reentry, the entire time of the reentry. When you bank to land, you come overhead the landing site, and then you bank the vehicle and you just come down like a corkscrew. As a general rule, you don't even make one complete rotation; you go 180 degrees or something like that. But you're just falling out of the sky. And it's about 1.2, 1.4 Gs or something like that, which you feel that in a car. But, it feels like you got gorillas sitting on your shoulder because you've been weightless for x number of days. And so it's just a really different feeling. You have to hold your head up because you've got this big old heavy helmet on and it probably weighs ten pounds, I'm not sure what, but it feels like it weights a hundred. So, you know, you learn to keep your head straight and all this kind of stuff.

It takes a little bit of energy to get your hands up off the console, because once you start feeling gravity again, your hands just kind of go down and they want to stay there; everything

does. So the two pilots onboard are doing a lot of isometric exercises all the way down, and I think I mentioned to you once before, I tried to do very gentle head movements to get my head oriented and get my gyros caged again without having something go wacky on me that I couldn't recover from. So you do a lot of just trying to get your body physically adapted to being back in a gravity, kind of hurtling your body at the ground until you get to 2,000 feet to pull the nose up is different, but it's like you've done it all your life because you have. You've done it thousands of time by now in the Shuttle training aircraft for real, and you've done it probably tens of thousands of times in the simulator. So it doesn't look abnormal at all; it's just something that you're accustomed to.

And you're constantly talking to the crew, those on the flight deck. One of the things that I always said was you really want to try keep the guys on the mid-deck informed, because they don't have the luxury or the privilege of seeing what you're seeing. So we tried to paint a word-picture for them as to what we were seeing, how things looked. So, a lot of conversation, surprisingly, on the flight deck that gets onto the OPS [operational] recorder. But the ground doesn't hear it because the ICOM, the intercom, is open loop; it just gets on the recorder, but people on the ground don't hear any of it. But you're talking all the time, just chattering away and oohing and aahing and all that kind of stuff. But it's very spectacular.

And then when you touch down, if you do it right, again, you hardly know you touched down. As big as the Orbiter is, the way that we land it is we just get it into an extremely shallow approach to the landing, and so it just kind of rolls out on the runway, and if you do it right, you all of a sudden you notice that things are starting to slow down real quick and you're hearing this rumble because the vehicle's rolling down the runway on this grooved runway. So you know you're down, put the nose down and step on the brakes and stop. That's it. And then you go,

“Holy G. I wish it hadn’t been over so quick.” It doesn’t matter—I don’t think it makes no difference how long or how short you’ve been there, it’s over too quick. You’re ready to come home, but once you get back, you say, “Boy, I wish I had had a few more days,” or something like that. And for me, my last two, being the commander and actually being the guy that had the opportunity to fly it to touchdown, was thrilling.

In my particular case, I think the rules at the time said that only the commander was supposed to fly, but that didn’t make any sense to me. So the way we trained and the way I did it was I always let the pilot take the controls first and fly the first part of the entry, the last little bit, so that he got an opportunity to see what the vehicle felt like and all that, and then I flew the last part and the landing itself. And so it’s pretty good, for whatever it’s worth.

JOHNSON: I imagine it was a different experience for Sergei Krikalev, too.

BOLDEN: Oh, coming back that way? Yes. Much gentler. Did you all interview him?

WRIGHT: No, we haven’t.

BOLDEN: Will you?

WRIGHT: I hope so.

BOLDEN: It would be interesting to see what he says. But I know, just asking him about differences, very gentle compared to Soyuz, and again, he said there’s no question when you

land in Soyuz because you're fearing for life. He said the hard part is after you land, because if the winds are high on the desert, you get dragged around by the parachute until it gets released, and they have guys get injured post-landing, just getting thrown around inside the capsule. Ours is real nice.

JOHNSON: As you mentioned before we took a break, you left NASA and returned to the Marine Corps. In 2002, you were nominated for a position as Deputy Administer.

BOLDEN: Oh, we're going to talk about that?

JOHNSON: Only if you want to.

BOLDEN: Yes, it's okay. I don't have any secrets. Somebody knows it.

JOHNSON: Okay. If you could tell us about the circumstances around that nomination.

BOLDEN: I can tell you what I know, okay? Actually, when it was finally decided that Mr. Goldin was going to leave as the Administrator, NASA started looking around and I had an opportunity to go—well, I was asked to go to the White House and talk to the people in the Personnel Office there. I interviewed eventually with Clay Johnson [III], who's the President's personnel manager; I don't know what he's called [Deputy Director for Management at the Office of Management and Budget]. He was with "W" [George W. Bush] here in Texas when he was the Governor and everything. But he's supposedly the guru for people. And so I went and

talked to him and they were in the market for somebody to be the NASA Administrator, and I made it very clear to them that I was not interested in being that person. And he made it very clear to me that I wasn't there to interview for that position, but they just wanted ideas, just wanted to hear what I thought NASA should be doing, where they should be going, what would I do if I were the Administrator, what would be some of the first things I'd do. And I shared my thoughts on that with them, and then I went away, after the second time.

And then Sean O'Keefe was named to be the Administrator and I was real happy. And then he called. Actually, he didn't call, but the Commandant of the Marine Corps, who is a friend of his, because I think they had both been legislative people, General [James L.] Jones having been the Congressional Liaison from the Marine Corps while Sean was working for Senator [Ted] Stevens or somebody. And so the Commandant said, "I want you to go and talk to Sean about being the Deputy Administrator."

I said, "Well, I'm not interested." We'd been through this once.

And he said, "Well, I'd really like for you to do this. It would be good for the Marine Corps, good for you, good for NASA and everything."

So I said, "Okay, I'll go talk to him, but I'm going to tell him I'm not interested." And so I went back and I talked to Mr. O'Keefe, and we talked for a long time and I explained to him that I really didn't have any interest in coming back, I really liked what I was doing and I wanted to stay there. At the time, I was actually in my first year as the Commanding General of the 3rd Marine Aircraft Wing out in California and loving what I was doing, flying all the time, having fun. And so he said he was very disappointed that I felt that way and that he had really hoped that he could talk me into coming to be the Deputy Administrator because he felt I could make a

contribution. I said, "I appreciate it, I'm honored," and all that kind of stuff, "but I don't think so."

And so I went back and thought I had gotten away, and I got a phone call from the guy that was my friend, who was the general responsible for personnel in the Marine Corps. And he says, "Oh, I've got a message from the Commandant. He said it's not over 'til the fat lady sings." And I went, "Oh, jeez."

So I guess he and Mr. O'Keefe talked a little bit more and so then he said, "Okay, I want you to go back and talk to him one more time, and I want you to keep an open mind, because we need for you to do this."

And I said, "Okay, I'll go do that." And I went back and I talked to Sean, and we talked about how long, and I explained to him that I was not ready to leave the Marine Corps, that I enjoyed what I was doing and that I would be willing to come if I could just finish my tour. And he said, "Well, I don't think that's possible, but we can guarantee that you won't have to get out of the Marine Corps. You can stay on active duty, and there'll be a promotion," and this kind of stuff.

And so I said, "Okay, what the heck. I'll try it." And so we started the proceedings for the nomination, and I got word. In fact, the Commandant announced it this time of year, back then. In a forum of all the general officers in the Marine Corps, he brought my wife and me up and announced that I was being nominated by the President to be the Deputy NASA Administrator and I was going to be a lieutenant general and stay on active duty and all this kind of stuff. Shocked me, but I said, "Okay."

We started doing all the paperwork and all that stuff that's required, and I had an appointment for my confirmation hearing, and I think it was a Wednesday, and I can't remember

the specifics because I purged it from my mind, for the most part, but Sean and the folk back at NASA Headquarters asked me if I could come back a few days early because they wanted me to go over to the Hill; I needed to meet all the different committees and speak to Senator [John] McCain, and the Chair and the ranking members on all of the committees that had to do with NASA, and go through some stuff and get their blessing so that the hearings would not be painful.

Ironically, everything in NASA is handled through the Senate Commerce Committee, so it was Senator [Fritz] Hollings was the ranking member, he was the Democrat, and Senator John McCain was the committee chairman for the Commerce Committee. So that was the committee to approve me, confirm me, to be the Deputy Administrator.

So I went through all my briefings, all my meetings; I had spent a lot of time at NASA Headquarters getting briefed by everybody so I'd be ready, and went in for my last meeting on the Hill. I had seen Senator McCain's staff that morning, and then that afternoon I went in to see Senator Hollings. He's my home senator from South Carolina and we've known each other for a long, long time, and he's a very good friend of my family and everything. So we talked mostly personal stuff, asked about the family and all that.

It was through Senator Hollings that I learned that there was about to be a hiccup. He said, "I wouldn't worry about the questions being asked by the Armed Services Committee. We're going to take care of that."

And I kind of went, "Sir, you've got me. I have no idea what you're talking about."

So he shared with me a letter that had been sent to the Office of the General Counsel in the White House, from Senator [Carl] Levin, who was the ranking member, the Democratic ranking member, and Senator [John] Warner, the Chairman of the Senate Armed Services

Committee. It had, I think, three or four questions for the President, through the General Counsel, and they were essentially, “You’re going to take a guy that’s an active duty military person at a time like this, when we’re engaged in the war on terrorism, and you’re going to make him the Deputy Administrator at NASA. Do you really want to do that?”

Question number two. “We don’t have anything against this guy, but why him? Why do you particularly want him? Do we want to set the precedent of taking a high-ranking military official and making him the Deputy at a civilian organization?” We’ve got some things in the past, Admiral Truly did it, but he retired and stayed on as the NASA Administrator once he became the NASA Administrator, and blah, blah, blah, blah, blah. And I forget what question number three was. It was something again like “Why him?” or something, I don’t know.

So Senator Hollings said, “I wouldn’t worry about it. We’ve got it. I’ve already talked to John McCain, I’ve already talked to Levin and Warner and everybody, and we’re happy. So we’ll see you tomorrow.” I went back over to NASA Headquarters and I was actually meeting with [William F.] Bill Readdy, and he and [Frederick D.] Fred Gregory were giving me my— because Fred had Code Q [Office of Safety and Mission Assurance] and Bill Readdy was, I think, was not the principal at Code M [Office of Space Flight] yet, I don’t think, but, anyway, so we were talking about ticklish issues that might come up in the hearing when I got word that Sean wanted to see me.

So I went down to Mr. O’Keefe’s office, and he said, “Hey, this is gotten to be too difficult. We’ve talked with the White House and everybody else, and we think the best thing to do is withdraw the nomination.”

I said, “Sounds good to me.”

And he said, “You know, I could fight it, but I don’t think it would do you any good if you want to stay in the Marine Corps. I could go talk to [Donald H.] Rumsfeld, but I don’t think it’s good for any of us. So we’re just going to back off.”

To this day, I have no idea what really happened. I don’t know whether the White House just didn’t want to answer the questions that came from the Armed Services Committee, whether Secretary Rumsfeld said, “No way,” or what. All I know is that the word was that he wasn’t aware that I had been nominated, which I found flabbergasting that the Secretary of Defense would not be aware that the President had nominated one of his general officers. But I believe what people tell me; I take them at their word.

So I ran from NASA Headquarters back to the hotel and packed my bags and jumped on the Metro and went to Ronald Reagan National Airport and asked Continental [Airlines] if they could get me on, told them I was scheduled to go the next day, but could they get me on a flight back to Houston, and I got back here before anybody could change their mind. And that was it. Never heard anything else about it.

So that was my moment in the sun and my almost being the Deputy Administrator. I went back to my job in the 3rd Marine Aircraft Wing and served out that tour. I think I served my Marines well. And then we decided to leave the Marine Corps.

JOHNSON: And you came back here, obviously.

BOLDEN: I did. I came back here originally to think about what we were going to do and where we were going to go, thinking that we would go back out to San Diego [California], because I

really love it out there. But my wife came back knowing that she wanted to live here, because our kids had grown up here and she has tons of friends here.

So we came back here, and I had several months before my official retirement, so I had a lot of time to think and do stuff like that, and I think, as some of you may know, my first civilian job was actually going back to work with Mr. Abbey. We had the water company, which for me didn't work out. Had nothing to do with him, it was just a lot of different reasons it didn't work out. I stayed with the water company for about four months, and then opted to take a job with TechTrans International, the company I'm with now, which is tremendous.

We were talking about things that people always ask you what do you remember, and the Marine Corps and NASA are very similar. They're both relatively small organizations that work on a shoestring, and they are both organizations that are as great as they are because of their people. The funny thing about NASA is NASA is more than just NASA employees, and you all understand this because you're a part of the family. I learned, anyway, over the time that I worked, that the organization was as successful as it was because of all the diverse and divergent ideas that were able to bubble up, contrary to what anybody says, and people's stick-to-it-iveness and persistence and their dedication to what they do.

Just like in the Marine Corps, where nobody ever looked at their watch, that I can remember, in my fourteen years here at NASA I don't ever remember anybody looking at their watch. They worked until they were either tired or until what they were supposed to do was done that day, then they went home. And that's something that I cherish. People ask you if you miss NASA, I say, "Not on your life." And they ask you if you miss the Marine Corps. I say, "Not on your life." And do you miss flying? "Not really." "Shucks, you must miss something." I say, "I miss the people." That's it.

JOHNSON: You've mentioned before your favorite memories or the things that you found the most enjoyable. Is there any one thing, looking back over your career, that you found the most challenging?

BOLDEN: My NASA career, or my entire career?

JOHNSON: Your NASA career.

BOLDEN: Oh, without a doubt the most challenging in my fourteen years with NASA was getting on the airplane and going back to Washington. And it got harder and harder every time when I'd come home; going back to Washington for that job. Seriously, that was my undoing. I have never hated a job. I hated that job. I just could not convince myself that I belonged there, for one thing. I never got a feeling that I was making a difference, the other thing. And I always had the feeling that I was swimming upstream, and it just wasn't pleasant. So while I enjoyed the people, it got harder and harder. And my wife and my daughter will tell you—my son doesn't know because he was gone; he was a marine by that time—but my daughter was here in high school, and they would literally have to push me out of the house either to go to Ellington [Field] to get on an airplane and fly back, or take me to the airport and get me out of the car to fly back to Washington. I dreaded that. And it got worse and worse every time I went back. I wish I didn't have to say that, but there is no question what was the most difficult thing for me.

And second most difficult was the decision to leave. And third most difficult was telling my crew and my training team. In that order.

Then in the Marine Corps the most difficult thing was—boy, that’s easy, too. Sending people in harm’s way.

JOHNSON: If you don’t mind, I’m going to ask Rebecca and Jennifer if they have any questions for you.

BOLDEN: Sure.

WRIGHT: I have one for you. When you were talking about preparing for STS-60, negotiations and plans and meetings were being held in parallel to start the Shuttle-Mir Program. Were you aware of that, or what were you aware of what was going on at the time?

BOLDEN: We were quite aware of what was going on because a lot of times it affected what we were able to do with the Russians. We were aware of some of the stumbling blocks that were arising, and there one of the things that made you feel good was that while I didn’t have any direct input into Shuttle-Mir and what was going on between us and the Russians, because of our contact with Sergei and Vladimir and the fact that they were consulted constantly by the Russians, by their side, and they had input—at least we were led to believe they had input—we were able to talk to them a lot and try to instill some reason in the discussion that was going on. So, undoubtedly we didn’t know everything that was going on, but we were aware of how difficult it was going.

WRIGHT: I was curious because it was announced as a one-time, and then before you launched it became the beginning of several years.

BOLDEN: Yes, you're right. When we were first assigned, I don't think there was any such thing as Phase 1. We were not the initial flight in Phase 1. And that didn't come until almost before we flew, that we were identified as a part of the Shuttle-Mir Program, as the first flight in Phase 1. I think that came real late, as I can remember, if it did, before we flew, to be quite honest.

ROSS-NAZZAL: I had a couple of questions for you. We talked to Dave Leestma. He talked about how your class called themselves the "Needless Nineteen." Do you remember anything about that?

BOLDEN: [Laughs] Jeez. We had so many things we did. I don't. I don't remember why, to be quite honest, and it may very well—I can only guess—it may have been because we had nothing—we had no responsibility. We were entrusted with nothing. You were just kind of existing, jeez, until after we got STS-1 gone. Because until that time, everybody was focused on STS-1, getting it safely into space and back, and then we turned to STS-2, because that was the groundbreaking flight because everybody knew we could get the Shuttle into space and back safely, or at least we were relatively confident we could. I'm not sure we were convinced we could turn it around and get it back into space again.

We got a scare when we had the water problem. We had the problem with hydrogen bubbles in the water on STS-2 and brought it home early. So I think there may have been some people—although as minor as it was, I think it caused a lot of people a lot of consternation

thinking that, “Holy jeez, we’re not going to be able to do this. We’ve got these guys up there, and now we’ve got to get them home, and the water’s not right, and we don’t know where this hydrogen’s coming from,” and all this kind of stuff. We made things difficult on ourselves.

But that’s probably what he was talking about, the fact that we may as well have been nonexistent. For what we did, we didn’t really need the title astronaut or astronaut candidate or whatever it was. We were gofers. And that was okay. Everybody who comes here is. I think the most difficult part of being an astronaut until you fly is being a gofer. And you really are, especially now, I think.

The Astronaut Office—and this is my opinion; I don’t know whether anybody agrees or not—it’s too big. It’s too big for the vision, it’s too big for the assets we have, it’s too big for the flight schedule, even before *Columbia* was lost. And so you put people, very, very talented people, in a position where they have to make very difficult decisions about their lives. And in many cases, they put their lives on hold, and in many cases they turn their lives around from great things that they could achieve, just because in their mind—and I know, because I’ve been there—in your mind, there is nothing greater than going to space. It’s a dream that everybody probably has. And so you think it doesn’t make any difference what you have to do, it’s worth it. I’ve served with a lot of people who would have made tremendous contributions to the country and to the world had they not become astronauts, but they became one of the needless however many there are. So that’s probably what he was talking about. I don’t whether he described it that way or not.

ROSS-NAZZAL: Yes, he gave us a sense of the fact that there had been thirty-five people there and the Apollo astronauts.

BOLDEN: When the thirty-five came in, that just exploded the size of the office. I'm not sure where they were. I think when the first group of Shuttle astronauts came in, I know the size of the office more than doubled. And then when they brought us in, that put it off the page. There was no question that you could go home and nobody would miss you, especially here in Houston. So that's why a lot of people like to go places. If you went to [NASA] Marshall [Space Flight Center, Huntsville, Alabama], or you went over to the Cape or somewhere else, you became a rock star. But around Houston, shucks, you're Amy's mom or dad or whatever it was. Oh, another astronaut.

ROSS-NAZZAL: I just had one other question.

BOLDEN: Sure.

ROSS-NAZZAL: I was wondering if you could give us a sense of how you think the position of astronaut changed from when you became an astronaut until you left the office.

BOLDEN: The biggest thing, and I think it's an evolving thing, it's when I came, at least, the number of astronauts was such that somebody who really was a space junkie could remember the names. So it was hard to go somewhere and be introduced as an astronaut and not have everybody there at least recognize your name. The more people we started bringing in, we put people in the position where now they're almost anonymous. And that's hard to take, to be quite honest, for somebody with a big ego. And a lot of us have big egos. Not many of them have the

kind of ego that makes it unbearable, but I'd be lying to you if I didn't say there's some people that go through the office—and some of you probably know some or have run into some. That's really traumatic for somebody who has been king of the hill up until now and they come down here to be where they think they're really going to be king of the hill, and nobody even knows who they are, doesn't even recognize their name. That's probably the most significant change that I sense.

The other thing that I think has happened in the agency has been—some people take it the right way, some people take it the wrong way—the misuse of astronauts in using them to plug management positions because somebody thinks that that will make something happen good all of a sudden, or it'll take the heat off, or whatever reason they use. So we now have astronauts up and down the management chain, some of whom really shouldn't be there, to be quite honest. Because, one, they don't have the training nor the expertise. When I stop and think about it, when I came here, I was a captain; I was selected for promotion to major. The things that I was entrusted to do when I finally was assigned as a crew member, and especially when I became a commander, were unbelievable in terms of magnitude as to what I would be doing if I were out in the operating forces of the Marine Corps. And there the ultimate, the big differences as a marine—I can speak for the Marine Corps—as a very junior marine, you're entrusted with the lives of your marines and sailors. So that is a big deal.

But in terms of making decisions that have big monetary impact or things like that, you don't. Nobody asks your opinion, nor does anybody care. In the Astronaut Office, you do. The assumption that because somebody's flown four times, that's why I kind of chuckled at—I was honored, to be quite honest, and I don't mean to make light of it at all, but the fact that being

considered to be the Deputy Administrator or the Administrator of NASA because you've flown in space four times.

Am I qualified to be an SES [Senior Executive Service]? To be quite honest, when I look at Jan Davis—I don't think I mentioned this previously. The person I admire, and I won't say the most, but one of the people that I admire unbelievably is Jan Davis, because Jan recognized early in her astronaut career that she didn't want to do that for a living, that she really did like being a worker bee, and she really wanted to be a manager. She wanted to stay in NASA, but she wanted to get into the SES hierarchy, and that she felt the way to do it was the legitimate way to do it, and that is you go to school, you go to seminars, you go through all the testing and everything else. And she did that for years on her own and finally qualified to be an SES, and then waited her turn to get appointed to an SES position, which is what she fills up at Marshall right now. And she is tremendous in it. She earned the respect of everybody with whom she associates because they know that nobody put her there because she was an astronaut. She's there because she is fully qualified. And I've always respected her for recognizing where she wanted to go in life and then doing the things necessary to get her there, not depending on a title or something else to get you there.

I don't intend that to take anything away from anybody who is serving in a management position, but there are some of us who don't belong there, to be quite honest, because we haven't paid our dues. And I don't think flying in space is paying your dues. That's fun. There are other people who would kill to do that.

I don't know if that answers your question.

JOHNSON: Is there anything that we haven't talked about that you'd like to mention?

BOLDEN: I think we've talked about lots of stuff, everything. The thing that I would re-emphasize is the key role that people play in the organization and in the concept of an organization whose responsibility it is to explore, not only for the nation, but for the world now. We've grown beyond it. That is my biggest concern with NASA right now, is that contrary to what I think a lot of us think, I think we're turning inward. And I think even with the President's announcement of going back to the Moon and on to Mars, I think there is a very good chance that we'll do it all wrong and we will make it a U.S. effort. And we should have learned by now that that's not the way of the world. We know that in the military. You can ask any military person from PFC Benoit to General Schmuck, and they will tell you that you don't do anything by yourself anymore. As much as every service would like to believe that they're the best—and we in the Marine Corps think we're the best—but even in the Marine Corps we recognize that you don't go to war by yourself anymore, ever again. And if you ever try it, then you're going to have hell to pay, because that's just not the way the world works.

So what I hope is that we won't try to venture back to the Moon and on to Mars or anywhere else alone, as the United States. My fear, from listening, is that we'll decide that we're going to do it all by ourselves and screw everybody else, they can go play with the Space Station, you know. For what it's worth.

JOHNSON: I appreciate you coming back and talking with us again today, and thanks so much for participating.

BOLDEN: Thanks a lot, I enjoyed it.

[End of interview]