

NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

EDITED ORAL HISTORY TRANSCRIPT

MICHAEL L. COATS
INTERVIEWED BY JENNIFER ROSS-NAZZAL
HOUSTON, TEXAS – JULY 14, 2015

ROSS-NAZZAL: [Today is July 14, 2015. This interview with Michael L. Coats is being conducted in Houston, Texas, for the NASA Johnson Space Center Oral History Project. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright.]

COATS: An interesting situation at Lockheed, where I was losing my young female engineers after about four or five years of experience, and they were leaving to take lesser paying jobs—they loved their jobs, they loved what they were doing at Lockheed, but they were leaving to take lower paying jobs. I thought this was not right, I don't understand this. So, I started doing exit interviews, and there were four or five of them that did this, and I was completely shocked to hear the reason was they didn't see any female senior managers, no vice presidents, no directors.

A 17,000-engineer company, Space Systems Company, and it hadn't dawned on me, because I was vice president, and the senior staff was about a third female, but they were HR [Human Resources] and finance and diversity and so forth. No technical jobs were held by females, it turns out, and they said there was no vice presidents and no directors the next level down, females. I said, "Well, that can't be right." I checked, and out of a 17,000-person company we had one female director, who was shortly brought up to corporate headquarters, so we had zero, and I hadn't noticed that because we had a lot of female engineers, they just weren't in senior management positions. But these young girls had noticed that and assumed there was a glass ceiling and they couldn't advance.

I was stunned, because we were paying them extremely well. These were design engineers that are paid pretty well. That was a real education for me, to find out you really need to see somebody like you in a senior position to believe you can advance in a company. So that's one of the things they asked me to talk about today at this panel. We'll see what else they want to get into.

ROSS-NAZZAL: I think that's a great topic. I was thinking about Carolyn [L.] Huntoon [former Director of NASA Johnson Space Center (JSC)] when you said that, because she seemed to be the one person at JSC who fit that role. She was the example for so many women looking to move up; they could always look to her.

COATS: Well, it's important to have a role model that you can look to and say, I can do that. And I guess I didn't really appreciate it, because there's no shortage of white male role models around.

ROSS-NAZZAL: Well, that is something I wanted to talk to you about later, about the Inclusion and Innovation. But I thought we'd start today by talking about your last mission, STS-39. It was an interesting mission for a number of reasons. It was the first unclassified DoD [Department of Defense] mission. Can you talk about how unusual that was?

COATS: Well, it was a really fun mission. It basically had two parts to it. One was the Air Force payload, which consisted of a bunch of sensors in the payload bay that they wanted to map and identify the aurora, in our case the Aurora Australis, the southern lights. Two of the crew

members, Guy [Guion S.] Bluford and [Charles] Lacy Veach, had trained for a long time on these instruments, how to operate them. They were actually assigned before the rest of the crew, so they'd been working on this for some time. The other part was for the Star Wars people, the Strategic Defense Initiative, which turned out to be how I met Mike [Michael D.] Griffin.

Mike was the deputy for technical for the Strategic Defense Initiative office, but everybody called it the Star Wars office. The idea for that one was to map what a rocket plume looked like in space. I think there were five different sensors on this platform that we were going to deploy. The idea was to command this platform and the sensors to look back at the [Space] Shuttle while we fired the Orbital Maneuvering System engine, the OMS engine, so they could map what a rocket plume looked like. The idea was to be able to develop satellites and sensors that would see a rocket coming up very quickly, detect it, and track it so they could, obviously, destroy it.

That's how I got to meet Mike Griffin. His first words to me were, "There's a \$25 billion program riding on the data you get, so don't screw it up. No pressure, now." It was fun for me as a crewman; not only did we get to fly through the Aurora Australis—and back then, having a high-inclination flight was pretty unusual. Now it's very common because everybody goes to the [International] Space Station, which is pretty high inclination, but back then it was unusual, and that was pretty special for us, but also for a pilot to be able to do a rendezvous in space was pretty neat.

Of course now everybody goes to the Space Station, or did, so no big deal, but back then it was pretty unusual. For me it was fun, because we got to deploy this satellite, fly away from it about three to five miles, command it to point back at us, and then I got to fire the Shuttle's engines. We'd go out of plane, out of the orbital plane, point out of plane, fire the engines, and

immediately flip around and fire them again to get back in plane, if you will. We got to do a lot of fun maneuvering in space that we don't usually get to do with the Shuttle.

That was really special for us, to be able to do a lot of different maneuvers, and then do the rendezvous and pick up the satellite with all the data it had on it. It was pretty important to get the data. It was a really unique and, I think, challenging mission to do all that, but it was a real privilege to be able to fly a mission like that. We got back, and Mike contacted us a little while later and said we got more data than we ever dreamed, so mission accomplished. That was really special. That's how I got to know Mike, working with him. Eventually that's how he contacted me about the Center Director job.

That was a fun mission. It was exhausting. The rendezvous was unusual. In the training, the simulator wouldn't stay up for a whole rendezvous, it kept crashing, so we'd do the first half, and then the last half, and we never did end-to-end rendezvous and capture. Not that it really mattered, because we had all the pieces practiced well, but when you get up into space, of course, it's not going to crash, the visual doesn't go down. But, it was a good thing we had a lot of practice, because we lost the rendezvous radar that gave us ranging, and then we lost a couple of the cameras that were the backup.

In the payload bay you have cameras that point from each end, and you can track the approaching satellite, or as you approach it, and get range rate that way. We lost a couple of cameras, and we're going, "Well, things are failing pretty fast here." The joke was, "Well, hopefully the visual won't fail."

It actually turned out to work very well for us. We were very fuel limited, we didn't have a whole lot of gas, because we'd done a lot of maneuvers, we were firing engines, which was the whole purpose of the flight. So, doing the rendezvous, we were worried about the amount of fuel

we had left. Turns out, when you don't have a whole lot of data coming in, you don't make a whole lot of inputs and fire your engines, because you want to wait and make sure you're either going too fast or too slow coming in. We ended up doing a pretty fuel-efficient rendezvous, and it worked out pretty well. A lot of that was Rick [Richard J.] Hieb, who was the guy doing the range and range-rate callouts for me while I was flying. He did a wonderful job with all the backup systems we had.

That was pretty exciting, because then we got to rendezvous and capture this SPAS [-II, Shuttle Pallet Satellite-II] that was built over in Germany with all the sensors on it that had the data. Turned out that we saved enough fuel that we were able to do quite a bit of activities on the contingency list, which was also fun, because every crew wants to accomplish as much as you possibly can on a mission. It allowed us to get a lot of things done that we wanted to get done, so that was a fun mission.

Of course flying through the aurora—can you imagine being in the cockpit floating, you darken the cockpit, no lights, and here you are flying through this thousands of mile long, 400-mile-high curtain of light that's dancing around, and you're just going, "Oh, man, I wish we could capture this on film." We just didn't have film that was fast enough to capture what you're seeing. You can take pictures of it, of course, long-exposure pictures, but boy, that was just a pretty special moment, to do that.

ROSS-NAZZAL: It was a pretty special mission for you. I think you had told us that you had only planned to fly two flights, but President [George H.W.] Bush had allowed you to get that third flight?

COATS: Yes, I told you the story how he convinced Diane [Coats] to give me one more flight. And then we got to go back to the White House and play horseshoes out there in the Rose Garden with the president, so that was pretty special as well. That was a good crew. All of my crews were very good crews, I was really proud of all of them.

ROSS-NAZZAL: They were all rookies, except for Guy Bluford and yourself.

COATS: Guy Bluford was experienced, and did a wonderful job. And the difference with an experienced crewman is you can ask them to go do something and they know immediately what you mean, because they've done it. Go connect such-and-such to such-and-such, go check on whatever, and they know, okay, check on it, that means do it this way. It helps having another veteran on the crew. My first crew, Hank [Henry W.] Hartsfield was the commander, and he was the only one that had flown before. We were all rookies. I learned to feel sorry for Hank, because he didn't have another veteran on the crew to help out. But, that was not quite as complicated a flight as the later ones out there.

ROSS-NAZZAL: How much did you know about the classified payload that you were taking up? Obviously we can't talk too much about it, because I don't know if it's been unclassified.

COATS: Well, obviously I knew a lot about it. I had to know a lot about it as the crew commander. Most of the Air Force [Program] 675 payload was not classified, which was neat, because we could talk about that to anybody. But, we did have some classified work, and Guy was the expert on that, and I had been back up. That was one of the bones of contention. The

Air Force didn't want anybody else on the crew to know about a certain payload, and I said, "Well, when everybody's crowded together on the flight deck and they see something go poof, they're going to notice. I can't tell them to close their eyes. It doesn't work that way up there. I'm going to tell them what they need to know, if no details about it." We had a lot of discussions about that. Naturally, with any classified payload or program, they want to compartmentalize and keep it as tight as they can, which is the right thing to do, but you're also faced with the real world, where you just can't stuff people in a locker up in space and say don't listen, either. We had some good discussions, and they finally agreed, they came around. It wasn't that big a deal, frankly, but there was some classified work that we did for the Air Force up there.

ROSS-NAZZAL: I understand that Guy Bluford had to have surgery. Were you concerned at some point that he wasn't going to fly, and the ramifications of that?

COATS: It was a bit of a concern. Guy was a real devoted runner, and he had developed some back problems, probably from all the running, the pounding that he'd done. He wanted to put off any kind of surgery until after the mission, but about eight months before the flight, six or eight months, he started to develop some numbness in his left leg, and the doctor said, "Ooh, that's serious. That means the back problem is developing and it may be irreversible if we don't do surgery pretty soon." He elected to do the surgery, and we had to rearrange the training quite a bit to accommodate Guy's surgery and his recovery, obviously.

So, we did, and the training people did a wonderful job, and the flight directors helped out tremendously to rearrange the training so that we could essentially miss Guy for a few

months while he recovered, and then cram everything in that we had to with Guy at the end. It did get real busy at the end, but they did a remarkable job of accommodating Guy's absence within a few months of the launch.

It worked out great. It did get busy at the end. As you near a launch date, you've done all your malfunction training, they've thrown everything at you they can, and what you'd like to do is fly a nominal mission, just to see what it was like, because you don't want to be surprised when everything goes right and you say, "Wow, I've never seen that before. What do we do now?" We probably didn't get as many nominal training flights as we would've normally gotten, but I think it worked out very well. Nobody balked on the ground about having to rearrange the training, they just did a wonderful job of scheduling.

I remember it wasn't just the training for flying the mission, it was the emergency escape stuff we had to do, bailing out and that sort of thing. A lot of that that you normally do early, we had to do late. Building 9, suiting up, the different types of emergency egress training you have to do, we had to put that off until Guy was physically able to do it, because you have to do it as a whole crew. That sort of stuff was crammed in at the end, but the crew was just fantastic about working a little longer hours, because Guy had spent years training on these payloads, and there wasn't anybody else that could do it other than Lacy Veach, but you need two people. That took some accommodation.

One of the strengths of NASA is the training they provide the crews. Historically it's just as thorough and realistic as possible to get. They're really good at that sort of thing, so, we benefited from that kind of skill.

ROSS-NAZZAL: You also benefited from the fact that your launch got delayed several times, as I understand it.

COATS: Yes, and that helped a lot. The trainers keep track of everything you do, and they want to make sure you've seen certain critical emergencies and malfunctions recently. One of the things they'll do in an actual flight, if they have an emergency, one of the first questions they ask of the training team lead is, "When's the last time they saw this in the simulator?" And he'll be able to call it up and say, "Two months ago, or six weeks ago," or whatever. "How'd they do when they saw it?" Again, you want to have recent and fresh memory of certain malfunctions and what the impact is. We were able, I think, to have a lot more freshness in our malfunctions due to some of the delays, so that's one of the side benefits of a delay, if you will.

ROSS-NAZZAL: Your crew was working two shifts; you had the red shift and the blue shift. Did you associate with one team more than another, or were you primarily working in between?

COATS: No, the commander is usually the floater. We have four compartments that we sleep in, sleep compartments. The commander has his own compartment and the other three have to share, two crewmen will share a compartment and rotate through; one's working while one's sleeping. I adjusted my schedule depending on what the critical events were during either shift. You also want to be as rested and relaxed as you can be for reentry and landing, obviously, so you want to adjust your sleep schedule a little bit to make sure you get a good night's sleep at least the night before entry and landing. Usually the commander on those kind of missions will be the floater, doing whatever mission he wants to observe and participate in.

ROSS-NAZZAL: You mentioned landing. I had read a nomination form that someone had filled out for you that they had decided to change the landing location, and within five minutes of landing you had to change course.

COATS: Yes, it was interesting. I think we may have been the only mission that actually had to divert to Florida. We were planning on landing at Edwards [Air Force Base, California], and my family was out there. Because I'm from Southern California I had lots of former classmates and teachers, family members, and I've got a brother and two sisters that live in Southern California, so they were all out there at Edwards. I think it was the winds that were the problem out there, literally a couple of minutes before deorbit, they asked us to re-target to Florida. It was one of those things you've got to type it in, or load it and then they check it on the ground, and then you enable it, and go, and it's just about that fast we did it. So, none of the family were there to greet us when we landed, which was unfortunate. We got to meet them back in Houston, we flew in from both coasts.

The neat part for me, though, was because we were coming down more or less the center of the United States and we were in a left turn to go to Florida instead of a right turn to go to California, we were in a left bank almost all the way, literally, during reentry, once you got down to the atmosphere. It was a clear day; there wasn't a cloud in the sky throughout the whole United States, it was an absolutely clear day. Here I am looking out my window, and at 200,000 feet—remember, airliners fly at 35,000 feet—I'm looking down at this beautiful country, at the Rocky Mountains and the plains, and I can see yellow school buses on the roads way down there. I can see contrails from the airliners way down there, and I'm trying to describe this to the rest of

the crew. They can't see anything, of course; I've got the only window out there. I forget who after a while, said, "Oh, just shut up."

It was really special for me to be able to look out, and I had to keep focusing back, bringing my attention back in the cockpit to pay attention to the Orbiter. That was a really special moment for me. I don't think we ever came out of the left turn until rolling out on final. I was so lucky to have an absolutely clear day, which was unusual, across the whole country. Wish I'd had a camera set up there to record all that.

ROSS-NAZZAL: What a special moment for your last mission.

COATS: Yes, it really was.

ROSS-NAZZAL: I understand your crew actually was recognized by Aviation Week & Space Technology [magazine]. You received an award, the Aerospace Laureate Award? Can you talk about that?

COATS: Well, Av Week has a number of awards in aviation and space that they pass out every year, very nice ceremony back in [Washington,] DC. We were nominated and got the award; I've got it on the wall in here. Of course I was lucky as a crew commander, I got to represent the crew at the ceremony where they gave us the award. But, it was because of all the payloads that we had, the Strategic Defense Initiative and the Air Force payloads that we were carrying, and the data we brought back. The mission was successful with all the data we brought back, and I think that's why they decided [to give us the award.]

It was a challenging mission, doing that. We called it the Malarkey Milkshake. John [M.] Malarkey was the guy who had designed these maneuvers in space to record the rocket engine plumes, and they were fairly complicated. We'd fire the engines and then flip around and fire them again, and flip around. So, we called it the Malarkey Milkshake. It was a complicated flight, and then of course we did the rendezvous, so it was pretty involved, and I think Av Week recognized the complexity of the flight and the fact that it was very successful in accomplishing the goals, and helped to enable the Strategic Defense Initiative development. I think it helped Mike Griffin's career. I used to tease him about that. I said, "You may be the chief engineer of the universe, but we helped your career."

ROSS-NAZZAL: When you flew that mission, did you know that you were going to be leaving NASA at that point?

COATS: I knew that'd be my last mission. Diane really didn't want me to fly again, and there's only so many times you can go to the White House, I think. Yes, I knew that would be my last mission, and that was okay. Don [Donald R.] Puddy offered me another mission, actually it was a tethered satellite flight, which didn't work. I think Loren [J.] Shriver got that mission, and it didn't work out there, so maybe it's just as well that I didn't take that mission.

ROSS-NAZZAL: You could've gotten another mission out of that, because Jeff [Jeffrey A.] Hoffman flew that flight, and then he got another, second mission.

COATS: That's right, that's true. When I came back, I was in a fortunate position, in that I was offered three different jobs. Bill [William B.] Lenoir, who was what we called Code M at the time—Bill [William H.] Gerstenmaier's job now [Associate Administrator, Human Exploration and Operations (formerly known as Human Spaceflight)]—asked me to come up, he was Chief of Staff at NASA Headquarters [Washington, DC]. The Navy offered me a job to come back to the Space Command, essentially as the chief of staff with the possibility of promotion to admiral eventually. Then I had offers from industry; Loral [Corporation] had the most attractive offer for me. My daughter was about to start college, going off to Baylor [University, Waco, Texas], and I had my son about five years behind that. Both the NASA job and the Navy job would've meant moving to DC, which is pretty expensive back there, so I wasn't real anxious to move to DC.

I think either job would've been fascinating, and I was curious to see if I could make admiral if I went back to the Navy, because it hadn't been done very much. Dick [Richard H.] Truly had done it, of course. Air Force tended to promote their astronauts to general more than the Navy to admiral. I think part of that is because they'd made Alan [B.] Shepard an admiral, and I don't think the Navy was terribly happy. They expected to get more publicity and help for Alan Shepard, and he wanted to do space stuff, and they wanted him to be more visible. I think rather than give up an admiral slot to an astronaut, they wanted you to come back. Now, a couple of people have gone back, obviously, Ken [T. K.] Mattingly and Dick Truly, and made admiral.

It was kind of tempting to see if you could make admiral, but living in DC was a big factor to me. Financially it would have been a hardship. I was very curious about the other side of the business world, what it was like in the contractor community. So, both from a financial

point of view, compensation, and from a curiosity, learning how the other side worked, that was pretty interesting to me, and Loral made me a good offer. I was able to retire from the Navy after 23 years, so I can draw a Navy pension while I'm getting paid by Loral. It worked out pretty well for me. They put me in a job where obviously I had responsibility for NASA programs for Loral, and one of them was the Shuttle Training Aircraft avionics out at Ellington [Field, Houston, Texas], which was fun for me, and a few other programs.

And then Loral bought IBM Federal Systems. I think it was the first time IBM had sold off any of their business. IBM had a contract for the Shuttle flight software, and had always had it, and suddenly I inherited that with a whole bunch of very unhappy former IBM employees who thought they'd be IBMers forever. They were shocked to find themselves suddenly working for a company called Loral they couldn't even pronounce. Was it "lor-all" or what? So it took a lot of convincing for them to convince them the world hadn't ended, that their jobs were important, nothing was really changed except the name on the paycheck.

I think it worked out pretty well, and it was fun for me. It was a shock for the Loral people. This probably doesn't have anything to do with NASA, but Bernard [L.] Schwartz, who was the CEO of Loral, had done an amazing job of building this company from a literally \$7 million company when he took it over to a \$7 billion company when he finally sold it to Lockheed Martin. He was very hands-on. Nobody talked to the media, nobody talked to the public without his permission. Yet he had suddenly inherited this Shuttle flight software contract, where if there was any problem with the Shuttle that was software-related, somebody had to get up in front of the media and talk to them about it. You didn't have time to contact him in New York and say, "Do you want to talk about it?" The people that's advising him were telling me, "He is ironclad. Nobody talks to media except him."

I said, "Well, we [have] a problem."

They said, "Well, he won't back down."

It was funny, because I met with him and said, "We need to talk about the contingency if something happens during a flight."

He interrupted me and said, "I can't even spell Space Shuttle." He said, "You got it. I trust you. Do the right thing and don't embarrass us." Fortunately, we never had a problem, but he was wonderful about it. He said, "That's just not my area of expertise, and you handle it. Keep me informed so I can talk to people."

It was really a nice transition, in hindsight, for us, and I got to learn a lot about the business. Then Lockheed bought Loral, and Bernard Schwartz said, "Look, I had no intention of selling the company that I built, but they made me an offer I couldn't refuse." It was a ridiculous amount of money, and in hindsight, Lockheed paid way too much, I think, for Loral. Then I find myself working for Lockheed Martin, obviously, and they transferred me then out to California to take over the civil space programs out in Sunnyvale, the old Lockheed, and then eventually transferred me to Denver [Colorado] for Advanced Space Transportation, which was where I was when Mike Griffin contacted me to see if I was interested in being Center Director down here.

I don't know if I told you the story. I had just told my wife 48 hours before Mike called, I had told her, "We love Denver, we love the job, we love Colorado, the kids love coming up here, we're never going to leave. Love the house, everything's ideal, good hair day every day, dry weather." I'd just told her that, and then Mike called 48 hours later. I told her that, and I said, "No, no, I won't go unless you agree."

She said, "Oh yes, sure." We called that the 48-hour meltdown. She cried for about 48 hours. That was tough; there were skid marks all the way from Colorado to Houston coming

back. But fortunately, when we got back, our first granddaughters, the twins, were born eight months later, and we couldn't imagine not being here when the twins were born, so it worked out really well for us.

As I've told everybody for years, it's the greatest job in the world. Being the Center Director for the premier human space flight center in the world is a pretty neat job. You get to work with the best people in the world, and you get to see some remarkable accomplishments up close and personal. Whenever the Shuttle or the Station would have a problem, watching the team solve the problem, the engineers, the flight directors, everybody, especially from the Center Director perspective, was just a real privilege. You see the best of humanity working to solve problems, coming up with some elegant solutions to some real serious technical problems.

Space flight, especially human space flight, is not easy. It will never be easy. And watching such a talented team work together as a team, the Shuttle Program, the Station Program, the engineering folks, all the NASA Centers work together when you have a real problem. Even NASA Headquarters works together. It was pretty enjoyable, really pretty special memory.

ROSS-NAZZAL: Any hesitation on your part over taking the job? Clearly your wife was not thrilled about moving back.

COATS: Frankly, the hesitation was giving up a really well-paying job. The compensation was pretty healthy for a vice president at a space systems company. Anybody who was human would have to think twice about taking a pretty healthy compensation pay cut. But Center Directors are not exactly starving to death, either, and it was certainly a worthwhile trade, but you had to at

least think about it before you made that decision. Coming from the contractor world back to NASA, you have to think twice about it. For one thing, I had to be careful to wall myself off from anything having to do with Lockheed Martin, and Lockheed Martin was involved in just about everything. I couldn't participate in contract award or evaluation or things like that. Anything to do with Lockheed Martin, I was completely walled off.

In our case, when the [President Barack] Obama administration came in, there was a lot of, as Charlie [Charles F.] Bolden put it, there was a visceral hatred on the part of this administration for George W. Bush, which you may have detected over the years. George W. Bush lived in Texas, and JSC was in Texas, so they were going to keep a close eye on JSC. I think we got a lot more help, if you will, then, and scrutiny and oversight, questioning of virtually everything we did than the other Centers did. Maybe I'm paranoid, but one of the things that, as a former contractor, they were able to constantly ask the inspector, and ask the FBI [Federal Bureau of Investigation] to investigate, "Is he still being walled off? Are there any conflicts of interest there?" They did it more as a harassment than anything else.

Now, it wasn't just this administration. There was still a little bit of rivalry with [NASA] Marshall [Space Flight Center, Huntsville, Alabama], not so much with Marshall management, but the Marshall politicians. Senator [Richard] Shelby was still very protective of Marshall and resented JSC, so he instigated an awful lot of investigations into me personally, because I was a former contractor. It was just pure harassment. Remember, this was a staunch Republican, so it was a lot of political, but it wasn't just one party versus another, it was sometimes the old rivalry thing. That was just a nuisance and a harassment. I had the IG [Inspector General] come in and the FBI agents come in, and first thing you do is apologize and say, "We're here again, sorry, but

we've got to go do it." They'd ask the same questions, and I'd give the same answers, and they'd say, "Okay, thank you, we know." It was just pure harassment, but that's politics.

There was a history there, not all of which I was involved in, between JSC and Marshall, quite a bit of rivalry, and I think we've come an awful long ways. A lot of that, I think, was Mike Griffin and Charlie Bolden. Mike emphasized, I'm not going to put up with this kind of rivalry any more, and if you can't get along, I'll find somebody who will. We're going to work together. Now, some things he couldn't control. Senator Shelby would say, "I'll be damned if the Space Station work is going to come through the Space Station Program, building a new rocket. It's going to go directly to Marshall, it's not going to come through JSC, like the Shuttle Program had." Not much they could do about that.

Mike emphasized, and Charlie, certainly, too, we're going to work as a team and we're going to meet every month someplace, as a team. Meetings rotated around the country, and there was a lot of traveling, but boy, you worked together as a team to solve your problems. That's certainly the right attitude, and I think we've come a long way. There's still some rivalry there, I think, in the mid-level managers. As a contractor at Lockheed Martin, I had a bunch of people at Marshall, so I got to know those people pretty well, and there was still resentment about JSC.

When Mike offered me the job, I agreed to take it and then I immediately started calling some old friends, Roy [S.] Estess, who'd been Center Director, and a few other people that I trusted to give me an honest opinion about what do you think about JSC, because I'd been gone for 14 years. Usually they'd laugh and say, "Well, there's still the problem of arrogance. JSC is the premier human spaceflight center, and they're kind of arrogant." But the real problem, I thought, was a "not-invented-here" attitude. They do human space flight better than anybody else, so why should they listen to anybody else?

Now, one of the things I learned at Lockheed Martin—remember, I came to Lockheed Martin at a time when Lockheed and Martin Marietta were still trying to merge successfully. They'd bought Loral, so now we had three large companies, and there were actually 17 companies that made up Lockheed Martin at the time. I had had several years out at the old Lockheed facility in Sunnyvale, and then they transferred me to the old Martin Marietta facility in Denver, so I had seen the Martin Marietta and the Lockheed cultures, and I inherited the old RCA and GE cultures on the east coast, the Valley Forge and East Windsor satellite factories that I had responsibility for. I got to see all the different cultures, and they didn't get along at all. They'd been rivals for 30 years, bitter rivals, didn't trust each other, and suddenly they're one company and they're being told to work together, and they go, "Yeah, sure."

I had a bit of an advantage, I think, in that I was perceived as not only not Lockheed and not Martin Marietta, but I was a former astronaut, so I was a third party and I couldn't be accused of, "Oh, you're favoring Lockheed," or, "You're favoring Martin Marietta in this merger." We set up a lot of internal benchmarking. We had to develop new procedures, engineering procedures, human resources procedures, everything. We did a lot of internal benchmarking to see which of these 17 companies had the best procedures to follow. Lockheed was very good engineering-wise, but they weren't very good financially and in some of the other ways, and they declared bankruptcy twice. So, a wonderful engineering organization. If you needed to accomplish the impossible and it didn't matter how much it cost, you went to Lockheed to do it, and they could do it, but they had no idea what it was going to cost and didn't have a good reputation for financial management.

Because we'd done a lot of internal benchmarking, I became a big believer in benchmarking. Let's go out and find the people who do the best. When I came back to JSC, I

was very interested in addressing the not-invented-here attitude, and you can call it arrogance or whatever. I told the staff right off the top, "Look, I want to be the best technical organization in the world. I think we are, but I want to make sure we continue being the best technical organization. I want to be the best across the board. I want to be the best human resources, the best financial management. If we're not the best, let's find out who is and go learn from them."

We have an advantage at NASA, in that we can go out and talk to companies that are anxious to talk to us. Not only companies, but other government organizations. They're anxious to talk to us because it's good for them to tell their boards of directors or their senior management, "Yeah, we're working with NASA." So, they would share stuff freely; we didn't have to buy it. They would love to talk to us about it.

I can give you the example of the diversity program here in a minute, but I wanted to use that name brand, the [NASA] meatball [logo], if you will, to get out and learn how we can improve what we do. Because I had worked with a lot of the other Centers as a contractor, I thought JSC actually was pretty darn good across the board. JSC sends more people to Headquarters to help out with critical functions than any other Center, and it's because I think we have an awful lot of talent down here. It wasn't like we had a huge problem to fix, it's just that I wanted to open up the aperture, everybody's aperture, and say, "Okay, maybe we can learn something. Maybe we're the best, but we can still improve, and if we're not the best, let's figure out how to become the best."

I actually tasked each of my direct reports to go out and do some benchmarking and find out what else was out there. They were wonderful at doing that. They welcomed it as a challenge. I asked them to brief me on what they learned, and they did. Not only with NASA Centers, but with companies, and not only aerospace contractors, but other non-aerospace

contractors as well. I tasked them all to read the good to great books, and figure out what a good management style was. They really, I think, did a nice job of doing that. So, benchmarking was one of the things I wanted to implement when I came back.

Another one, of course, was the—I didn't want to call it diversity. That's got a bad connotation. What we elected to call it then was Inclusion and Innovation, and what I was trying to emphasize to people was, we've got to be more innovative. If we have this not-invented-here attitude, we're going to have blinders on and we're not going to see the latest innovations, and we ought to be setting the example in the space program, especially the human space program. We ought to be the most innovative in the world. If we're going to be the most innovative, we've got to go find talent from every pool of talent around the country. I don't really care if it's black or yellow or what, I don't care if it's male or female, I don't care if it's LGBT [lesbian, gay, bisexual, transgender], I want talent here. I want the best. One of the things you learn as a contractor is you're competing to survive. That was actually the big attraction for me to go to the contractor; I love to win, I love to compete, I love to win contracts and perform on contracts, because I'm a pretty competitive guy.

But NASA is also in competition. We're competing for the best and the brightest out there against industry. I had a huge advantage in industry, because I could pay whatever I needed to get somebody. Now, in Colorado I was competing—Colorado was the fourth largest aerospace employer, state-wise. The state of Colorado was, after California, Texas, and Florida; we were number four. Huge aerospace. Lockheed-Martin was the largest employer in the state of Colorado, except for Walmart. We had thousands of people working up there, but most of our recruiting was from the Colorado universities. There were seven engineering schools in Colorado, and I was on a first-name basis with the dean of engineering at every one of them. I

would go out and meet with them and agree to come and occasionally talk to their engineering schools about flying in space, if they would clue me in on who their best and brightest students were, so I could offer them summer intern jobs and then pick and choose the best and the brightest.

I got a lot of wonderful female engineers that way. There weren't too many minority students in Colorado in the schools. When I came back to JSC, I wanted to emphasize, "Look, we are competitive, we have to compete for the best and the brightest. We're competing not only with industry, who can offer more money than we can, but we're competing with other government organizations, and we're competing internationally, for heaven's sake. We have to set the gold standard."

Now, we have a huge advantage. Young kids coming out of college love to be able to say, "I'm going to work for NASA." We really do get the best and the brightest, we get the cream of the crop at JSC, and at NASA. But, we have to continually challenge them or they're going to leave and go someplace else. So innovation is important. Inclusion is important, because I need to have a role model, and one of the things I learned, obviously, from the young ladies that were leaving Lockheed-Martin, was they need to see somebody up in senior management that looks like them.

Inclusion was important. I needed to have a representative management structure. Because we had such a wealth of talent at JSC, I could make sure I had a representative management structure, and it was a very talented group of people. I paid attention to the numbers; not a quota system, but I made sure we were having a representative workforce, so that if a young engineer came in, no matter what their background was, what segment of society they

belonged to, they could look up and say, “Oh, I see somebody like me up there.” And then they could talk to their compatriots, and that’s how you get the best and the brightest.

Instead of calling it a diversity council, we called it the Inclusion and Innovation [I & I] Council and Program. The team did a wonderful job of setting that up. Remember, they’d had diversity programs before, and they weren’t very well received, I don’t think, or terribly successful. It’s funny, because we implemented our Inclusion and Innovation Council and Programs and started setting up employee resource groups, and when human resources came to suggest the idea of employee resource groups, I was very skeptical. I was the last one to sign on. They’d had affinity groups before that at JSC, and my understanding is they kind of turned into gripe sessions, if you will, and I said, “I don’t need that. If the whole idea is to be inclusive, why are we setting up separate groups that are exclusive?”

They said, “Well, because it can work if it’s done right.”

I said, “Okay, show me where it can work if it’s done right.” So, we started benchmarking outside JSC, and we went to Toyota motor plant and factory in Indiana, visited them for a couple of days. We went to Georgia Power in Atlanta, and visited them. Talked to several companies, several other government organizations that set up the equivalent of employee resource groups and had been successful at it. We’d have meetings where they’d explain what they were doing, and they loved to talk to NASA, it was a big deal for them.

Toyota plant was neat because I got to drive their test track out there. People were really motivated there, which was neat too, and I’d been buying Toyota products for years, so it worked out pretty well. Then, after the briefings, I’d get one-on-one with the vice president or plant manager and say, “Okay, now tell me the problems you had and what you were worried about, and how did it work out.” And every one of them would say, “Well, I was skeptical at first.”

But, if you set it up right, if you define the charter for these groups very carefully, and the charter has to be, “How are you as a group going to help us accomplish our mission?” The union will represent you on your gripe sessions. If you want more money or whatever, the union’s job is to argue for that. Your job is to figure out how you’re going to help us accomplish our mission. How are you going to recruit people like you, the best and the brightest; how are you going to make them fit in when they get here; how are you going to train them and develop them so they’re promoted quickly? In other words, how do you make them feel part of the team as early as possible, so they know from day one they have a responsibility to speak up and contribute? That’s the charter for every employee resource group. It’s not, “What more can we do for us?” It’s, “What more can we as a group do for Johnson Space Center and NASA, and the space program?”

If that’s the charter and you review every month, how are you helping us accomplish those goals, recruiting, training? How do you make people feel immediately part of the NASA family? If you keep concentrating on that, it can be very successful. If it starts to wander off into, “Well, we don’t think we’re being treated properly,” for whatever reason, it’s going to fall apart. I think it’s still working. They’ve set up additional employee resource groups, like the women’s group. When I left, we had an African-American, and Asian, and what did we call the LGBT group? Out and Allied?

ROSS-NAZZAL: I think that’s right, yes.

COATS: Hispanic group and so forth. Now they’ve got a women’s group. Oh, we also had an engineering group; I forget now what it was called. I think they’ve been very successful. It was

somewhat ironic when the Obama administration came into office, one of the first things Lori [M.] Garver did was say, “Okay, you haven’t been doing anything on diversity, and we’re going to change that.” She came in, and I’ll be honest with you, Lori was an old friend, her husband worked for me, he was at Lockheed, and Lori was a paid consultant for us. She was heavily involved in the Democratic Party. Lori was an old friend.

It’s not unusual to have the Deputy Administrator be a political type, political appointee; Shana [L.] Dale was a Republican under Mike [Griffin], so it wasn’t unusual to have it. Lori started to—and I think Charlie didn’t have any choice—but she wanted to get involved in the technical decisions, in the management decisions. Remember, Lori had no executive or management experience. None, zero, zip. And she had no technical background. She prided herself on not being technical, and now she’s the Deputy Administrator of NASA.

She came in, and first thing she did was get all the Center Directors and Associate Administrators together and essentially said, “Okay, your job is to figure out how you’re going to make cuts.”

We said, “Beg your pardon?”

She basically said, “Your bonuses and evaluations depend on how much you cut, people in jobs and so forth.”

We said—actually, we started laughing, which didn’t help her a whole lot. It quickly became obvious, I think, to her that we weren’t in this for the money. They can take away bonuses, they can take away our salaries; nobody was really in this for the money. We thought that NASA’s mission and the space program was pretty important to the country. We made it pretty plain to her that we expected her to help us accomplish the mission, and she made it plain that the political ends and objectives were her priority.

It was a rough relationship right off the bat. She had heard from some of the Centers, it turned out, I think it was [NASA] Langley [Research Center, Hampton, Virginia], that they'd had some problems there, and she assumed it was problematic throughout NASA. She wanted to fix everything right off the bat, and really not much was broken, at least on the human space flight side. Because she had no management experience or executive experience, she really didn't have much to offer to help, and she didn't even know the right questions to ask. She just said, "Here's the political objective. How are you going to meet it?" Her two favorite phrases were, "If you don't agree, leave"—usually she said that when Charlie [Bolden] was out of the room—and when Charlie would come back he'd say, "I need to hear dissenting opinions," and we're going, "Boy, you two ought to talk occasionally."

Then her other favorite phrase was "How come I wasn't aware of that?" We wanted to say, "Well, if you had a background and some experience, and you ask the right questions, you'd probably be aware of that," whatever it is. She didn't care for JSC or Texas, because of George W. Bush being from Texas.

She wanted to cut us back dramatically, a number of SES [Senior Executive Service] slots, a number of personnel, much more dramatically than the other Centers. So, we had some real difficult discussions. She'd go to the White House staff, and they'd give Charlie guidance, so he was caught in the middle. Frankly, we would work with our congressmen. Senator Kay Bailey Hutchison, and Senator Bill Nelson were fantastic. I knew Bill, of course, when he flew on the Shuttle, and Kay Bailey was wonderful. Tom DeLay wasn't there anymore, but Senator Hutchison did everything she could. Even Senator Barbara [A.] Mikulski was very helpful. I think they did a tremendous amount to help me protect JSC. We'd gotten big cuts, but not

disproportional to the rest of NASA, which was the objective, I think. Senator Shelby made sure things went to Marshall directly and not through JSC, which was fine.

Lori, of course, wanted to have this big diversity program, and she starts making demands, and we said, "Well, maybe you ought to learn what we already have in the way of diversity." So, three of us volunteered; I think it was Langley, and [NASA] Goddard [Research Center, Greenbelt, Maryland]. Each of us got up and made a presentation on our diversity programs, and I think it blew her away, what we'd been doing for years, including our employee resource groups. She said, "You're going to have employee resource groups."

We said, "We've had them for quite a while, actually."

Of course her response was, "How come I wasn't aware of this?"

We said, "Well, maybe if you'd asked."

My concern was that because the administration was making a big deal about diversity, that our efforts in Inclusion and Innovation would be interpreted as being responsive to this new administration, and I had to try to tell people, "Well, we had this in place long before this administration came in, and this is not a reaction to their political objectives." I don't know how successful that was or not. I think the employee resource groups have been successful, from everything I've heard. I think the Inclusion and Innovation Council is still working fine out there, and [JSC Center Director] Ellen [L. Ochoa] was very determined to make it successful.

But boy, politics just drives you nuts, especially in the space program. If we think we have problems, the other government agencies have even more serious problems. I think part of it is because we're so technical, which is so foreign to most of the political types, they will set political objectives and they'll try to meddle, but when push comes to shove, they don't know what the heck we're doing and they have to leave us alone. Part of it is the Congress has said,

“We’re going to buffer a little bit. We want a space exploration program, and we’re going to compromise with what the administration wants to do.”

In a sense, you’ve got a commercial program that the administration wanted and a space exploration program that Congress wanted; neither one has been funded as much as they’d like, so like typical government, it’s a compromise. But, at least we have a space program. Not as soon as we’d like, and we’re paying the Russians a whole lot longer than I’d like to take our people back and forth to space; never dreamed we’d still be paying them at this date, but that’s the way it’s worked out.

ROSS-NAZZAL: Would you talk about those first few months when you came in as Center Director? It was a very exciting time. We were going to go back to the Moon and Mars. We were starting to transition Shuttle a little bit, because we knew Shuttle was going to come to an end in 2010. There was also a very robust ISS [International Space Station] Program. Can you talk about those days?

COATS: Well, it was very unique, and I look at it as almost a golden age. We had three major programs in different stages of development. The Shuttle Program, which was flying out, and the Station Program, which was in the middle of being built, still, and then you had the Constellation Program that was on the drawing boards. You had three huge human space flight programs that were in different stages in development. Man, I’m in heaven. It doesn’t get any better than this. We’re launching Shuttles, we’re doing amazing missions, we’re building the Space Station, we’re already conducting research on the Space Station, and we’re looking to the future with the Constellation Program.

The first couple of years, it was really neat. Just wonderful. It almost correlated to when our astronaut class came in in 1978, the Shuttle Program was still on drawing boards and it was three years away from the first flight, but we knew it was coming, we're working hard, we're literally working around the clock to make the Shuttle fly. And the first six years we were here, it was like a dream. The perfect job, we got to fly the Shuttle on our first mission, it's just fantastic.

Then [Space Shuttle] *Challenger* [STS-51L accident] happened and it brought us back down to Earth. This is a tough business, a dangerous business. The dream faded, reality came in, and it was that way when I came back as Center Director; the first three years were just a dream. Then Obama comes in and cancels the Constellation Program, and we knew the Shuttle Program was going to come to an end as well. At the time, the Space Station was going to be up there till 2020, and that was it.

When Obama canceled the Constellation Program, there was a period of about six weeks where I was really concerned. I don't get depressed easily, because I have the grandkids, but I wasn't sleeping well, because I didn't see the future of the human space program in this country. When you think about it, the Constellation Program has been canceled, it wasn't restructured, which was what Charlie wanted, and the Shuttle Program is going to come to an end, and the Station Program is going to come to an end shortly thereafter. There was nothing else on the drawing boards. Nothing. What's the purpose of the Johnson Space Center? It's the human space flight center, and we weren't going to do human space flight.

I spent a lot of time in DC visiting with Senator Nelson, Senator Mikulski, Senator Kay Bailey Hutchison, Congressman John [A.] Culberson, and Frank [R.] Wolf, who was chairman of the committee. Of course met with John Cornyn as well, the other senator. He wasn't on any

of the NASA committees. I spent a lot of time with congressmen, and they were very receptive. The Texas congressional delegation is fairly cohesive, even the Republicans and Democrats. Remember we had Sheila Jackson Lee, who was pretty involved in the space program. They were protective about Texas and JSC and the human space program, which I think was good for us. Bill Nelson was leading the effort, and obviously Kennedy Space Center depends on a human space program as well. So, we had some real strong advocates in Congress, and I think they essentially saved the Orion [Program] and the rocket that Marshall was building.

It was a very difficult period there for several weeks. The administration was determined that we were going to get out of the human space flight business, turn it over to the commercial operators. To do what? If the Space Station was going to come to an end, where are we going to low-Earth orbit to? What's there? The business case for commercial operators is to take things to and from the Space Station, and we're going to pay them a whole lot of money to do that. If the Space Station was going to end, what's the business case? Why are we spending billions of dollars to develop commercial spacecraft that have no place to go? We're not going to pay for them to go after the Space Station is gone. So, it didn't make a whole lot of sense to have a commercial program when you don't have the destination.

We have an exploration program, the Orion Program, to go beyond low-Earth orbit because of Congress, not because of this administration, and we're not going to get there as soon as I'd like, but I think we're going to get there. It seems to be on pretty solid ground now, so eventually we'll get there. So, let's see, I ought to go look up and see what all my objections were when they came back, I had a handful here.

ROSS-NAZZAL: We can come back if you'd like. I know we're not going to cover everything. There's so much that happened under your tenure.

COATS: There were several things I wanted to emphasize when I came back to JSC. One, obviously, was innovation because of all the comments I got about not invented here. I wanted JSC to be more open-minded and receptive to ideas. The Diversity Council, which we renamed Inclusion and Innovation, I wanted to set that up, and we did that. I told HR, Natalie [V.] Saiz, that I was interested in a program that we eventually called PPMD, Program Project Management Development. I think one of the toughest jobs anybody can have is a program manager, whether for government or the contractor, a large program, talking multibillion-dollar program, integrating and managing a multibillion-dollar program is really tough, especially a technical program like we have.

I had the opportunity at Lockheed Martin to see a number of programs for DoD, for NASA, for other government agencies, and all the NASA Centers. I think I had programs at virtually, maybe 8 out of the 10 NASA Centers, so I got to see good ones and bad ones in program management, both on the contractor side and the government side. I wanted to strengthen our program manager development efforts, and especially along the lines of helping prospective program managers learn from previous programs the mistakes that had been made. I told that to Natalie, and she came up with this PPMD program that I think was pretty good.

I was able to—because I knew an awful lot of the program managers, both on the government side and the contractor side—bring in these program managers on some big programs to talk to the students. We had people from all around NASA in these PPMD classes,

all the NASA Centers participated. I wanted them to hear the mistakes that had been made, the lessons learned, so maybe they wouldn't have to reinvent the wheel and make the same mistakes.

It was an expensive program, bringing people in, and I think because of budget reasons we had to stop it eventually after three classes. But, I got rave reviews from all the people that participated in these programs. I learned a lot listening to the program managers. Jeff [Jeffrey W.] Bantle, who had been a flight director here at NASA went off and was a program manager for the presidential helicopter program, which was [problematic] for a lot of reasons, and listening to Jeff talk about it, boy did I learn a lot.

I also believe that NASA had a lot better program managers than DoD, in general. DoD has a big advantage in that they can classify a program, make it classified, and then they can just throw money at any problem. I had a lot of DoD classified programs, and if you said, "Oh, we've got a problem with," they'd say, "Fine, how much does it cost to fix it?" and you'd go fix it. We don't have that advantage with NASA, because everything's out in the open, every dollar is scrutinized.

I wanted a PPMD program, and I think we did that for a while. I wanted a diversity program. I wanted to strengthen the business planning PP&C, Program Planning and Control, how we track our funds. I don't know if you remember, Dan [Daniel S.] Goldin once had to testify in front of Congress about the Space Station, and he testified during the summer and said, "We're fine, doing fine." Three months later he testified, "Well, we've got a \$5 billion problem." Boy, I was working for Lockheed at the time, and believe me, we spent a lot of time in Congress, and Congress was furious. Goldin had lost all credibility. They didn't want to see him anymore. You don't tell everybody everything's fine, then three months later, well, except for \$5 billion.

Obviously the Program Planning and Control, the business management as we call it in industry, was not very good in that case. I think Tommy [W.] Holloway came in and did a fantastic job. He essentially said, “We’re going to be honest and tell them what it’s costing, and get the money to fix it and do it right.” ...

I wanted to strengthen public awareness of the benefits of the human space program. I don’t think NASA does a good enough job of informing the public of the benefits of the space program. We can’t even agree, and we had many, many sessions with the senior management team, what are the benefits of the space program. It turns out there’s a long, long list, and you can’t tell everybody everything at one time, and how do you prioritize what your top two or three things are?

When I came back, I told Mike Griffin I wanted to emphasize public awareness, and he said, “Good luck with that.” Now Mike, you’ve got to remember, was the chief engineer of the universe, he wrote the textbook, literally, on spacecraft design. He loves that stuff. He’s brilliant, absolutely brilliant, technically sharp as they come. He’s a very good manager as well. He jokes that he’s not a good people [person], but he’s a fantastic manager. He doesn’t like the salesmanship part of the job, making the public aware of the benefits of the space program. He almost feels, and these are my words, not his, that the public ought to understand that space is worth it.

I said no, you’ve got to inform them. First of all, the public doesn’t really know what we’re doing, you’ve got to educate them, and then convince them of the benefits of the space program, which starts with Congress. You’ve got to go in and tell the congressmen, “Here’s what the benefits are.” Nowadays, the congressmen, first thing they want to hear is, “How many jobs in my district or my state?” You’d better have an answer, and if you have an answer—and

it doesn't have to be that many—but if you say, “Yeah, we've got a couple of hundred people working such-and-such,”—you've got their full attention and their full support. They got skin in the game, and that's what they think, “Okay, how many jobs in my district?”

Public awareness is something I wanted to emphasize, and Mike essentially said, “Yeah, okay, have at it.” But, it's not his priority and it's not his first interest. He doesn't enjoy talking to the media especially. He can get impatient. The famous saying is when one of the reporters asked something repeatedly, and Mike finally said, “Look, I can explain it to you again, but I can't understand it for you.” That was at a press conference. I've thought that many times but I've never had the courage to say it publicly. Because it is a pretty technical business, a complicated business that we do, and it's hard to describe it to the layman in simple terms, the difficulties we deal with.

I've often said engineers tend to downplay—when we have a serious problem, we tend to downplay it. So, how are we going to fix it? Now, we're trained to know we're going to fix it, failure is not an option type thing, but maybe if we didn't downplay it so much and we got a few more headlines about it, we were a little more open as to the risks, the downside if we don't fix it, there'd be more publicity, more public awareness. It was a tough sell on my part to do that, because we want to say we're going to solve that problem and we're proud of ourselves when we do it, but the public isn't especially interested in hearing how you solved the problem. As soon as you say the problem's been solved, they say, “Okay, fine, I'll go on to the next thing.” But if you say, “This is serious, we may have to abandon the Space Station if we don't solve this problem,” they go, okay, this is pretty serious.” Now you've got their attention. We're not very good at grabbing the public's attention nowadays.

I think we've done a whole lot better with social media now. The astronauts have gotten involved, they do all kinds of things now with the social media from the Space Station when they're on orbit, and they've really stepped up taking advantage of that. John Culberson, Congressman Culberson, who literally used to watch the NASA channel in his office—he's a lawyer by background, but he loves the technical stuff. His staff said he honestly sits there and watches NASA Select [TV channel], and he would constantly berate me, "How come the programming's not better on the NASA channel?" I'd go, "Okay, we're working on it." So, public awareness is something that we probably didn't do—it was one of my goals that we weren't very successful at, as successful as I wanted to be.

Knowledge management, I was very anxious to capture the first 50 years of human space flight. An awful lot of the knowledge was retiring and walking out the door. That's one reason you're doing what you're doing here, let's try to capture that knowledge. I learned a long time ago it's very expensive, and sometimes painfully expensive, to lots of people to reinvent the wheel, to make [the same] mistake that somebody else did. We had the Apollo [1] fire; wouldn't it have been nice to know that the Russians had had a similar fire and lost a crew several years before that? Maybe we would've learned a lesson from that, but we didn't share. There's lots of examples about that. "Oh, man, if I'd only known that somebody else did this, I wouldn't have made that mistake again." So knowledge management, knowledge capture is something that is very important. As I've told people many times, we're here to make history, but we also need to capture our history and be proud of it. We tried to do that. I tasked Jeanie Engle to work on that, and I think she did a pretty good job of it.

I wanted a better blueprint for the future, where do we go. I think we had a pretty good blueprint. The Constellation Program, while it was expensive, space is not cheap, and I think it

was a reasonable program. Unfortunately, the [George W.] Bush administration, as soon as he announced it and laid it out, including the budget, OMB [Office of Management and Budget] immediately started cutting the budget. And when the Obama administration came in and gave them a golden reason to say the money's not there, the budget's not there, we'll cancel the program, can't afford it. Would've been nice to have better support from President Bush, second President Bush. Maybe we would've had better luck with President Obama if we'd had more support from OMB.

I think we had a good blueprint, I think our international partners really bought in to that blueprint, the Constellation Program. I've seen an awful lot of frustration on their part that they expect the United States to provide the leadership in space, and they're happy to contribute if they want to be a part of it, but we're not providing the leadership any more that they expect, and I worry that they're going to turn elsewhere, either to the Russians or the Chinese, for that leadership in space.

One of the benefits of the space program is it brings countries together, gives us something to talk about. Even with the Russians now, we have no problem talking cosmonaut to astronaut and engineer to engineer and scientist to scientist—politicians have problems—but it gives us a common ground to communicate. That's important. I'd like to do the same thing with the Chinese. I think eventually we will. Those were the things that I was interested in emphasizing when I came back to NASA.

ROSS-NAZZAL: A fairly lengthy list. I was curious, a lot of times when new leadership comes in to an organization, they'll make some changes to their staff or reorganize. Was that something you did as you came in as Center Director?

COATS: No. In fact, I wanted to do the opposite. I'd been a contractor for a while. Not only did I have a history at JSC, but I'd been a contractor working with the Centers, and I believed that JSC had a very, very strong staff, senior staff. I think Beak [Jefferson D. Howell] did a terrific job. He provided leadership at a very difficult time, and I think ... he was a [terrific] leadership model at a time when NASA and JSC needed strong leaders, and he did a wonderful job.

I knew much of the staff already, obviously, personally, and I was convinced that it was a very strong staff, so I didn't want to make a lot of changes. Beak's secretary was Lisa [A.] Navy, and one of the things Beak told me as we were having a lot of discussions, he said, "You ought to keep Lisa as your secretary. She's fantastic."

I go, "Let's see, I was in the Navy for 23 years, and [her name is] Lisa Navy. I think we can work that out, sure." And, she was fantastic. I wanted to keep the staff, and I don't think we had a whole lot of turnover. I eventually had to make a few changes, that was pretty common, I think. But, I pretty much kept the staff in place, and I tried to reassure them. It was funny, because I had a wonderful HR organization at Lockheed-Martin in Denver, very strong, and I'd had some companies where HR was not very strong. I came back here, and Natalie Saiz really is a first-rate HR manager, very innovative. She told me later, after we got to know each other better, she said, "I was kind of leery when you first came in, because you didn't have too many expressions. We'd be briefing you, and you had an absolutely straight face. So we couldn't read you."

I said, "Well, that's strange, because my history is what you see is what you get. Every fitness report I ever had in the Navy basically said that. No hidden agenda, what you see is what you get." I finally figured out, because my hearing is not very good after so many years of flying

jet airplanes—I have to listen very carefully when people are talking. I have to concentrate on what they're saying or I'm going to miss it, especially if there's any background noise whatsoever. I think that concentration bothered people. I was listening intently, not showing any reaction. I had to laugh at that. I said, "No, what you see is what you get. I don't have any secret agenda anywhere."

I had a really strong staff and I stepped into a wonderful situation. Beak had made some changes, some difficult changes before I came in that he could've put off and dumped on me, and he didn't do that, he made the decisions. I really stepped into a good situation, and I knew it and I appreciated it. I don't believe in making change just for the sake of change. Some people believe that. Dan Goldin believed that he needed to stir the pot and constantly shake things up, and I believe stability is important to people. If you're going to make a change, make sure it makes sense to people, and explain it to people why you're making the change. Get their buy-in and support, and it'll be so much easier. But, just to shake things up for the sake of shaking things up doesn't make any sense to me, never has. I think I pretty well kept things in place when I came in.

I wanted to implement some of my programs, my ideas, and I wanted to do it such that I would say, "Here's what I'd like to do. Why don't you give me some ideas on how we can implement this?" Make it their ideas. Natalie did a wonderful job with all these things, the PPMD, the Diversity Council, which became the I & I Council. Just fantastic. Jeanie Engle was doing a great job with the knowledge capture.

I also learned the hard way not to micromanage things. In 2004 I had a heart attack that almost killed me, and should've killed me. If I hadn't been at home a mile from a brand-new hospital that had been open three months, I wouldn't have made it. The doctor finally explained

to me, “Well, you know, you’ve been working 18-hour days for several years, and maybe you ought to cut that back a little bit.” I took that to heart and said, “Okay, I’m going to put good people in place, or keep people that are good in place and let them do their jobs, and I’ll try to keep my fingers out of things and not micromanage.”

It’s real easy to do, because it’s interesting, I love it. I love the job. You even have to be careful about the questions you ask, because you don’t want to appear to be meddling. “Why’d you do it that way?” I had to learn to provide high-level guidance and then inquire about how things are going, and then just nudge them to explain more and more, without appearing to micromanage too much. Most of the astronaut office are the type of personalities, the control freak thing, I want to make things happen, I want to get involved, and you can overdo that if you’re not careful.

One of the secrets of being a successful executive is to find good people, and not be afraid or hesitant, if you have somebody that’s not working out, to put somebody else in. People can do a great job over here, but they’d be horrible in a job over here. Mixing and matching people and jobs is very, very important. Having a good management team in place that works as a team takes a lot of work and a lot of thought, and it shows. When you have somebody that doesn’t have the background or the experience or the education in a senior management position, it almost never ends well. So, picking people for jobs is very, very important. You make mistakes. Somebody can look great on paper, they can interview great, and in the real world they’re not very good at what they do. Then you’ve got to have the courage to make a change, and I had to do that a few times. That’s really hard, that’s the toughest part of being a manager, is to make a change, tell somebody they’re not cutting it.

I'll tell you a story. When I selected Ellen Ochoa to be the Deputy Center Director she was Director of Flight Crew Operations [FCOD], and I wanted her to be the deputy, and she didn't really want to be the deputy, she loved being Director of Flight Crew Operations. I finally had to explain to her, "Well, I mis-phrased it the first time. I meant to tell you, not ask you." I think it worked out okay for her eventually, but then I had to replace a new Director of Flight Crew Operations. Janet [L.] Kavandi had been the deputy and was a good choice, but I [wanted to be sure she could be forceful when necessary]. Sometimes you have to make some tough decisions, especially as Director of Flight Crew Operations, about when to ground people, and we had a number of pilots at Ellington that were getting up in years. It's hard to admit that you're not the aviator you used to be. I can tell my flying skills were not as good at 45 as they'd been at 25. Experience counts for a lot, but your skills tend to deteriorate. We had people that were 65 still flying out there. We really didn't have a limit on it at the time; we had to put a limit on it.

I told Janet, "Look, sometimes it's tough to tell somebody they're going to be taken out of the cockpit, but you have to do it." ... She did a fantastic job at FCOD, and now she's Deputy Center Director at Glenn Research Center [Cleveland, Ohio]. I just got an e-mail from her yesterday; she's going to bring her senior staff down to JSC for a retreat in September and wanted me to talk to them. I said, "Okay, I'll talk about the Cleveland Cavaliers and how LeBron James almost did it."

ROSS-NAZZAL: I wanted to ask you about the joint leadership team, which was something that Beak had established before you came here. What were the benefits of that group that you saw,

especially coming in as a contractor? You'd been a civil servant, but then you came back from industry.

COATS: Well, I was very impressed. Beak and Bob [Robert D.] Cabana had set up that joint leadership team after [Space Shuttle] *Columbia* [STS-107 accident], and it was a fantastic idea. The big advantage was the communication. We got together on a regular basis. They had their objectives and goals, which we addressed, but the real advantage was just the communication. We could get together and discuss things as a management team. I could communicate some of my decisions and the rationale behind them, what NASA was trying to do, why we were doing what we were doing. I could say, "Look, we're faced with budget cuts. I know it's going to be hard on everybody. It impacts an awful lot of things when your budget gets cut, and ours got cut fairly dramatically. Here's the impact it's going to be. If you've got any ideas, we're anxious to hear them. I want to share the pain equally." We've got to be fair. We've got to follow all the rules. It just helps to communicate with people and having a forum to share ideas.

That was the big advantage, I think. We had a couple of retreats where we'd get together for a day or two and talk about things, and just keeping the lines of communication open. It takes a team, contractors and government personnel, working very closely together. It's not that easy to communicate. It's never easy to communicate, you have to work at it very hard. You have to create opportunities to talk to each other and listen to each other, and listening is perhaps the hardest thing of all to do. I mean really listening, "What are they trying to tell me?" They'll have concerns that would never dawn on me.

One silly example is when Loral bought IBM Federal Systems, and we had the big beautiful IBM building out there, and I sat down to talk to these people and I thought that their

big concern would be their benefits or pay or whatever. Their biggest concern was the number of parking places. “We have 22 handicap parking places set aside. Why 22?” I’m going, “What? That’s the biggest concern this group has, is the parking places and the parking garage? For heaven’s sake, you’ve got a parking garage. What do you care about parking places?”

It was silly. Literally two whole rows were taken up with handicap places that nobody ever parked at. We had two handicapped employees. [It seemed trivial, but it was a big complaint.] They had other concerns. The number of vacation weeks is less at Loral than it was at IBM, and I said, “Great, I’ll give you a 2 percent raise for every week [you lost]. How’s that?” They’d go, “Hey, that’s fantastic. Can we give up all the weeks?” And I said, “No, no, we can’t give up all the weeks.” [Seemed like a good solution].

ROSS-NAZZAL: We have about 15 minutes. I thought maybe we could talk a little bit about the second Return to Flight mission [STS-114]. Initially there was some disagreement over whether or not to launch based on the risks associated with the partially modified ice ramps. Do you remember some of that dissension going on?

COATS: Boy, let me think. Several missions had problems. What was the technical rationale on that one?

ROSS-NAZZAL: There was some concern, even Bryan [D.] O’Connor [Chief of Safety and Mission Assurance] had come out, I think the Chief Engineer, a number of folks had come out and said this is a catastrophic risk. I think the Marshall Space Flight Center engineering review

panel said it could be catastrophic. I think JSC engineering came out opposed to a launch, maybe about a month prior.

COATS: Well, we fixed it, didn't we?

ROSS-NAZZAL: I think so.

COATS: We didn't launch. I was very impressed—we had several problems over the years. One of them was we had ice around the feed line from the tank going into the Orbiter. Any time anybody objected or voiced concern, Mike Griffin was just fantastic. He wanted to hear any concerns, and he had no problem holding up a launch, scrubbing a launch. There was no question. And it's tough. You have launch fever. When you're down there, you've got tens of thousands, if not hundreds of thousands of people out watching the launch, the families are down there, you're anxious to go, everybody wants to see a spectacular sight. It's tough to scrub a launch, but it wasn't tough for Mike. It wasn't tough for [N.] Wayne Hale, the Shuttle Program Manager, or the Launch Director, or any of them. They had a very experienced crew. I was very impressed.

There was one flight, and after all the launches I'm getting them mixed up now, but Ellen Ochoa, near as I could tell, Ellen's the only person I'm aware of who single-handedly scrubbed a launch. I can't remember all the technical details about this ice buildup problem. There was a leak problem, leak detection problem with hydrogen leaking from the umbilical going into the Shuttle from an external tank, and we'd had indications of a problem on several flights that just barely exceeded the limits. We actually stood down [for a few months] while they tried to fix

the problem, and it wasn't clear exactly what the problem was, so they were tinkering with what to fix.

We had an awful lot of meetings that Ellen was involved in as FCOD at the time. We finally agreed, the consensus was, "Okay, here's the flight rule. If the leak is above a certain rate, we're going to scrub." We came down to launch and the leak was just barely above the limit we'd agreed on, it was toggling in and out of the limit, which was sort of an arbitrary limit, but everybody was go for launch, except Ellen. She said, "No, I'm not go." She said, "We agreed that if it was above a certain limit we weren't going to go, and I'm not comfortable waiving that." We occasionally waived a rule, depending on the conditions, if it made sense and everybody agreed it was safe. Ellen said, "No, we agreed. It's probably safe, but we agreed to this and I'm not comfortable." Both Bryan O'Connor and Mike Griffin stood up at the same time in management row and said, "[if] Ellen [isn't a go, we're not going]." I thought, that's the way this team ought to work. And nobody disagreed. Nobody. Nobody said, "Oh, wait a minute, let's talk about this." They said, "Whoops, if somebody's not happy, we're not going."

Now, that's the kind of attitude you've got to have, you should have. Ellen, near as I can tell, was the only one objecting, but nobody was going to disagree. Mike could've overridden her easily, but he wasn't about to do that. I think if he had tried, even—he had no desire to try—the rest of us would've objected en masse to it. Everybody had to be go for every launch, and it was an ironclad rule. Now, maybe that's because of the *Columbia* accident, I don't know. But, everybody was really super conservative and safe. ...

ROSS-NAZZAL: I was curious, you've experienced missions from both sides. You were an astronaut, so you got to fly, but you came back and now you're managing a Center. Can you talk

a little bit about the experience of missions from those two very different perspectives and experiences?

COATS: I've told people for years, and I don't think anybody believes me, but it's actually tougher to watch a launch than it is to ride through a launch, and it comes down to the control freak part of it. When you're in the Orbiter and you've been trained up to a peak efficiency, you're very confident you can handle anything that can humanly be handled. The things that can't be handled, why are you worried about it? You're anxious not to embarrass yourself when you're in the Orbiter and make a mistake. On the other hand, you have complete confidence in your crew and in the ground controllers and yourself, and let's go do it. You're just so mission focused, getting it done. You're proud of the level of proficiency the crew has achieved in the simulators, getting ready to go. It's almost like, "Okay, throw it at me, I can handle it." Which is what you want them to be thinking.

When you're watching a launch as Center Director, you have no control, you have nothing you can do except hope everything goes okay. That's a horrible feeling, to have no control, and because you've been through the training, you know all the different emergencies that could happen to you. You can't help but be thinking about, "Okay, if we lose an engine now, what happens? If we lose an engine now, what do we do? If we lose an engine now? If we lose the hydraulic system, what happens? If we lock up an engine?" That stuff goes through your mind, and you can't help it. You lived it, trained it, for years and years. So, it's tougher to watch a launch than it is to ride through it, or at least it was for me.

On the other hand, boy, you're as happy as the crew when they come back safely. When you're hugging the crew out there, boy, you really mean it, "It's so good to have you back."

That's the big difference to me. You feel responsible for the crew. The Center Director has final approval on crew assignments, and you just feel responsible for every crew when they're up there; you want them to come back safely. That's a big responsibility.

ROSS-NAZZAL: Absolutely. I think this might be a good place for us to stop.

COATS: Okay.

[End of interview]