

**JOHNSON SPACE CENTER ORAL HISTORY PROJECT
EDITED ORAL HISTORY TRANSCRIPT**

MICHAEL L. COATS
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is September 14, 2015. This interview with Mike Coats is being conducted for the JSC Oral History Project in Houston, Texas. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright.

Thanks again for taking some time this afternoon.

COATS: My pleasure.

ROSS-NAZZAL: I wanted to ask you about the Advance Planning Office that you established when you came on as Center Director. I was curious what the idea was behind that and what came of that office.

COATS: Well, I thought it was very, very important that we continue to look ahead down the line and see not only where we thought the space program was going to go, but where JSC's role would be in that space program, human space exploration. So, I wanted somebody to literally focus, spend their time thinking about where we might go and how do we prepare, how should we reorganize, what should we do to restructure JSC to get ready for whatever comes down the line. We were expecting, at that time, of course, to have a Constellation Program, and a real focus was that the [International] Space Station is going to be there for another 15 years or so, and the [Space] Shuttle was going to fly out, obviously, and how do we structure ourselves? We

had three major programs in different phases of their life cycles. Shuttle was ending, and we had to make sure we flew out safely. Space Station was still being constructed, but that was going to fly for another 15 years or so. Then Constellation was going to replace the Shuttle and should have been flying this year, originally.

So, how do we position JSC? By that I mean do we have the right skill mix, are we training our people properly? Let's do some serious thinking about how we're going to prepare for the future, make sure we're ready for the future. NASA is very good about that. I've always been amazed at how well NASA not only trains the astronauts, the flight controllers, and engineers, but looks ahead pretty well. I wanted to continue that. Not that this was something new, I didn't want us to be so focused on every Shuttle flight and every Space Station assembly mission that we didn't plan ahead and prepare. By planning ahead, that doesn't just mean what do we think is going to happen. Is there a way to influence it with NASA Headquarters [Washington, DC], perhaps with some of the key members of Congress? How can we have a say for the Johnson Space Center?

We were very fortunate that we had a very strong congressional delegation. Texas has always had a very strong congressional delegation. It's bipartisan; we had excellent support from Republicans and Democrats. At the time, of course, Tom [Thomas D.] DeLay was a very powerful majority leader in Congress; in fact, he introduced me at the assembly when they announced I was going to be the Center Director. He was with me up on the stage in the auditorium. So, I got to know Congressman DeLay pretty well. We had very good support from most senators and all the congressmen. Ralph [M.] Hall was a key chairman for us. They and their staffers would ask us questions almost constantly, and both Mike [Michael D.] Griffin and

Charlie [Charles F.] Bolden had said, “Boy, you’re free to answer any questions, just let us know so we’re not surprised.” I think we were pretty good about that.

The attitude was let’s do an Advance Planning Office and see what we could do to influence things if we think we needed to. Obviously, while we’re not allowed legally to ask for money, we can make a case for a space program. In fact the Space Authorization Act of 1958, the Space Act, actually makes NASA the only agency that’s required by law to tell the public what they do, believe it or not. We have to disseminate information on our activities. We’re not allowed to lobby, but we’re required by law to tell people what we do. I told Mike Griffin and I told Charlie after that, I think we need to do a better job of that.

The problem is, every [Presidential] administration that comes in, it doesn’t matter which party, they don’t want you out there lobbying for budget, they’ll tell you what your budget’s going to be. They don’t need additional pressure from Congress. You’re walking a fine line; you have to tell the public what you do, but they don’t want you overdoing it either, either party.

We’re stuck to, “If they’re asking us questions, what are we going to give them for answers on our planning office?” I thought that was important, to have an Advance Planning Office that focused their thinking on what do we think is going to come down the line and are there any actions that we need to take to prepare for that, whether it’s restructuring the Johnson Space Center, training our people differently. Do we have the facilities we need, is there any way we can influence Congress or educate the public about what we do, with the idea we do human spaceflight, and that was a huge responsibility.

That was my thinking initially coming in: I want somebody thinking about the future, because you tend to get tied up doing crisis management every day. Your schedule is always full

of meetings, and you don't have nearly enough time to sit back and think about the big picture, and I thought that was important to do.

ROSS-NAZZAL: Was that helpful when Constellation was canceled, to have this idea in mind, looking at numbers and programs, things of that sort?

COATS: Well, I'll tell you, the cancellation of Constellation was a total shock, as we've talked about before. I didn't see that coming, even though [President] Barack Obama had said in his campaign he was going to put Constellation on the shelf for five years, which meant canceling it forever; you don't fire everybody five years and say come back, especially with the quality of engineers and scientists we have. I knew if he was serious, that it was a possibility, but I also thought we had pretty strong support in Congress. So, I really didn't see that one coming. I thought they would restructure the program, cut the budget.

[President George W.] Bush had cut his own budget repeatedly, that he had promised for the Constellation Program, and I expected Obama to do the same thing. When it was canceled, I really was caught off-guard. I couldn't imagine that any president would actually cancel the space program. When he canceled it, there was no follow-on. Space Station was going to quit flying soon, within 10 years, and there was nothing after that. I saw no role for JSC as a human space exploration center. That really got my attention; I didn't see that coming. You can't plan for that; it wasn't one of the scenarios we'd dreamed of in our Advanced Planning Office, was going out of business.

I think, on the other hand, because we had been fairly active in working with congressmen and their staffers, we had a relationship, we knew who to call, they knew who to

call, and I think we got pretty active in doing that. Senator [Kay Bailey] Hutchison was just amazing, bless her heart. I'm convinced we wouldn't have an Orion Program or a heavy-lift rocket or a human exploration program without Senator Hutchison and Senator [Bill] Nelson from Florida. I'd known Bill Nelson, of course, because he flew on the Shuttle, and I'd known him for a lot of years. The two of them were very, very active, and we worked a lot with the two of them and their staffs. In that sense, because we had done a little bit of planning and knew the right people to talk to, I think it helped.

I know Charlie Bolden was fighting very hard to save the Orion Program and the launch vehicle program, but he had a real battle on his hands, I think. There wasn't enough money to do the commercial program that Obama and the White House wanted to do, and the Orion and the launch vehicle. Nobody was going to get the money they thought they needed. It was a struggle for a while. We weren't sure how it was going to come out. Obama was not a fan of the Orion Program, and I don't think he was really interested in the space program; it wasn't one of his priorities.

I think the Johnson Space Center and the Texas congressional delegation did a lot, did everything we could to save the Orion and the launch vehicle program—we needed the launch vehicle to launch Orion—to have a human exploration program. You could launch Orion on existing rockets, but you couldn't really have an exploration program without a new heavy-lift vehicle. You needed something that could lift 70 or 100 metric tons, and there was nothing on the drawing boards to do that. All the studies had indicated over the years that you really needed a heavy-lift vehicle if you were going to go explore the solar system. It just makes sense, to even a layman, you've got to have a pretty large rocket if you're going to lift a lot of stuff into space, which you need to go explore. We worked very hard, I think, to inform and educate the

congressional delegation and the staffers about the studies that had already been done and why these things were necessary.

And of course, what Congress did was compromise with the White House and say, “Okay, we’re going to do everything. We’ll do the Commercial Crew Program, and we’ll do the exploration program.” The good news is, they left NASA’s funding level; where they were cutting other programs, they left NASA’s level. They were just trying to squeeze 10 pounds into a 5-pound box, and not enough money got allocated to anything to get a timely launch vehicle or a timely spacecraft. It’s frustrating, because that means we’ve been paying the Russians longer than we really wanted to, and paying them an awful lot, to go fly our astronauts, because we don’t have a launch vehicle or a crew vehicle.

But that’s politics. At least we still have the Orion Program and the launch vehicle on the books, and I’ve just been amazed that they’ve actually kept the Orion schedule that they laid out. I never would’ve dreamed they would’ve gotten the one launch off. They went out about 3,000 miles and came back, on time, exactly when they said they would. I think the team did a terrific job pulling out. [William H.] Gerstenmaier did an amazing job.

ROSS-NAZZAL: What did you think of the commercial endeavor? You talked a little bit about Orion and the new launch vehicle, but what about that commercial component? What did you think as the Center Director?

COATS: Well, people say we were opposed to the commercial effort. That’s not really true. I think most of us said when we’re ready, it’d be great to turn over low-Earth orbit to the commercial providers. I don’t think NASA should be in the business of operating a service, and

if we can buy the service from somebody else, a proven service, that's great, because we can focus our efforts on exploration, which is what NASA was really chartered to do. I think the technology was mature enough that there's no reason that commercial companies couldn't develop a rocket and a spacecraft to run back and forth to low-Earth orbit.

I got a lot of questions to me asking, "Exactly what's commercial about this commercial crew if NASA is paying for it? What's the difference between that and a government contractor?" I've never been able to come up with a good answer to that. We gave them hundreds of millions of dollars, we gave NASA contractors hundreds of millions of dollars to go develop something. A true commercial effort is a company develops a product and you buy it. For NASA to spend literally billions of dollars for these companies to go develop something makes it not as commercial as you would think, and I really have a hard time saying there's a big difference between a government contractor and a commercial contractor the government's paying.

But, I've been very impressed with the commercial companies and what they've done. Certainly Elon Musk is just an amazing individual. You've got to admire somebody that puts a lot of their skin in the game, and they've certainly done that, and he's in so many different areas. If you think of the word entrepreneur, you've got to think of Elon Musk, in so many different areas. It's not just obviously the space business, but the electric car business, the solar array business. He's interested in so many different things, and boy, he puts his money where his mouth is and puts his name on the line. He's come close to going out of business several times. You've got to admire somebody like that. That's what America's all about. Wish we had more people like that.

Orbital Sciences [Corporation] has done a great thing, and Boeing [Company] has put an awful lot of money into their CST [Crew Space Transportation]-100 vehicle. And that's great. We were constantly looking at how to encourage companies to invest more. For a government contractor, they've got research and development money, and we want them to invest that in the areas that benefit us. I've been delighted with what they've been doing. I want them to do it sooner. We wanted them flying by 2017, and I'm hearing that's probably not going to happen, which is frustrating, because this paying the Russians \$75 million a crew seat is just painful. That could employ an awful lot of American engineers. It adds up; it's approaching half a billion a year that we're giving the Russians that we could really use in our economy over here.

ROSS-NAZZAL: About how much was it costing the U.S. government to operate the Shuttle Program? Is it comparable?

COATS: The problem is, you have an infrastructure you need to maintain. The whole Shuttle Program was about \$3 billion a year. It didn't matter, really, how many flights you flew. It was going to be \$3 billion a year to operate the Shuttles, each flight added about \$100 million. So, if you flew five or six times, maybe half a billion, but you could take that out of the \$3 billion, so it was going to cost you about \$3 billion. When they canceled the Shuttle, there were proposals from NASA and Boeing that said, "Hey, we could cut it down to \$2 billion or \$2.1 billion and continue flying the Shuttle." Make some changes, modifications. But, it was going to cost somewhere between \$2 billion and \$3 billion to continue operating the Shuttle.

There were people that wanted to do that. I wanted to do that. I thought we had learned an awful lot about safely operating the Shuttle. We suffered a lot of pain to learn from some of

the mistakes we make, and I thought we perfected it. The Shuttle is an amazing vehicle. It could lift more than any other launch vehicle could; it could bring things back, which no other vehicle could. We could do amazing things when we were on orbit up there, repairing things while we were up there.

The problem with the Shuttle is, we didn't have a crew escape system, and we've proven twice now it would've been [highly desirable] to have some kind of crew escape system in the Shuttle, and just weight-wise and expense-wise it was prohibitive when they were designing the Shuttle. I think we're to the point now, and have been for a few years, where we're comfortable rendezvousing in space and building things in space, so we ought to have a vehicle that is tailored for safety for the crew. How do we get the crew back and forth to space as safely as possible?

The bottom line is, a capsule-type vehicle is probably the safest way to go. It has some down-mode capabilities, so even if you have a problem, it's inherently stable and ought to be able to safely bring the crew back. They may suffer some pretty high G [gravity] forces coming in, but we've done that a couple of times on the Soyuz missions, too, with the ballistic reentry. And, the same thing during launch and ascent: if you have a problem, you can abort and pull off the capsule and parachute the crew down, and it looks like that's the safest way to go with the crew. Until we come up with an anti-gravity of some type, it's probably the best way to go. Then you can launch your payloads on a dedicated unmanned rocket and go up there and rendezvous with it to build whatever you need to in space, and I think that's a sensible way to go.

I wanted to continue flying the Shuttle because I thought it was a capability I really didn't want to give up. I wanted to operate until we had another vehicle ready to replace it, and of course you can't pay for both. You can't have \$3 billion a year going to operate the Shuttle and

\$3 billion a year going for development of a new vehicle, and \$3 billion for the Space Station to boot. So that, financially, was not possible, budget-wise.

ROSS-NAZZAL: One of the things that the Shuttle and its crews were able to do was to go service the Hubble Space Telescope. Mike Griffin, as Administrator, changed his opinion about whether or not we could back to Hubble. Sean O’Keefe had said we can’t go, it’s not safe, and he made that decision. Were you involved at all in that decision-making process?

COATS: I’ll tell you a story. When I was working for Lockheed Martin, Sean O’Keefe called the CEOs in, and he had made that statement publicly, that it wasn’t safe to go fly. Vance [D.] Coffman, who was CEO of Lockheed Martin—each CEO was allowed to bring along one other member of the firm, and Vance brought me along, since I had been a Shuttle member. We were in the big conference room up there at NASA Headquarters with Sean O’Keefe, and that was the second time I met him. Sean O’Keefe was very upbeat and happy, and he opened it up to questions, and I made the mistake of asking him about his thinking on that Hubble decision. And boy, it was like pouring gasoline on a fire. He just went off. He was screaming and yelling, and we were all shocked. It was a room full of CEOs of these corporations. He went off, and finally steamed out of the room. Obviously it was a sensitive subject for him. I never dreamed it would be that hot a topic.

I wasn’t asked my opinion on it, and we walked out, and Vance Coffman says, “Well, you certainly impressed him, didn’t you?” That didn’t work out quite as well. But yes, I thought servicing the Hubble was worth the risk, and I think when Mike Griffin came in, he felt the same way. You want to be as reasonable as you possibly can, but as John [W.] Young said once, if

you want to be perfectly safe, we'll never leave the ground. That's not what the American public pays us to do in this business, is sit on the ground. You really want to make it as safe as you can affordably make it. We could spend trillions of dollars making it safer, but there's always going to be some risk involved, and we don't have that kind of money, so how safe can you make it given the budget we've got?

There's certainly mistakes that have been made, and one of my biggest concerns was complacency over the years. It seemed like every 15 or 20 years we have a fatal accident, and if you look at it, frequently it's because you'd gotten complacent, and this is not a business where you can get complacent. That was a big challenge to me; when you've had a run of successful flights and missions, how do you keep from becoming complacent? If you think you know everything, something's going to bite you. I hope I answered that question.

ROSS-NAZZAL: Yes. I was just curious if you were involved in that decision. I wanted to also ask you about the Smart badges. Remember those, the little cards that have the little chip in them? That was rolled out while you were Center Director, and that seemed to be a big issue of contention, at least at some other Centers. Was there any challenge here at JSC rolling out that program, anyone strenuously objecting to the program?

COATS: We tried to head that off. I tried to prepare people, to say, "Look, it's a pain, passwords are a pain, all this is a pain, but here's the reason we have to do it. The fact is, we're being hacked on a regular basis." I wish I could tell people how often we have been hacked by lots of different people, the Chinese, the Russians, the Iranians. Some of the Norwegian countries had really good hackers, believe it or not. NASA was hacked repeatedly, and the government's been

hacked repeatedly. Every agency, it seems, we learn more and more about it. Usually we didn't learn about for six to twelve months after it had happened. So, we needed to do whatever we could, trying to make our IT [Information Technology] as secure as possible.

I tried to get the message out. "Look, I know this is a hassle. It's a hassle for me, and I'm barely literate when it comes to computers and IT. It's a real hassle for somebody like me, but I also see the other side of it and I know why it's necessary." We really didn't get a whole lot of push-back. Maybe some of the other managers did get some complaints, but I had very few. The people I would ask about it seemed to say it's a nuisance and a hassle, but it's also necessary. I think we did a reasonable job, from my perspective, of preparing people.

Again, people don't complain a whole lot directly to me, so I don't know, there may have been a lot more discontent. But, if you prepare people and try to explain why they're having to do something, I think it helps a lot. I wish I could have told them more about the intrusions that we'd had, because we got briefed an awful lot as the senior management. Whenever Mike Griffin would have a retreat, one of the briefings we'd have is well, we've been hacked again, and boy, it's just really frustrating. There didn't seem to be much we could do about it. All we could hope was maybe we're hacking them too somehow.

And obviously the Stuxnet [computer worm], where we shut down Iran's computers for a while, while they were developing their nuclear program, was something that we collaborated with the Israelis, which came out in the news later. From everything I've heard and read, it was absolutely brilliant. The problem was, there was a lot of debate among the very senior administration people over whether we should do that, because once you've given them that virus, eventually it'll be discovered, and now they can use it against us and make it even more

dangerous, in essence handing a weapon to your adversaries. There was apparently a lot of debate about that.

So maybe we're hacking them, too, I don't know. That's all classified, and we don't get to hear all that stuff. I hope so, because we don't seem to have much defense against them out there. A lot of the experts I've talked to say there's not a whole lot you can do, because they can always be one step ahead of us, and that's very frustrating. There's got to be a better answer than that.

ROSS-NAZZAL: Go back to paper and filing cabinets, I guess?

COATS: Well, I guess. And we're obviously not going to do that. But, it is frustrating. We spend literally tens of billions of dollars developing new technology that they can steal easily. And, worse than that, they can have the capability to shut us down, absolutely shut us down. They've shown, on several occasions, that they can in fact shut down the electric power grid, and we're out of business. If they got that kind of capability, that's pretty serious stuff. The joke was, well, we can shut down North Korea, but who would notice? It's so elementary over there anyway.

That's a worry, that they can do serious damage to us here. I wish I could've told the people how dangerous the risk was out there. But, all you can say is, there have been lots of public stories about the hacking of government agencies, and we've got to do everything we can to fend it off. I just didn't get much push-back. I expected to get a whole lot more. Engineers and scientists are pretty picky about their IT, but I didn't really hear much about it.

ROSS-NAZZAL: In 2007, the Saturn V rocket was restored and opened to the public, and I'm just curious what your thoughts were on that unveiling and the restoration of such a wonderful artifact here at JSC.

COATS: Well, of course we were excited to have that restored. It was a shared expense with the Air and Space Museum out there. Our Saturn rocket here at JSC was the only one that was actually going to go fly, and theoretically you could take the thing and go stack it and launch it, because it was a flight vehicle. Some of the others around the country weren't intended to fly, so that was cool. That was getting to be in pretty bad shape after sitting out there for so many years. Remember, I was a double major in math and history, so I've always loved history, and I love the history of the space program, so that was important to me to protect that vehicle out there. It gets a lot of tourists looking at it. I think that was money well spent.

ROSS-NAZZAL: One thing we didn't talk about last time but had such a huge impact on the Center was Hurricane Ike in 2008. Would you talk about the impact that that had on the Center?

COATS: Yes, well, obviously that was a pretty big blow. The impact was about \$100 million of impact. We had, I think, 195 of our 200 buildings that were damaged in some way. It was pretty serious. Because of [Hurricanes] Katrina and Rita, we'd had several rehearsals. Joel [B.] Walker had done an amazing job of actually practicing and rehearsing for that sort of thing. One of the things we were worried about was flooding, and we've got a tunnel system out there, where all the utilities run through the tunnels. I've been down in the tunnels, and they've got open vents, of course, and we're at about 12 feet elevation now. We've subsided a few feet over

the years, so we're down to about 12 feet, and it only takes about a 12-foot surge tide and we're going to flood those tunnels, and we'd be out of business for several months while we cleaned that up and repaired it. Estimates were it'd cost \$10 million to \$20 million to harden the tunnels so they wouldn't flood, and we didn't have that kind of money.

We were worried about the flooding, and when Hurricane Ike was threatening, they were initially talking about possibly a 20-foot surge tide. It came up I-45 [Interstate] and veered a little bit to the right, so the eye [of the hurricane] actually came over us right here in the house, and over JSC. My wife and my son were here; my daughter and her family evacuated, got out early. But my son was here with me, and my 92-year-old father-in-law was here with my wife. So the eye came over and Paul and I walked outside, middle of the eye, it was really weird, because it is absolutely quiet and you can pick up a leaf and it just flutters down. There's not a breath of air in the eye of a hurricane.

When the eye came over, about 2:00 a.m., I think, on a Saturday morning, fortunately it had actually come a little bit further east, so it came over us instead of coming up I-45, which helped keep the surge tide down. So, we had about an 11-foot surge tide instead of a 20-foot possible surge tide that they were worried about. Which was good, which means we came within 12 inches of flooding the tunnels out there. We didn't have the flooding, we just had a lot of damage from the wind. Remember, this was technically only a category 2 [Saffir–Simpson hurricane wind scale]; it came within one mile an hour of being a category 3, but it was a wide storm as well, which caused the surge tide to be so much of a concern out there.

The wind was bad enough, and one of the things we learned, believe it or not, was we'd parked the government cars out in the parking lot, thought we'd shelter them from the wind. The surface of the building, it's a pebbly surface, it's kind of rough. Well, the pebbles come off in a

hurricane, and just sandblasted these cars and did a lot of damage. We learned, well, maybe we ought to find someplace to put them inside, someplace, if we can. You'd think we would've thought of that, but we didn't.

So, it came over about 2:00 a.m., and I spent most of the day inspecting the house here and making sure the family was okay, and we didn't have much damage here, fortunately. Talking to Joel on the phone, and he was talking to his folks out there. Sunday morning we got up, we had our first meeting—I called the staff together, the ones that could make it in. The storm came over Saturday morning, and Sunday morning we had our first staff meeting, and Joel and I drove around the Center looking at the damage. It turned out, we estimated about \$100 million in damage, and Congress gave us about \$90 million, which was more than I think we expected. Less than we wanted, more than we expected. But again, we had 195 of the 200 buildings that were damaged of some type.

I thought, boy, this is going to be several weeks before we're back in commission here. No power and so forth. We had our first staff meeting that Sunday morning, and I was just amazed at the response of the staff. I couldn't have asked for a more talented group of people to deal with an emergency like that. My direction was pretty simple: let's go find our people and see who needs help, first and foremost. Then let's figure out what needs to be done to get back in commission, because we'll go ask for the money. During the storm I was talking to Mike Griffin on a regular basis, "Oh, the eye's over here now, this is weird. It's awfully quiet." And it's weird because you know you're going to get hit again in a second here. So, we were talking almost constantly about it.

I was really impressed. Natalie [V.] Saiz, just an incredible job. I said, "Let's capture our people, let's find all of our people and find out who needs help and what we can do to help."

And boy, she went off with her team and accounted for almost everybody within a day or two. I think it took about five days to find the last person, and the joke is, next time we'll check the Galveston County Jail first instead of last. I think that's where we found our last employee, down there.

We said, "What can we do to help them?" She came up with this idea—and fortunately we got power back in the Gilruth Center very quickly. Joel managed to get power sooner than the rest of the Center. Of course at the Mission Control Center we had generators for emergency power, but we actually got power to the Gilruth Center right away. Well, she came up with this idea of kind of an R&R [rest and recuperation] center for the community, since we had power and we had water. We have well water; we don't like to use it because it causes subsidence, but we have water if we need it. So, we had water when a lot of people didn't have water, and we had electricity, so she organized it. Of course Joel was just doing a fantastic job of getting power back as quickly as possible, finding what needed to be repaired, and prioritizing the assets and the people we had. Just incredible job. We met every morning for a week or two, to see what progress we'd made, and we were back in commission a week later. We were open for business within a week, I think seven days later. Joel just did a fantastic job.

Dot [Dorothy E.] Swanson was the deputy for the IRD [Information Resources Directorate]. Larry [N.] Sweet was the head of IRD, but his wife was dying of cancer. Can you imagine the nightmare Larry was going through? He was literally at home with her in her final stages, and the hurricane hits and they didn't have power or anything. Oh boy, what a mess. So Larry [really had his hands full]. Dot stepped up as the deputy and just did a fantastic job. We said, "If people can get to the Gilruth Center, and we can put some computers over there, they can get online and pay their bills and communicate with people." So she got a bunch of

computers installed over at the Gilruth Center upstairs, in the conference rooms up there. Natalie had movies set up for the kids. We had babysitters, we had bottles of water brought in, people brought their families in. The kids could watch movies, because they didn't have power at home. We had air-conditioning, [so] it was cool. Between Joel and Natalie and Dot, boy, anything I seemed to think of, they could implement immediately, and they thought of stuff that I never would've dreamed of.

An awful lot of families had lost their homes, had lost a lot of things, and we were looking for how we could help. Each of the organizations, whether it was MOD [Mission Operations Directorate] or Engineering, or whatever, did a great job of taking care of their people. How do we, within this organization, help our people that really need help? Finding homes for people to stay in if they'd been literally flooded out of theirs, that sort of thing. Accounting for everybody, communicating with everybody. I couldn't have asked for a better response.

The irony was, when NASA came down a year later—NASA Headquarters people wanted to come down and have some emergency drills. If something happens, a terrorist sets off a dirty bomb in DC, and we have to run NASA from here, we were the first Center up [in line] to take over and run NASA, so what do we do? Because of the hurricane we'd had and the drills that we'd had, we essentially said, "Here's the book. Here's what we do."

And they go, "Wow! That's impressive. We hadn't even thought about some of these things."

Joel just did an amazing job. He basically said, "Okay, NASA Headquarters, here's your blueprint for what you need to think about and do." And I was really proud of him, because I got

lots and lots of praise for Joel and the job he had done helping NASA as an Agency come up with their emergency plans.

But, we'd had a lot of practice, and we'd been through it. We practiced several times, and in fact implemented—if we have to shut down the Center completely, what do we do with Mission Control for the Space Station? We had backup, of course, with the Marshall Spaceflight Center [Huntsville, Alabama] and of course Moscow [Russian Federal Space Station Mission Control Center]. And we arranged to have people go up to Round Rock [Texas] and were going to get together up there, and we could reconstitute the Mission Control Center up there if necessary. We had a van tricked out, a mobile mission control center. Joel did a great job of that.

I think we responded wonderfully to the hurricane. The heartbreaking thing was to hear so many people that lost their homes. Of course a lot of people, none of our people, but a lot of folks lost their lives in that storm, especially on the Bolivar Peninsula. I had promised the people ahead of time, I said, "I will close the Center as soon as I possibly can; I encourage you to save a couple of days' leave if you need to evacuate the family before I can close the Center." And we did, we closed the Center maybe a day or two earlier. As soon as the school district closed, I said, "Great, we're closing." Because we needed to be coordinated, to give people a chance to evacuate. I didn't come in [as Center Director until] two or three months after Rita, when they had so many problems, my daughter included was 22 hours on the road stuck between here and Dallas [Texas]. So evacuation didn't go so well. More people were killed in the hurricane that didn't come than were killed in the hurricane that did. We lost more than a hundred people in Rita, just because the evacuation and the heat. I wanted to give people plenty of chance to get out of town if they wanted to and take care of their families.

And it turns out, nobody ever questioned it. I probably could've closed a week ahead of time. "We have a cloud in the Gulf of Mexico. We're closed."

ROSS-NAZZAL: I don't think anyone would've objected.

COATS: Nobody did. Nobody questioned it at all. I was very happy with that. Mike Griffin was wonderfully supportive.

ROSS-NAZZAL: Because of the storm, I remember there was a gala planned for NASA's 50th anniversary in Galveston, and it had to be rescheduled. I was looking at the coverage of that event, and you said something to the effect of you were looking forward to NASA's next 50 years. You were proud of what NASA had accomplished, but NASA was going to go back to the Moon, we were going to go on to Mars, we were going to explore the solar system. I wonder, are you as positive and as upbeat about what NASA's going to achieve its next 50 years, today looking back?

COATS: I wish I could be as optimistic as I was back then. We find ourselves in an interesting situation, and I don't mean to pick on this [presidential] administration, but they're not terribly supportive of the space program. I think Obama showed his true colors when he campaigned and said he was going to cancel Constellation, which was the future of the space program, and that was it, there was no fallback. I think it's just a matter of he's not interested, period. It doesn't buy votes for him, so why would he care?

I think we have Congress to thank for saving the Orion Program and the heavy-lift launch vehicle program [Space Launch System]. But, we need somebody, and maybe several leaders, to step up and tell the public, “Here’s why we need a space program. Here’s the benefit and the value of a space program.” The general public thinks NASA spends as much as the Department of Defense, and they’re shocked when they find out our budget’s like \$18 billion a year and the Department of Defense is \$600 billion a year. We’re less than half of one percent of the federal budget. I think I’ve told you, I’ve been giving speeches now for, gosh, almost 40 years, and occasionally I have somebody who says, “I think we spend too much on the space program.”

And I’ll say, “Okay, of your tax dollar, how much would you spend, given here are the benefits,” and I try to list them, inspiring young people and developing new technologies. Explain how going to the Moon benefited us technology-wise. “How much would you spend?” And I’ve never had anybody say, “Less than one penny. I’d only give you a penny of my tax dollar.” And I can say, “You just doubled our budget.” And they’re stunned. Because they believe they spend 20 or 30 cents out of their tax dollar on the space program. So we’re doing a lousy job of explaining the benefits and the cost of the space program.

It’s much more fun talking to children, who are excited about the space program, and to see their excitement and eagerness to learn about space is really inspiring to me. I love talking to children. Kids go through stages, there’s a dinosaur stage and there’s a space stage, where they really get excited about it. That’s when you want to grab them and say, “Okay, boy, if you want to study math and science, here’s a reason why: the space program.” If nothing else, if we’re going to be competitive globally as a country, as a nation, we have to get our young people interested in math and science, or we’re going to be bypassed by the rest of the world, who are very interested in that sort of thing. And space is one thing that gets them interested in math and

science. I can give you a whole long list of reasons why the space program is worth the money, but we don't do a very good job of telling the American public about that.

ROSS-NAZZAL: You mentioned earlier that Mike Griffin was such a supporter of JSC, and you. What impact did his resignation have on the Agency, that you saw?

COATS: We expected, when the new administration came in, that there would be a new Administrator of NASA. I have heard, and I don't know for sure, because I never asked Mike specifically, but I've heard that he was actually offered to stay in the job, under certain conditions, including a certain deputy. He said, "No, I can't, I'm not going to do that." Mike's a dear friend, as I've told you. He was my customer on my last mission, and we'd tease him about being the chief engineer of the universe. He wrote the textbook on spacecraft design. He was spacecraft design. He knows an awful lot about it.

It's really fun to have a meeting with Mike, who knows the technical side of the business cold. He knows the right questions to ask, he knows when somebody is blowing smoke, so he doesn't like to waste time. That's refreshing, to have somebody who really knows the business. If you're going to have neurosurgery, you'd like to have a doctor who knows something about neurosurgery, especially if they're operating on your kid, for example. Well, in the space program, wouldn't it be nice to have somebody that knows something about the space program?

Now, no offense to Sean O'Keefe or some of the other Administrators we've had, but they didn't know beans about the space program. Mike comes in, and he loves the space program, he knows it cold, arguably better than anybody else in the country, so I think he was the perfect man for the job. I'm biased, Mike's a dear friend, and I got to see him up close and

personal and how he operated, and that's the kind of person you want in the job. Now, I argued with Mike, I said I think we ought to do a better job of selling ourselves to the American public, and he said, "That's just not me." He wanted to concentrate on the technical, and I wanted a little more emphasis on the publicity side of the business. He was completely supportive, "Whatever you want to do, I'm behind it."

I'd say, "Well, I'd like you to do this."

He'd say, "Oh, I'd rather do this. I want to go design a spacecraft instead of explaining why we need a spacecraft." But I think he was a fantastic Administrator.

We expected him to leave when a new president came in. It's a political appointment. Now, we've argued, and I've argued with several congressmen that it ought to be like the FBI [Federal Bureau of Investigation]. How about a 10-year appointment for the NASA Administrator so we don't have to change Administrators every time a new president comes in? That's been proposed, but it never goes anywhere. Along with, it'd be nice to have multi-year funding so we don't have to wonder every year what our budget's going to be. I've told several congressmen, "You can cut my budget 20 percent if you'll tell me what it's going to be for the next 5 years, and I'll get a lot more done, because I can count on it." But, I don't think any Congress is going to give up that kind of authority. Too bad.

ROSS-NAZZAL: So you worked with [John A.] Culberson and [Frank R.] Wolf, who came out with that proposal in Congress?

COATS: Yes.

ROSS-NAZZAL: That's an interesting idea. It seemed like for so long we didn't have an Administrator, and it seemed like things drug on for about six months. Did that have an impact on the Agency, having just an acting head?

COATS: I don't think so. Chris [Christopher J.] Scolese, who was the Acting Administrator, is an old dear friend as well, and not only is he a superb engineer, a superb program manager. He was my customer when I was Lockheed; he was the program manager for what they call Terra [Program] now, which was a multi-billion-dollar program, and he did a fantastic job. Very level-headed, cool, never got flustered. I've never heard him raise his voice. He's also a gifted Administrator, meaning manager, and managing people and the trivia, the boring trivia of running an organization. A lot of engineers are not very good at that. Good at the technical side, but not the "administrivia."

Chris was very good at that. He has a phenomenal memory, he remembers the details. Very calm and organized, so he did a wonderful job. Now, he was in a rough spot because he had to run an agency, NASA, and yet he had to be careful about making decisions, because a new Administrator could be named any day. Making decisions about where the money went in the budget was dicey, I think, but I thought he did a fantastic job. So, we had leadership even when we didn't have a permanent Administrator. He was very collegial and collaborative. He got all the Center Directors and Associate Administrators involved; we had monthly get-togethers. He was very open, he'd say, "Okay, here's the challenges we've got." So I thought the Agency marched on very well.

I had heard Charlie was being considered, and of course Charlie and I were classmates and old friends, and I was encouraging him to accept it, and he was very reluctant to do that. I thought he'd be a good man for the job, and he has been, I think.

ROSS-NAZZAL: Can you describe his leadership style against Mike Griffin? He doesn't seem to be as technical, for instance, as Griffin.

COATS: Well, nobody in the world's as technical as Mike Griffin. But, Charlie is certainly technical enough, he's got the credentials, he was a Space Shuttle commander. Very sharp along those lines. He's also got a strength I think—he was caught between a rock and a hard place. He's working for a president; he's a part of the administration, so he salutes and does whatever the president says, which usually means whatever the White House staffers tell him to do. He's got to follow that out. I think behind the scenes he can voice his opinion, and I think Charlie actually had some influence; I think he developed some influence later on. He wasn't part of the inner circle, because he wasn't part of the campaign, but I think he developed influence later on, behind the scenes. But, initially it was, "Okay, here's what the administration wants to do, and we're going to go do it." And he had to justify it.

Meantime, Congress is saying, "What's this, you're canceling the Constellation program? No, we don't want that." So, Charlie was caught in the middle here, between Congress and the president, and he had to work for the president. I think Charlie had the personality to actually pull that off. I'd heard from several congressmen how unhappy they were with him. I heard from a lot of people how unhappy the White House was with him, which meant he's made everybody equally unhappy, which means he was probably doing the best job possible. I think it

was a very difficult position to be in, and I think he really did a great job. I think he was instrumental in saving the Orion Program, and of course the launch vehicle program. Someday I hope he writes a book and explains some of the behind-the-scenes stuff that I'd heard about, but I don't know if it went on or not. I don't think we'd be where we are now without Charlie in that job.

ROSS-NAZZAL: One of the things we also hadn't discussed that I thought would be interesting is the [Norman R.] Augustine Report [Seeking a Human Spaceflight Program Worthy of a Great Nation], which came out in 2009. Were you briefed on that report before it came out? Sally [K.] Ride was on that board; did she give you a heads-up as a former classmate?

COATS: No, no. I wasn't briefed on that at all. One of the things I learned in the Navy, when you have a lot of oversight, a lot of inspections, a lot of people second-guessing everything you do, you can either complain about it or you can say, "Let's learn everything we can from it." Now, I'm an American, so I have a constitutional right to complain about anything and everything; people think I'm crazy if I don't.

What I tried to tell the employees at JSC was that we're going to have a lot of oversight, we're going to have a lot of second-guessing, not only from the White House, but from Congress and the media. Everything we do, any problem we have, we're going to have second-guessing, questioning. Let's treat it like a learning experience, okay? Let's listen carefully to what people have to say, because they may have some very good points. We don't see everything. We see things from a pretty narrow prism, because we're focused on the mission. How do we get the job done, what can we learn from this? Don't assume that anybody that comes in to review you or

inspect you or question you is out to do you harm. Maybe they're trying to help. And look at it that way. If they are trying to hurt you, or harm you, if you're just telling them how grateful you are that they're here to help, it'll drive them crazy, if they want to hurt you. So, listen to what they have to say.

I've tried to, whenever we have a review of any kind, including the Augustine Report, learn everything you can from it. They had some good points in there. I'm trying to think of examples, but I thought they missed a few things, I thought some things could've been approached differently, but I thought they had an awful lot of good points to make in there, too, and I hope we learned from it.

Again, one of my biggest concerns is that we get complacent over the years. You can use the Augustine Report as a tool to say don't get complacent. These types of things can happen if you don't pay attention. So go back and read this every once in a while, see what we might be doing wrong, what we might be missing. Let's listen to everybody. Let's listen to every dissenting opinion, and let's take the time to explain ourselves. When we make a decision, for heaven's sake, do people the courtesy of explaining your thought process. Why did you decide this or that?

It seems like you're faced with nothing but tough decisions, but it's because the easier decisions are made by somebody down below you. They're going to kick it upstairs if it's a tough one that requires a lot of money. So, when you make a decision, for heaven's sake, tell them your thought process. Even if the people disagreed with you, if you explain your thinking, they'll probably speak up next time. If you just say that's the way it is, without explaining, the people that dissented are not going to speak up again, and that's the worst possible situation to have. So keep an open mind.

One of the biggest dangers, and we talked about it before, is a not-invented-here attitude. We do this, we do it better than anybody else, so why should I listen to anybody else? Well, that can bite you big time. I viewed the Augustine Report as an opportunity, and tried to use it as a tool to say, “Let’s keep thinking about mistakes that may have been made in the past, and how do we avoid them in the future. Are we taking the time to think about the things that can bite us down the line? Let’s not be surprised.”

It’s so easy on a day-to-day basis, like I said, you’re putting out the fires every day, that you don’t step back and say, “Okay, in the big picture, are we doing what we wanted to do to accomplish our mission? Are we doing the advance planning? Are we keeping the big picture in mind?” And that’s not human nature. It’s human nature to go, “Okay, let’s put in a full 10-hour day and put out all the fires.” But you really need to step back occasionally and think about, “Okay, am I doing what I wanted to do when I came into this job?” Hopefully it allows you, then, to say, “Whoa, wait a minute. Are we missing something? Is that something going to bite us down the line?”

If you go out and ask a lot of people their opinions, you may hear something that’ll spark an idea, and you can avoid a problem in the future. You don’t want to have to reinvent the wheel that somebody else paid dearly to invent. It’s easy in this business to say we do this better than anybody else, and I think we do, but it doesn’t mean you can’t learn from other people.

ROSS-NAZZAL: After Constellation was canceled, there seemed to be a real emphasis on saying JSC was open for business, that there was this new push to establish partnerships with industry and business. I wonder if you could talk about that shift, because it seems to be a very big shift

in thinking. Were there opponents to that idea, or some debates over whether or not that was a good idea, utilizing government facilities for industry use or other businesses, things of that sort?

COATS: I'll tell you, when Constellation was canceled, and I've told you this before, for about six weeks we were in shock, I think. I was in shock. I don't get depressed, but that's as close as I ever came to being depressed, because I felt like I had a responsibility as a leader of the human space exploration program to try to reassure people that we had a future, and I was struggling to figure out what that future was going to be.

I called the staff together and said, "Look, let's make our own future. Let's do what we can to influence the future. It doesn't do us any good to sit back and whine and say, 'Wait a minute, we had a Constellation Program, and you took it away, wah-wah-wah.' That doesn't accomplish anything." And I said, "Frankly, rule number one, always, is follow the money. Who's got the money? So, let's go out and see who we can partner with, who we can work with, who we can share our resources with. We can't afford to duplicate anything within any other part of NASA, so we have to coordinate with other Centers and figure out how we can utilize our limited resources to the maximum benefit."

So we did. It makes sense to me that if we're going to do deep space exploration, which is what the administration started saying, we're going to turn low-Earth orbit over to commercial crew, but we're going to do exploration. Eventually we'll go back to Mars. They came up with this idea about asteroids. Okay, if that's what you want to do, fine. The idea was we're going to have an exploration program, and Congress will make sure we had some money to do it.

I said, "Well, let's see, who's got the expertise?" We've got the expertise in human spaceflight. Jet Propulsion Laboratory [Pasadena, California] has the expertise in deep space;

they ran the Mars missions. Let's team up with them. Let's learn what we can about deep space exploration, deep space operations, and they can learn from us about human space operations. We spent an awful lot of time working with them, and I think we have an excellent working relationship now.

Let's talk to the other Centers and see what we can work with. We had excellent possibilities and working relationships with all the Centers. Goddard [Space Flight Center, Greenbelt, Maryland] was anxious to talk to us, and we had lots of meetings, but it turns out what they do was so different than what we do that it was hard to find things to partner with out there. A lot of stuff I'd done as a contractor with Goddard, building Earth observing satellites and that sort of thing, Johnson Space Center doesn't really do anything like that. That was the area that we wanted to partner with, and they're the next biggest Center. They may be bigger, actually, or about the same size, so I was anxious to work with them if we could, and of course I knew the Center Directors.

We were looking for other Centers, other agencies, are there any contractors that we can work with. How can we partner? Eventually the hope was they'll put some meat behind this nebulous idea of exploration, that they say eventually we're going to go to Mars, we're going to do asteroids first. Okay, let's help them put some meat on those bones if we can. Instead of arguing and fighting, why do we want to do an asteroid, why can't we just go back to the Moon like we'd planned on? Okay, if that's the way you want to do it, let's figure out a way to make it happen, but let's follow the money. If that's what they want, let's give them an idea, a plan, about how to implement that, and work with Congress to say maybe it's not the way we would've done it, but it's a way to do it, and here's some ideas to implement it. But, keep in

mind, the whole idea of boots on Mars is the ultimate objective. Don't lose sight of that. Whatever we're doing, does that help us achieve that eventual objective, boots on Mars?

As one fourth grader told me once in front of an assembly, "Why are we stopping at Mars?"

I said, "Love you. Would you like a job?" And I learned after that to say, "Mars and beyond," actually. I mean, deadly serious, this little fourth-grade boy. "Why are we stopping at Mars?" Good question. Good point.

The whole idea was, if we're worried about the future of JSC and maintaining the skill base that we had here, we first of all have to have the money, the budget. Where's the money? Let's go team up and find out how we can influence the budget. We're not allowed to ask for budget, but that doesn't mean we can't educate people about the benefits of the human exploration space program. I think we did a lot of planning about how do we follow the money, how do we make sure we maintain the skill base here at the Johnson Space Center?

I think we did a pretty good job of educating the congressmen and their staffers. They were receptive. Like I said, Bill Nelson and Kay Bailey Hutchison were just fantastic, I couldn't have asked for better support. John Culberson and Frank Wolf, Ralph [M.] Hall were all terrific. And the whole Texas delegation, I don't mean to exclude anybody. I was delighted to find out that it seemed like they were Texans first and Democrats and Republicans second, which is kind of nice. There were a couple of far-out congressmen, but most of them were saying, "Okay, how can we help the Johnson Space Center?" And boy, I was relieved to find that.

ROSS-NAZZAL: I think now might be an appropriate time for me to ask this question. I think Rebecca and I both remember an all-hands meeting. We heard you say something about one of

our congressmen, that he called and was surprised to hear that we were still open. I think this was in 2011, 2012?

WRIGHT: When the Shuttle Program was cancelled.

ROSS-NAZZAL: Yes, when we were closing it down, and I think it was Pete Olson. I'm curious to hear the story about that, since you mentioned that, made that comment.

COATS: When he came into office he was a little surprised that we were not going out of business. Now, I've never really understood how serious he was about that, but I think he was surprised that we were so energetic about trying to influence the future of human space exploration. He was anxious to help, obviously; he was a local congressman, so he was anxious to help out, and has been terrific. Really couldn't ask for better support from him. But he wasn't the only one that was surprised we weren't going out of business, because remember when they canceled the Constellation Program, like I said, they didn't propose anything in its place. There was no Orion, there was no heavy-lift launch vehicle. They were going to have a commercial crew until the Space Station was finished operating, which is 10 years away, and that was it, curtain went down, we're going to let the foreign countries do space.

You can see why people have the idea, "Wow, they just canceled *the* space program, that's it." Some of it was, well, we didn't want that to happen, so let's assume it's not happening. Let's assume we'll get the support from Congress, or perhaps we can change the administration's mind, and we'll have a human space exploration program. I knew Charlie

would be back there arguing for it; he wasn't going to give up. Like I said, I think we have an Orion Program and a heavy-lift launch vehicle because of Charlie arguing behind the scenes.

I think in a sense we're betting that we were going to have a space program, and I was trying to tell people, encourage them not to get down, and I said we will have a space program. This country is not going to give it up. We'll tell you what it is as soon as we figure it out.

ROSS-NAZZAL: I wanted to go back to that idea of partnerships, and I thought it was interesting how the NBL [Neutral Buoyancy Laboratory, Sonny Carter Training Facility], for instance, opened its doors to the oil industry, and there were other facilities opened to other businesses. Were there some objections to utilizing government facilities by outsiders?

COATS: We expected there to be, and I didn't hear a single objection. The way we proposed it was, like with the NBL, what we said was, we need the NBL as long as we're going to have space walks, and we'll have space walks as long as we have human space missions, but when the Space Station is assembled, the space walks will be much, much fewer. How can we get somebody else to help pay for and maintain a Neutral Buoyancy Laboratory? It's not cheap having that great big swimming pool out there, and it's a shame to have it sitting there idle when in fact the oil and gas offshore industry was paying a lot, and there were six or seven different companies that did their training for them, and they were paying a lot for that. We had this amazing capability. We said maybe we can share the cost, and it'd save the taxpayers a lot of money. I charged Paul [S.] Hill with looking for ways to do that, and he did a fantastic job. He essentially charged Raytheon with the task of coming up with ideas on how to share the cost of

that facility, and they did a wonderful job incentivizing to save money. It's incredible what they can come up with. Paul did a terrific job of that.

Same thing with the other facilities. We wanted to say, "What can we do if we have the facility and we're not using it 100 percent of the time? Is there a way we can get other organizations to utilize it and help pay for it?" We need the facilities, but they're not cheap. Remember, the Shuttle was supporting an awful lot of things, infrastructure around NASA, and when that budget went away, Space Station basically said, "I'd like to pick it up, but I don't have the money. They didn't increase my budget." So we had to find ways to help bring in additional resources to pay for the facilities that we weren't using full time. I thought the team did a pretty good job of doing that, and I never got a single complaint.

Usually we tried to head it off by saying we're trying to save the taxpayer money. We have to pay for these facilities, because we have to have them, but they sit idle part of the time, which doesn't make a whole lot of sense. If we framed it in that context, I never got a whole lot of push-back. I expected somebody to complain, but, knock on wood, they haven't. If you say we're trying to save you money, that's a hard argument to fight, so I think it was how we phrased it. Paul Hill and his team did a remarkable job of bringing in the resources to help pay for that NBL out there. Space Station would've struggled to support that on their own.

ROSS-NAZZAL: Would you talk about the Houston Technology Center? That was another collaborative adventure that opened under your watch.

COATS: If you look at the Space Act, NASA is actually chartered to develop technologies and pass them on to the public sector. We can't make a profit, we have to share it with everybody.

Whatever we're doing, we have to share it with everybody. The Houston Technology Center was another avenue to do that. How can we benefit the American public? How can we get information out there about the technologies that we have developed, for the benefit of anybody who wants them? Remember, we can't just give it to one company, if we've got a new technology, if we've got patents, we have to make them available to anybody that asks. All they have to do is ask.

The Houston Technology Center was one avenue to get the information out to the public about what we have to offer here, if that makes any sense, educating the public about what we do and the technologies that are available to them if they want to take advantage of them. But, they've got to learn about them first, and the Houston Technology Center is a good avenue to do that. They're chartered with developing new technologies and new businesses here in Houston. So, I thought it was a reasonable partnership, and in fact we found space for them in one of our buildings out there, Building 35. I've been to several conferences and symposiums to explain and give some examples of the technologies that we have developed here, a lot of things, a recent one is robotics. We've been doing an awful lot of work with robotics, teaming up with General Motors and Chrysler developing robotics works.

The robot that we developed in partnership with GM, and we also worked with Chrysler, they're obviously looking at the benefits of robots. I have to laugh; when Lori [B.] Garver came down and saw a robot with a GM patch on it, her first response was interesting. She said basically, "So, you're going to do away with jobs for union members?"

We said, "Well, that's up to General Motors. But, it'd be nice to have a robot that we could send out doing space walks that we didn't have to risk human lives to do."

We partnered with a lot of companies like that, developing new technologies. I think robotics is something that NASA has been on the cutting edge, and we want to continue that. Then that technology is available, of course, to anybody once we've developed it. That's why the Houston Technology Center is, I think, valuable, because we can use them to get the information out. One of the things I've been impressed about with Texas and Houston is the entrepreneurial spirit. This is an unusual area, in that we have so many areas of expertise. We've got obviously oil and gas, we've got the [Houston] Medical Center, we've got the space business. We've got our own Silicon Valley burgeoning up in north Houston. So, high-tech, oil and gas, energy, all these areas right here, and we've got several major universities as well.

I can't think of another area of the country that's got all those things in one area. And, we've got this entrepreneurial spirit in Texas. They want to encourage new business; let's grow business, let's create jobs. I've seen it, because I've been in so many conferences and meetings. There's no shortage of people willing to take a risk. There's an awful lot of Elon Musks out there, I think, and some of them are going to become billionaires someday. The majority will not; the majority will fall on their face, but a lot of them will succeed, and that's exciting to see. That's how you improve the standard of living for everybody. We wanted to participate in that as best we could. Since we invest the taxpayer's money in a lot of research, how could we educate the public about what that taxpayer money has bought? That's one of the advantages of Houston Technology Center, sharing information.

ROSS-NAZZAL: JSC was able to share its knowledge with the government of Chile when there were some miners stuck. Can you talk about that and JSC's role?

COATS: It was interesting. Steve [Stephen J.] Altemus, was our director of engineering. When they found out the [Chilean] miners were down there alive and they came up with a rescue plan, Steve came into the office with a little model of a capsule, and he said they'll be able to fit a miner in here, it'll be a certain circumference. He was explaining all the technology that went in there, rollers on the side, straps to hold a miner upright in case they got stuck. It couldn't collapse. At the time, they were thinking it was going to be an hour or two journey up and down, and it turned out it wasn't that long. But, if he passed out and collapsed in there, that'd be pretty serious. When you faint, what happens is, you fall down and the blood goes to your head and you recover. But, if you're stuck [upright] when you faint, the blood can't get to your head and it's pretty serious, so there were a lot of factors to figure in here.

He came in with this model of a capsule, and this was on a Thursday, and I said, jokingly, "Well, where's the full-size model?" I was joking, and he said, "That'll be ready Monday morning." Yes, they were already working on it. Through NASA Headquarters, and working with [NASA] Langley [Research Center, Hampton, Virginia], Langley was really leading the effort, they gave their design to the Chilean Navy, who had responsibility for actually building the capsule down there. I think we had an influence on the capsule that was finally used down there.

Our medical personnel were very involved. [James] J. D. Polk and Mike [J. Michael] Duncan went down there and were very involved. Because if you think about it, at NASA, and Johnson Space Center, we have experience and expertise in humans that are in isolated environments, harsh environments, for extended periods of time, which applied to the miners here. And we had done a lot of studies. If we lost a Shuttle, God forbid we had another accident, how do we resupply the Space Station? How long can they last, given the food they

have up there? We'd done a lot of studies about how long humans can survive on reduced rations, so we knew an awful lot about nutrition and what the miners needed.

So, J.D. and Mike did a wonderful job. They went down there a couple of times, working with them to say, "Okay, you can't just start shoveling food down there." Remember, as soon as they broke through with a very small tube they could communicate, they could also start sending food down to them. But we learned after World War II, when we found the concentration camps with the emaciated survivors, we started giving them food and thousands died because their bodies couldn't handle the change, and you actually have to be very careful how you recover somebody in a very emaciated state.

So, they helped out and said, "Okay, here's what you need to recover gradually down there, and they worked and came up with a plan. I was really proud of the effort the team did here, both engineering and our medical staff, with the miners. That was pretty cool to see them. We happened to be up at NASA Headquarters at a meeting when the first miners came up, and that was pretty cool to watch. Felt like you got to participate in that.

ROSS-NAZZAL: It's so unique, as you pointed out. You wouldn't think that NASA would help with something like that.

COATS: Yes, but if you think about it, our expertise, again, is keeping humans alive in isolated and harsh environments, and that's what they had down there.

ROSS-NAZZAL: You've talked a lot about politics and working with the Senate and Congress, but I wanted to ask particularly about funding for the last Shuttle mission, because for so long we

didn't know if STS-135 was going to get funded. It's my understanding that it was because of Kay Bailey Hutchison. Can you talk about your work with her to see that that would finally come to fruition?

COATS: Well, I don't want to take credit for that. I think Bill Gerstenmaier did more than anybody to convince Congress, and both Bill Nelson and Kay Bailey Hutchison, that that was a worthwhile mission to have. I certainly gave my input, but Bill led that effort. That's another example where Kay Bailey said, "We're going to make it happen," and did.

It was funny, when we had assigned the last crew to *Discovery* [STS-133], that was near and dear to my heart because I flew the first flight of *Discovery*, so I wanted input on the last crew. Chris [Christopher J.] Ferguson was disappointed that he didn't get that last [*Discovery*] mission. I was 90 percent confident we were going to have one more mission, and I told Chris, "Don't give up. Careful what you ask for here." But, I couldn't tell him that. I couldn't tell him we were going to have another mission. I wanted Steve [Steven W.] Lindsey to fly [STS-33] for a few good reasons. If there was one more mission, we'd get it, and [Chris] got that last mission [STS-135], so that was pretty cool.

I think I told you, I got pretty choked up in front of a whole crowd when it landed. We had thousands of people out here in front of Building 1, in the parking lot out there, at 0-dark-thirty in the morning when it landed at the Cape [Canaveral, Florida]. I'm talking to folks about what's happening, and Chris, "Fergie," rolled to a stop, and of course the tradition in aviation is that you never say "final landing." That's bad luck, it means either you or the aircraft is not going to fly again. So, what you say is "full stop" instead of "final landing." And Chris surprised me by very clearly and intentionally saying "final landing." I got all choked up, and

here I am standing there in front of thousands of people, children and everything, and I'm so choked up I can't talk after that, which was a pretty emotional moment for me. It surprised me, completely out of the blue. I didn't see that one coming. Chris did a wonderful job on that flight.

ROSS-NAZZAL: I think it was a pretty overwhelming moment for a lot of people. I talked to a lot of folks when the program ended, and a lot of people talked about the tears that they had for that final mission.

COATS: I'm very proud that I was able to be the Center Director when the last Shuttle rolled to a stop out there. Means an awful lot to me.

ROSS-NAZZAL: Were there other Centers that had those sort of celebrations like JSC did for that final rollout?

COATS: I don't know. I would think so. I would assume [NASA] Kennedy Space Center, [Florida (KSC)] probably, with Bob [Robert D.] Cabana down there [as Center Director], certainly had something, but I don't know for sure.

ROSS-NAZZAL: I wanted to ask you about the selection of the Orbiters. Did you have any input with NASA Headquarters to determine where the three Orbiters were going to go?

COATS: Not a bit. That's a sore subject with me.

ROSS-NAZZAL: I hate to bring it up. I had a suspicion it might be. Just curious about that, if Center Directors had any input.

COATS: No, that was a political decision that they covered up with some kind of Mickey Mouse analysis. They were not going to send an Orbiter to Texas. It's funny, because I was scheduled to testify to Congress shortly after that on some other subject, and we had some rehearsals at NASA Headquarters. One of the lawyers said, "Okay, if a congressman asks you if you were upset about where the Orbiters went, what are you going to say?"

I said, "Goddamn right I am."

They laughed, and Charlie said, "We may want to phrase that a little differently." It doesn't make any sense. This is where human spaceflight is run from; this is where the Space Shuttle Program was. It's the 5th largest city in the United States. Good heavens. We couldn't put one of the Orbiters here? You've got to be kidding me. But they weren't going to put it in a red [Republican] state.

ROSS-NAZZAL: Did you have any role in bringing the replica that we have now that's on top of the SCA [Shuttle Carrier Aircraft]? Or was that all Joel Walker's doing?

COATS: No, Joel pretty much handled that. We got the idea that if we couldn't have one of the Orbiters, the next best thing, could we get one of the Shuttle Carrier Aircraft, a [modified Boeing] 747, here. Of course we had two of them out at Palmdale [California], and we could get one of those here and maybe get the replica from KSC. Since KSC was going to get the *Atlantis*,

they didn't need that replica. The Space Center Houston visitors center did all this. We really didn't have a whole lot to do with it. They had to buy that, for I think a million and a half bucks, and barged it out here.

I laugh, because we had to tow it from in front of the Hilton [Hotel] there, where it came in on the barge, down NASA Road 1 to the Space Center Houston visitors center. For some reason, they decided to close off all the roads, and why they had to close off the one furthest west, the entrance into Nassau Bay, I'll never understand, because we didn't need to go down that far. They were supposed to close it off for two or three hours on a Sunday morning, and then have it moved in that time and open back up again. It wasn't us; that was Space Center Houston.

Well, they didn't get it moved in time and they closed off all the roads so people couldn't get in and out of Nassau Bay, so they couldn't get to the three main churches there. Boy, did I hear it from some of the ministers of the churches. "You owe us a bunch of money because we didn't get the Sunday collection."

I said, "It isn't us. Talk to Space Center Houston. Not our baby. Sorry about that." But they all thought it was Johnson Space Center. I got chewed out by a couple of ministers. One of them was very understanding, very nice, and one of them was very much not understanding. I just listened politely and said, "We're sorry."

ROSS-NAZZAL: That's interesting, probably not something you considered when you took the position, that you'd be dealing with ministers.

COATS: No, I didn't see that one coming either.

ROSS-NAZZAL: I wanted to ask you about the SAIL [Shuttle Avionics Integration Laboratory] facility. Of course at the time here at JSC we were disappointed because we didn't get an Orbiter, but there was some discussion about SAIL. It had a tail number, OV-095. At what point did you make the decision, or did someone else make the decision, to make that a permanent stopping point on the tram for Space Center Houston, thinking it would be a great exhibit and opportunity to tell the Shuttle story?

COATS: It was a joint decision, because a lot of people had to contribute money to modify that facility. Of course, I had worked in SAIL for a year or so before the first Shuttle mission, so I was attached to it anyway over there, and I thought, "Hey, this might be a good idea." So we converted it, and it's a nice facility. Now, the tram doesn't stop there anymore.

ROSS-NAZZAL: It doesn't?

COATS: No. They stopped it after a while, so that may not have been the greatest idea in the world. I actually was over there a couple of weeks ago looking at it, and it's a shame, but I guess it just wasn't that interesting to people. You have to explain what it is. It's really a test bed for the Shuttle, all the avionics as realistic as possible. That's how you test out the software. I guess it just wasn't that interesting to people.

ROSS-NAZZAL: I think it needs more signage. I haven't been over there in a couple of years. Last time I was over there, there wasn't much explanation, maybe that's it.

COATS: Maybe so.

ROSS-NAZZAL: Maybe you need to go over there, give a couple of tours.

COATS: Yes, there you go, in my spare time.

ROSS-NAZZAL: There is a lot of Shuttle property that is no longer at NASA. Was there discussion that this would be too difficult to dismantle and piece back together elsewhere?

COATS: Well, it was a combination of who would pay for it and who wants it, who wants it bad enough to pay for it. It came down to nobody wanted it bad enough to pay for it, and we said, "Okay, let's see if we can use it, get some benefit out of it." A lot of the Shuttle hardware, people did want it, and we wanted it to get out there, we wanted it to be available for the public to see as much as possible, but it costs money to move things. Some of the museums were anxious to get it and pay for it, but we just didn't have the money to do a whole lot, I'm afraid.

ROSS-NAZZAL: Was that a difficult time for you, seeing things like the full fuselage trainer and some of the other simulators leave JSC?

COATS: Yes, it was. It was hard for me. I spent an awful lot of years with that hardware and did a lot of training myself on that stuff, so seeing an era come to an end is always sad. On the other hand, I wanted as many children around the country to see as much of the Shuttle Program as

possible. If you want to keep it alive in their memories, it's good to have that stuff out there, so I'd be crazy to seal it up here. I was looking for ways to get the legacy and the reputation of the Shuttle Program out there. I don't want people to forget.

It made me sad to see in Russia, they only flew their Buran once unmanned. They built six of them, I think, their space shuttles, and a couple of them are sitting in old falling-down hangars out at Baikonur, which I thought was incredibly sad. The Russians, when they leave a program or terminate a program, they just walk away from it, and a lot of their launch facilities, their hangars, people just walked away, so they're falling down from disuse. We tend to tear things down and rebuild, they don't. I thought that was incredibly sad. I didn't want to see our Shuttles, or any of our Shuttle hardware, sitting in a storage facility where nobody'd ever see it. I'd like it to get out there as much as possible. So I loved having the *Discovery* in the Air and Space Museum, and *Atlantis* down at KSC, and it would've been nice to have *Endeavor* here. But, I also wanted all the trainers to get around the country as much as possible.

ROSS-NAZZAL: Were you out at the Smithsonian [Institution] in DC when *Discovery* arrived on the SCA?

COATS: Oh yes. As the pilot of the first *Discovery* mission, and all three of my missions, it meant a lot to me to see *Discovery* come in out there. That was a big event, really pretty special.

ROSS-NAZZAL: Have you been out to see her since she's been placed in the museum?

COATS: No, no I haven't. Someday I'll take the granddaughters out there and tell them I flew that, and they're going to go, "Wow, you must be really old."

ROSS-NAZZAL: I think they'll be really impressed. Speaking of your granddaughters, because I think they have something to do with this, I remember you would always tell people—you'd end a meeting with, "Just keep your heads down and keep coloring."

COATS: I just wanted people to keep doing their job. I kept saying, the best way we can influence the future is to do a great job now, and if we accomplish the missions we've been given, we'll be given a lot more missions in the future. So, just keep doing what you're doing, keep coloring, it'll work out. Always does.

ROSS-NAZZAL: We've talked about your work with national politicians. Did you have much contact or work much with the mayor of Houston or state government?

COATS: You know, we met. We had wonderful support from all the mayors, whether it was Mayor [William H. "Bill"] White or Mayor [Annise D.] Parker. I just couldn't have asked for better support. They're obviously very supportive of the Johnson Space Center and the space program, an awful lot of their constituents work there. They frequently would go to DC. Annise Parker was just fantastic, she made several trips to DC advocating for the space program.

Governor [James Richard "Rick"] Perry was very helpful. We went a couple of times up to Austin [Texas] to visit with him and his staff up there, and they've been very supportive. Obviously all they can do is advocate, they don't have the money, it's federal money for the

space program, so there's not a whole lot they can do, but they were voices. The congressional delegation certainly listens to them, and they were very supportive. Couldn't have asked for better support.

ROSS-NAZZAL: I wanted to ask you about some of the various community aspects of JSC. There are efforts by the Center to reach out to the public, and there are also fun events that people get invited to, like, although no longer, the Ballunar [Liftoff] Festival, there's the chili cook-off, the Houston Livestock [Show and] Rodeo, the trail rides, Wings Over Houston, all those sort of things. What value do you see in those type of events and JSC's involvement over the years?

COATS: First of all, I feel like it's not JSC versus the community. We are the community. We have 17,000 employees at the Johnson Space Center. That's a lot of people living around here, and we live all over the place, from Galveston all the way up to the Woodlands. I had several employees that lived in the Woodlands and commuted down here. We're obviously a huge part of the community. We are the community, in a very real sense, and I wanted the people to feel a responsibility for the community.

I tend to think of it as how can we make it a better place for our children to grow up. Certainly providing good jobs is important, but what more can we do to make this a better place to live and work and raise our kids? How can we help the school system, how can we help the local mayors? And, all the things that you mentioned, I think, are important things to do. We invite the public in as frequently as we possibly can to the Johnson Space Center, because we want them to feel like, whether they work here or not, the Johnson Space Center belongs to them, it's a part of the community, they're welcome here.

I've encouraged people to go out and get involved, any way they feel comfortable doing, with the community. I think we have a responsibility. And, if you think about it, the people that work in the space program are fairly well paid. They're not going to get rich, but you can certainly raise a family comfortably. You have a responsibility to contribute in any way possible to the community, whatever intrigues you. Do you want to get involved in PTA [Parent Teacher Association]? Do you want to get involved in church activities? You really need to look for ways to become a part of the community.

And it's important to me. Remember, I was an Air Force brat, so we moved around a lot, so has my wife, so it's hard to put down roots when you're moving a lot. It was really nice to be able to raise the kids here. Our daughter was five years old, started kindergarten when we moved here; our son was born here, and all the way through the school system here. Having the opportunity to live in one place and raise the kids was really pretty special.

It would be nice if people would appreciate that and feel a responsibility to work in the community and make it a better place to live. I think we have some of the most motivated people. I don't want to say intelligent, because there's a lot of different types of intelligence, but I think we have some pretty motivated folks in the space program, and that kind of motivation and determination can really make a community a better place to live as well. It's the old thing, to whom much is given, much is expected, and I think the people that have the opportunity to work in the space program should be expected to contribute back to the community. I've tried to get that message out to the employees, and I think they do a really good job about it.

Like Hurricane Ike, we had the Gilruth Center open to the whole community, it wasn't just employees, and an awful lot of people came in to get water and food and use the computers and air-conditioning. I think we have a really nice community here in the Bay Area; this is a

pretty good place to live and work. The weather can be miserable sometimes. Hurricanes can be really miserable.

ROSS-NAZZAL: Mosquitoes.

COATS: We don't shovel snow.

ROSS-NAZZAL: That's true.

COATS: And don't freeze to death too often here.

ROSS-NAZZAL: It is a nice place to live. I can't complain.

COATS: Well, we can always complain.

ROSS-NAZZAL: Well, how about this, it could be worse.

COATS: It could be worse, that's right.

ROSS-NAZZAL: When you were Center Director, and I don't know if this was the case before you came, the federal government was trying to decrease its use of energy and become more efficient. How much of a challenge was it for you as Center Director to cut back on things like water and electricity usage? I know there was some effort to put in sun panels at the child care

center, and other efficiencies, but what challenges were there taking a facility built in the early '60s and bringing it up into 21st century efficiency standards?

COATS: Well, I'll tell you who was really active in that was Joel Walker. Joel was very serious about that. He had an awful lot of ideas about how we could become more efficient in all those areas, water and energy. He was always coming up with ideas, and I'd say, "Great, how can we afford them?" And he'd say, "Oh, I'll go find the money somehow." He'd go juggle his little budget and do things. I was impressed with Joel, he's very much a conservationist, and set a terrific example for all of his people, and for the whole Center. He could give you a whole long list of things that have been done out at the Johnson Space Center, and I think we've done a lot.

When we built some of the new buildings, Building 20 is a [U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) certification level] platinum building, and boy, Joel can talk to you forever about what it means to be platinum. He's very serious about that, and I was delighted to see him not only taking the lead, but being a real evangelist for conservation, because I think it's important that we set the example for the community as well. A lot of the things that we've done, like the Flex Friday that [current Center Director] Ellen [L. Ochoa] implemented, that we had done at Lockheed Martin when I was at Lockheed. What you're saving is energy and gas and commuting time.

I've been delighted, and surprised, I guess is the word, at how receptive people have been to ideas like flexible work week and work from home. There have been a few folks that don't like change, but I think we've demonstrated that these are valuable things that benefit everybody. I've been pleasantly surprised at not only what JSC has done, but what the people of JSC have been anxious to do along those lines. But, it takes leadership, it takes Joel Walker to think of

ideas, go out and get other ideas, and then explain why they're of benefit. That's leadership, and Joel's a born leader.

ROSS-NAZZAL: When we first sat down to talk about you being Center Director, one of your goals was communicating with the public, reaching out to those people. Before you left, there was a video that went viral on the web, it was a spoof on Gangnam Style [music video], and it was Johnson Space Center style, and you were featured in there with Ellen, here and there a little bit. I was curious, what were your thoughts about that video put together by the interns and co-ops [cooperative education students] about JSC?

COATS: Well, for one thing, I didn't understand the attraction. I couldn't figure out why it went so viral, and I thought, "Boy, I must be getting old." But if people like it, I didn't see any harm in it. Now, what came out about the same time is that the guy, what's his name, Psy, the Korean who started that whole Gangnam Style thing, had said some things in previous years about wanting to kill Americans, especially women and children. I don't know if you heard about all that.

ROSS-NAZZAL: No, I don't remember that at all.

COATS: Go Google that. When he found out he was getting rich off this thing, he apologized, "Oh, I didn't really mean that." But there was quite a hullabaloo about that, and I thought, Oh, geez, why'd we have to pick that to go viral? But it seemed like a fun thing to do. And I've learned that the young people, in fact, are so enthusiastic, they don't know what can't be done.

Anything is possible. You don't want to take that away from them. You need that kind of energy and enthusiasm in any organization. The old people have been around enough, they tend to get jaded and they tend to immediately say, "Okay, here are the problems with any idea." You need to recognize the pitfalls, but you also need young people's energy, and say, "Let's figure it out," instead of just saying no. Say, "Yes, if we do such-and-such and such-and-such, we can get something done." I was delighted with Innovation Day, we let the young people come up with the ideas for the Innovation Day, and they were really creative in what they came up with. I was delighted with that.

Yes, I was anxious to give it a try. I felt like it's important that the Center Director not do anything that's not dignified; you don't want to embarrass the Center. But, I didn't think that would be embarrassing. I don't think it was.

ROSS-NAZZAL: At some point you made the decision that you were going to retire from JSC, and I understand that you wanted to take care of your wife, that was your decision.

COATS: She was diagnosed with early-onset Alzheimer's about six years ago. Then it became obvious, when I read everything I could about Alzheimer's and talked to the neurologists, it became obvious she would get to the point where she'd need full-time care. I told Charlie that I intended to retire whenever I felt like it was not safe to leave her home alone. It got to the point where she had to quit driving, but she was safe at home. Then it got to the point where I worried if they had a fire or something here at the house, she wouldn't know what to do, and that's obviously when somebody needs to be with her all the time. I notified Charlie I think about six

months in advance that I needed to retire at the end of 2012. He was very understanding, of course. He's known Diane since we've been married, he and Jackie [Bolden] are good friends.

He had asked me for inputs on who my replacement should be, and I gave him a list of names, but I said I would put Ellen at the top of the list, I think she's more than qualified. He was very, very gracious in allowing me to announce that Ellen was going to replace me, which meant a lot to me. Usually the Administrator will come in and do that, so that was quite kind of Charlie to allow me, and I'm really proud of what Ellen's done.

It was obvious that I needed to be home, and that's what we've done for the last three years. And, it's nice having the newest granddaughter. Since I'm home anyway with Diane, it's been fun to babysit the newest baby granddaughter as well. Diane's having a hard time talking anymore, some of the words don't make sense. At the same time, this year-and-a-half-old baby is learning to talk and she doesn't make a lot of sense either. So sitting here listening to the two of them saying things that don't make a lot of sense, I'm thinking, is it me or is it them? Maybe it's just me. Kind of funny.

ROSS-NAZZAL: Were there any goals that you had set for yourself that you didn't feel you had achieved when you left the position?

COATS: We've talked about it; I thought we as an Agency should have done a better job of selling the space program, explaining to the public the benefit of the space exploration program. I would've liked to have done more along those lines. It turns out there's a lot of constraints, the administration is always—any administration, Republican or Democrat—is watching you to make sure you don't overdo that. They don't want you out there, from their perspective,

lobbying for budget. I still think we could do a better job, and by law are required to do a better job, of informing the public of the benefits of the space program. That's one area that I wish we could've done more. Given the constraints, it's probably not possible to do a whole lot more.

I wanted to fly out the Shuttle Program safely, and we certainly did that. I wanted to get rid of or modify the not-invented-here attitude here at JSC and be more open-minded, more receptive to new ideas and outside ideas. I wanted to train program managers a little bit better, and I think we did some of that, as much as we could within the budget constraints that we had. Obviously I wanted to do what I could to make sure the Space Station was assembled safely, and I think we did that.

I never dreamed coming in to the job that we'd be worried about the Constellation Program being canceled, but I think we did everything we could to respond to that, and made whatever contribution we could to saving the Orion Program and the heavy-lift launch vehicle program. I think Charlie probably did a whole lot more back there where he was. I'm pretty satisfied with that.

I wanted to continue to recruit the best and the brightest from every talent pool around the country, and it didn't matter to me, I don't care about the color of somebody's skin, I don't care about their gender, I don't care about their sexual preference. I want the smartest people we can get working in the space program. I want people of every segment of our society to feel like they're welcome here at the Johnson Space Center, and that they would fit in immediately. I think only time will tell if that objective has been achieved, but that was important to me.

If you want to be competitive in this world, and that means against other countries, competing for budget with Congress, you've got to go out there and compete for the best and the brightest. If I've got better players on my team, I'm going to win, and I like to win. So,

continuing to recruit—and I think we always have—but continuing to recruit the people that love the space program is very important to me. I think Natalie Saiz did a fantastic job of doing exactly that. That's important to me, but that's one of those things that only time will tell if we did it right or not.

ROSS-NAZZAL: Looking back, is there one thing you can point to as your most challenging moment or event that you had to deal with as Center Director?

COATS: I think the cancellation of Constellation was the most challenging event we had. Like I said, for a few weeks there, I didn't see where we had a future, and that was a tough time for us. Later, you've got to be optimistic and say, "Here's the objective, and I'm going to go fight to get the resources to get there." Boy, when you don't have an objective, that's tough. So, that was probably the most challenging event.

We had a few. Obviously the murder-suicide was a horrible event. Walking in and telling Linda [the victim's wife] that Dave [David Beverly] was dead was just one of the hardest things I've ever done. It's hard for me to understand how that could happen. Same thing with Lisa [M.] Nowak, having her do what she did is just beyond my comprehension. I think it's beyond her comprehension, now, too. I'm not a psychologist, so I'll probably never understand what could've been in her mind at that time, but that was certainly a shock to all of us.

The accusation of astronauts flying drunk was such a ridiculous and ludicrous accusation, by another astronaut, just floored me. It made us a laughingstock for a long time, and that hurt. That was hard to see, because you knew it wasn't true, and it certainly wasn't fair. But, I have to think it was the cancellation of Constellation that was the hardest thing for us to deal with.

ROSS-NAZZAL: What do you think was your greatest accomplishment while serving as Center Director?

COATS: I think working with Congress, especially the Texas delegation, to save the human exploration program. I think saving Orion and the heavy-lift launch vehicle. It wasn't obvious there for a while after they canceled Constellation that we'd be able to do that. I'm extremely grateful and thankful to Senator Hutchison and the whole Texas delegation for the work they put in. Senator Hutchison, we could probably rename the Johnson Space Center the Hutchison Space Center. Ralph Hall, same thing, he was just wonderful. I don't want to leave out Bill Nelson and Senator [Barbara A.] Mikulski and some of the others, too. It was a bipartisan group that I think saved the space program, and I think behind the scenes, Charlie did an awful lot. I'm proud of what we did working with Congress to answer their questions so they could make the case for a human space exploration program.

If you think about it, originally the Space Station was going to be decommissioned this year. There was a period of time when they canceled Constellation that this would've been the end of the American human space program. No sense having a commercial crew program if there's no place to go, and there would've been nothing else in low-Earth orbit to go to. I think that's what I'm proudest of, but it was simply informing and educating the politicians who were anxious to look for the right words to justify the human space program, and I think we were fortunate to have some pretty strong leadership like Senator Hutchison. She was just flat-out amazing. I don't know where we'd be without her down here, so we're lucky. Wish she hadn't retired.

ROSS-NAZZAL: I think a lot of people think that. Well, I think that we have touched on probably all of the topics that I was thinking of. I wasn't sure if there was something else you wanted to talk about in your position as Center Director that we may not have covered.

COATS: No, I've felt for 10 years that I had the best job in the world. I used to tell that to Mike Griffin. I appreciated him offering me this opportunity, and I worried for years that he'd decide he wanted to be the head of the Johnson Space Center.

ROSS-NAZZAL: Make a swap? You could be Administrator, he could be Center Director?

COATS: No, I wouldn't want that job. I had the opportunity to work with a lot of really good people, and I got to see what dedicated and talented people can do in some real crisis moments. We had some problems with the Shuttle and then the Station that any space program is going to have, and watching the teams work together to solve the problems and come up with some truly elegant technical solutions was really fun and really satisfying. I wish my kids and grandkids could have that kind of satisfaction. Being part of a very successful team, motivated team, was pretty neat, a good memory.

I think it was a privilege to be an astronaut and fly into space. It was even more of a privilege to be the Director of the Johnson Space Center and feel like you're part of a team, and to be able to, from that perspective, see the different parts of the team and how they work together, what they accomplished. I think being the Center Director is a unique perspective,

because you get to see so much. I just can't say enough about how motivated this team is. They think they're making a difference, and they are, and that's pretty neat.

ROSS-NAZZAL: It's an unusual place, I can say that. In a good way, not in a bad way.

COATS: In a good way, that's right.

ROSS-NAZZAL: Well, I thank you so much for taking time today and these past couple of times.

[End of interview]