# NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
# ORAL HISTORY 3 TRANSCRIPT

ELLEN OCHOA
INTERVIEWED BY JENNIFER ROSS-NAZZAL
HOUSTON, TEXAS – 25 SEPTEMBER 2012

ROSS-NAZZAL: Today is September 25th, 2012. This interview with Dr. Ellen Ochoa is being conducted in Houston, Texas, for the JSC Oral History Project. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright. Thanks again for taking some time this afternoon to meet with us.

OCHOA: You're welcome.

ROSS-NAZZAL: We appreciate it. So last time we ended you told us the story about how [Center Director] Mike [Michael L. Coats] had approached you and convinced you that you needed to be the Deputy Director. So tell us about those first couple days being Deputy Director. What sort of things were you experiencing or learning about?

OCHOA: Well, I don't know if I can remember the first couple of days in particular. But obviously early on there's a lot to learn. Fortunately having already been a member of senior staff I at least essentially knew everybody on senior staff. I didn't know everybody really well, but it wasn't like I had to meet a whole new group of people that I was going to be interacting with. So I was mainly trying to understand some of the specifics of running the Center that I really obviously didn't have to concern myself with when I was just in Flight Crew Ops [Operations]. A lot of what the Deputy Director does is more of the maybe chief operating

officer concept where you get pretty involved in the budget, particularly the Center maintenance and ops or CMO part of the budget. But also with the budget as a whole to understand how it's moving through the Center and how we're doing during the year in terms of obligating and costing. You get particularly involved in how the CMO budget is allocated, the challenges that we have there.

Workforce is another big one. How many people we have total, how many people we can hire, how many people were leaving, how you decide the hiring strategy when issues come up like you overall need to come down as a Center, how you go about doing that and helping to make sure that you have about the right number of people in each of the organizations. It's another big part of it.

Certain personnel issues might only get to my level and sometimes some of them would go where both Mike and I are involved, a lot of that type of thing. You continue on in a technical role as well obviously where the Center Director, or me as the designate when I fill in for Mike, needs to represent the technical authority of the Center for critical agency reviews like flight readiness reviews, and on launch days being down in what we call the management bubble. Making sure that we were prepared to represent any of the technical areas that our Center supports, which obviously are many, including Engineering and Space Life Sciences, which has to do with the health of the crew, Flight Crew Ops, Mission Operations. If there was any issue that they felt the program wasn't adequately addressing or wasn't hearing their concern or had made a decision that they felt was not in the best interest of the program and NASA based on their own input, then going up through the Center Director level is essentially their alternate path to raise an issue. So you still need to be informed on all those technical and operational issues.

It's a multifaceted role, which I think is one of the aspects of the job that I like. I certainly didn't want to give up the operational technical part. You do have to step away at a certain level. You're at a higher level and you're not obviously as involved in the day-to-day details of all the operations of what's going on in space or preparing for space. But you still have to be aware of all of them at a certain level as well as how the whole Center is operating as a whole.

ROSS-NAZZAL: You took over in 2007?

OCHOA: Yes. I think it was October, November.

ROSS-NAZZAL: How did the 2008 election impact NASA's budget and NASA's vision as a whole?

OCHOA: Well, elections always impact. It's not just the election, it's everything leading up to the election, then the election, and then everything that happens. Because we're a federal agency, Washington starts to get focused on the election partway during an election year. That makes it difficult to do business as usual because you don't get the kinds of decisions coming down that you would get in a nonelection year. Everybody wants to wait and see what's going to happen. In that case there was obviously a change of administration and we knew that would likely lead to a change in the Administrator and potentially a change in policy. It's partly a little bit of a waiting game but also understanding that hey we do have a current mission, we've got to

keep operating, we've got to make sure that we're doing what we need to do as a Center to make sure we're fulfilling the mission that we currently have.

ROSS-NAZZAL: Those same things are happening today.

OCHOA: Right, exactly, we're reliving that through another election year.

ROSS-NAZZAL: You've shared some of the basic roles of the Deputy Director. You said you had a seat at the table [as Director of Flight Crew Ops], but now you have a very different seat. Talk about working with the Shuttle and Station programs and Engineering and Space and Life Sciences, which was very different from just managing one directorate.

OCHOA: Right. I basically had interactions with the directors or program managers of all of those in my previous job as Flight Crew Ops. So again it wasn't that I had to get to know the people necessarily. It was just interacting in a little bit different way, little bit different role. If I was working with the Shuttle or ISS [International Space Station] Program Manager before it was usually on a specific issue having to do with crew training or funding that we were receiving from that program that was supporting aircraft operations and crew. Here, we're looking much more globally. Mike and I have regular tagups with all of our directors and with the major program managers. Might be every week or every two weeks or every month, depends on which director you're talking about or what program you're talking about. We just try to stay up to date on all the major issues going on in all of the institutional organizations as well as in the

programs. Then when there's examples of the interests not seeming to line up quite right, trying to understand where the disconnects are and help the right conversations to occur.

ROSS-NAZZAL: Can you give us an example?

OCHOA: Well, every year as you go through what we call the PPBE [Planning, Programming, Budgeting, and Execution] process, used to be the POP [Program Operating Plan] process, but the budgeting process that you do every year where the programs say here's what I need not only for next year but the next five years, and here's what I need from the institution, here's the exact number of people that I need from these orgs and these orgs. When you add it all up it doesn't necessarily work out exactly as you need it. In the time that I've been in any of my management roles we've gone through different ways of how we account for civil servants. We used to have an overall code that was just here's a civil servant labor code, it's taken off the top. You're not really negotiating for that, you're negotiating for all of the procurement dollars.

Then we moved to a full cost method when I was in FCOD [Flight Crew Operations Directorate] where now you're accounting for all the civil servant time in hours in that process as well. Everybody had to figure out what that meant and how to get used to it. When you change the number of major programs you have, now you have all this negotiating about who's going to pick up what kind of support from each of the organizations. Of course all the civil servants have to be paid. They have to have some charge code so you're trying to work that. Now we're under even a different system, what they call GOLD [phonetic], where it's a little bit of a hybrid. You work it in advance of an operating year, and then during that operating year it's fixed about

what program is going to cover what people. So that's always an issue where you don't always have the same view from the programs and the institutions.

The programs may say here's how many people we think we need to cover for our program. The institutions say well, to do the job you've asked us to do we actually think it's this many and this much procurement dollars. The orgs will work that in many cases with the programs directly. We need to understand the overall Center view and where there's more major disconnects, not just a handful of people or a few dollars. Then that's where we need to get engaged and make sure we end up with some sort of compromise that works for the whole Center and the program.

ROSS-NAZZAL: Talk about the transition. When you came in as Deputy Director, we knew we were going to be closing out the Shuttle program. We thought that we were going to have Constellation go on to the Moon and Mars. Talk about how you handled that transition from the cancellation of one, the ending of one, and then we have a smaller program now, the Orion or the MPCV [Multi-Purpose Crew Vehicle]. How did you handle that? What role did you play in all of that?

OCHOA: That was obviously probably the biggest thing we've worked as a Center over the years that I've been here. We had a lot of good work going on about trying to prepare for the end of Shuttle that involved a lot of organizations and a lot of different people. Human Resources was very involved to understand both from a civil servant point of view what people who were supporting Shuttle were going to move to after Shuttle. They also worked with their HR

counterparts at all of the contractors that supported Shuttle so that we would understand. Obviously there was going to be a series of layoffs as well as reconfigurations there.

Trying to maintain the communication, trying to understand where there were tools that could be used to help people transition. So obviously, both on the civil servant side and on the contractor side, our major next program Constellation was going to be the one that was going to be staffing up. That was the way the whole budget was built also. The budget for Constellation was going to be up after Shuttle ended. That was the major reason for actually closing out the Shuttle program, to free up the money and people to support Constellation, when you could really now start the buildup of these new developments.

When it came out in the President's budget in early 2010 that that program was going away, or that was what they were proposing, yes, that did change our entire outlook. So the plans that we had in place for transition were all thrown up in the air. Of course it wasn't immediately obvious what was really going to happen, because this is a budget that the President proposes and then Congress needs to act on it. We need eventually an authorization and an appropriations bill.

So it was actually many months before we really understood what might be happening. In fact it was—I'm trying to think when exactly it was—May of last year maybe before we really got the go-ahead on yes, we are going to continue Orion. We call it Multi-Purpose Crew Vehicle. We put it together now. Orion MPCV. Because it just wasn't clear exactly whether it was going to be what we had already been planning for Orion or something different.

It's in general mostly what we'd been planning for Orion. Although we really are not any longer looking at it as a low Earth orbit vehicle but only as a beyond low Earth orbit vehicle, where before it was going to do both jobs.

Over that time when there was a lot of uncertainty, a lot of what we were trying to do was plan for different scenarios. So we had a tiger team put together that I led for the Center in terms of what were some of the new efforts that were proposed in the budget and how we might plan those. Then also how that would affect all the transition planning that we were doing.

We went through a variety of phases. So from month to month there were different things maybe that we were focusing on as more information was available or plans were slightly shifting. There was a good year or so where we were really trying to understand what is actually going to be included in NASA's portfolio that both houses of Congress and the President are going to sign up to support.

I think the upshot is as we said we're going through with Orion in a little bit different form, focusing on the beyond Earth orbit requirements. The Commercial Crew Program really started up, and although the lead center is KSC [Kennedy Space Center, Florida], we're a very strong partnering center. When you look at their org [organization] chart, everywhere there's a KSC lead there's a JSC deputy. Everywhere there's a JSC lead there's a KSC deputy just about. There's some expertise where it's a little bit more focused on JSC and some expertise where it's more focused on KSC just based on our histories and our expertise. We're more into spacecraft design and development, and they're into launch processing and launch integration. So it made sense to split those, but we do partner closely with them.

Overall though there aren't that many people involved in that program. So certainly what we ended up with was a lot fewer people working in program offices or directly supporting programs. One of the things that has come in to take up some of that work is more in the area of technology development. Probably the biggest single program is called the Advanced Exploration Systems, AES program, where there's a number of smaller technology

developments but all focused on exploration beyond low Earth orbit and understanding and developing and demonstrating in relevant environments, the technologies that you would need to do that. So that was really something that we basically came up [with] here at JSC. Steve [Stephen J.] Altemus, the Director of Engineering, was probably the brainchild behind that. Part of it was trying to make use of all the assets that we already had available to us, so you wouldn't need a lot of extra money in the budget, or you weren't really trying to advocate for a new program.

So you looked at civil servants that were available. You looked at hardware that was available because it had been used as testing hardware for another program. Just tried to look across the human spaceflight Centers about what already existed, and then what could you use it for in an environment where you're doing rapid prototyping, testing, and then more development and testing. More of a small teams, almost a Skunk Works type of approach to doing technology development. So that has grown into an important activity here at JSC also over the last couple of years.

ROSS-NAZZAL: There seems to be a broader emphasis now also on partnering with industry and universities. Can you talk about that and what role you might play in that?

OCHOA: Sure. As we look at trying to make sure that JSC is really helping the agency move exploration forward, human spaceflight exploration, that's really the job that we do for the agency, and that's where our value is to the agency, we look at what are ways that we can do that in a more affordable and more sustainable way. By sustainable I mean over multiple years and even multiple administrations where because of the fact that the timescales that it takes to

develop new programs and actually carry them out is over many years, you want to be able to carry through programs as much as possible.

So obviously one of those things is more partnerships and more collaboration. That helps in a variety of ways. You may be pooling resources, both money and people, to be working on something that's of interest to both groups, whether it's two different NASA Centers or NASA with an aerospace company or even NASA with a nonaerospace company like we did with General Motors in developing Robonaut 2. They had a particular use for that technology. We had a different use, but it was really advancing the same technology that we were both interested in.

That can help both in the affordability as well as the sustainability because it gives you more advocacy for the type of work that you're doing because it can be applied in more than one area or it involves people beyond just the doors of JSC here.

So we have increased our partnerships in a variety of ways. With the commercial crew companies, not only does the Commercial Crew program have agreements with them, in many cases these are Space Act agreements. They'll be moving to contracts in the future, but they have been Space Act agreements so far. JSC, along with other Centers, have individually signed agreements with these companies so that the companies come to us for certain types of expertise, for certain types of analysis, for certain testing facilities so that they don't necessarily do every single thing from scratch. They can make use of the expertise and the actual assets that we have here at JSC. So we have those types of agreements.

We've always had agreements with academia, and we're continuing that and trying to make sure that we're maybe reaching out a little bit further than we used to in a broader range of areas and a broader number of universities.

We've tried to reach more in the Houston environment. Obviously in Houston you think of energy industry, transportation, medical. There's certainly a lot of overlap in some of the technologies and interests between what NASA does and what these industries do. In some cases there was not a whole lot of interaction. We've been trying to increase that.

The end goal is always trying to make sure that in the role that we play for the agency we're trying to figure out how do we best bring value to the agency to carry out the human exploration role, how can we help make it more affordable, more sustainable.

ROSS-NAZZAL: How have you tried to really build morale at the Center for so many employees who might feel like NASA doesn't have a mission? A lot of people have been talking about that lately. NASA doesn't seem to have a goal like they did for the Apollo program or even the Shuttle program. How have you and Mike tried to ensure that people are excited about the new goals of JSC?

OCHOA: I think in a variety of different ways. A lot of it is making sure that people are reminded [of] what we actually are doing. We are flying people in space. They're doing really exciting things on the International Space Station program. So the program itself I think has really changed its focus to make sure it's supporting the utilization of the International Space Station as both a science laboratory and a technology test bed. We're trying to help in those communications. In addition of course to making sure that as a Center we're working with the program to safely operate the Station. There's been a lot of communications developed on what are the benefits that we're getting from ISS. There's new websites and there's lots more information I think available on how we're doing that utilization. We want to make sure all of

our employees and our community knows that information is out there so they can be good ambassadors, they themselves can feel good about what we're doing here at JSC and they can be good ambassadors for what we're doing.

In the whole area of exploration first of all ISS is a key part of exploration, because we are learning how to live and work in space, and we can also test out things like advanced life support systems and human robotic interactions on the International Space Station.

Then what are the other areas of exploration? Obviously Orion. There are a variety of milestones that Orion has accomplished over the last couple of years—fairly major hardware testing. We try to make sure that our folks are aware of when that's happening and get photos and video and press releases out about those various milestones so that they're able to track that progress even if they're not working on that program.

Then we've had a variety of technology demonstration projects that I think have gotten a lot of visibility and gotten people here at JSC excited. There are things that we focus on during Innovation Day as well, like the Morpheus project where there's a variety of goals for that project but two of the main technologies that we're developing are LOX [Liquid Oxygen]/methane engines so using a nontoxic propellant for in-space propulsion and then also the autonomous landing and hazard avoidance sensor suite and software suite that goes with it that will be used to help the vertical test bed or the lander be able to land safely on a surface someday. So those projects have combined to be able to do some demonstrations together.

Also people are pretty familiar with Robonaut 2, and the fact that we were able to get Robonaut 2 up to Station, again a good collaboration between engineering technology development and the ISS program in terms of getting that humanoid robot qualed [qualified] and up to Station and now being able to be used up there. Trying to learn what are the first steps that

we can use it for, and then how would we progressively increase its capabilities so it can become more useful to humans in space both now and in the future.

So we try to get information out about that whenever there's a milestone that we feel we can share and tell a good story. I also think overall we're doing a good job with social media. Astronauts on ISS send down tweets with all kinds of pictures. They write blogs, and that really reaches a lot more people than five years ago the standard press releases that we put out. That always went to the same community but didn't necessarily get out beyond that wider community. I think we've managed to reach beyond that core group that always follows NASA, because now people can retweet to their friends or post things on Facebook. "Hey check this out!" And you get more of that effect where friends contact friends contact friends, which is beyond that core hard-core space group that has always followed NASA.

So I think those are some of the things that we're doing, because what we are doing really is exciting. But it has been a bit overshadowed by all the news of programs ending and being canceled.

ROSS-NAZZAL: Did you play any role in trying to get an orbiter here at Space Center Houston? Were you involved in that effort at all?

OCHOA: Well, I'm on the board at Space Center Houston. So part of the role of the board was to talk about the desire to get an orbiter here. We did get some help from JSC in terms of helping Space Center Houston get some information that would be useful for the proposal that they sent into NASA Headquarters [Washington, DC].

Although we weren't ultimately successful in getting an orbiter, we were able to get a full-scale mockup that had been outside the KSC visitor center for a number of years. There are some advantages of having that, because we will be able to get people actually inside that and to see a little bit more the whole size and scale in terms of what the astronauts would actually experience and see when they're in that, which you're not able to do with the real orbiters, because you can't get anybody close enough to actually touch them with the real orbiter artifacts.

I just think it's important to make the most of what we have, and the important thing was to have an educational and inspirational exhibit here in Houston, because we played such a key role. Of anywhere in the country obviously Houston played the key role in the Shuttle from the development on through all of the training and operations.

We want to be able to share that with people who either live here or who come to Houston to visit.

ROSS-NAZZAL: We actually do have an orbiter. We have OV-095? I can't remember in the SAIL [Shuttle Avionics Integration Laboratory]. It's got an orbiter number.

OCHOA: Oh yes. It wasn't one that was ever designed to fly. That is one of the things that we're doing in terms of adding the SAIL as a tour stop for Space Center Houston. We hope to have that ready a little later this year for people to see a little bit more about the ways that you actually test and make sure that you're ready to go fly. Beyond training of astronauts, which is also an important role that we had, but we also had to verify all the avionics software, and this was the major way that we did it. I think that's just part of telling the story to people who probably don't understand everything that it takes to go get ready for safe Shuttle flight.

ROSS-NAZZAL: There's a lot of behind-the-scenes work, that's for sure. You mentioned that you were working with the facilities budget. There have been some new buildings that have gone up here at JSC over the years. Can you talk about that?

OCHOA: Sure. There've been two or three new buildings as well as the renovation of a couple of buildings. We have buildings that are close to 50 years old, because JSC essentially went up, all the buildings around the mall, in the first half of the '60s. So we want to make sure that we're maintaining our infrastructure as best we can in the budget environment. So the plan is to one by one with each of the mall buildings do a renovation for a variety of reasons. We want to get asbestos out of the building. We want to make sure we're compliant with ADA [Americans with Disabilities Act], all the disabilities regulations. We want to have ways to more efficiently cool and heat the buildings so we spend less energy.

We can actually even put more people in buildings and use less energy if you have the right design during the renovation. That's actually what we've been doing with Building 2 and now most recently Building 12.

We were able to get a new building built, Building 20, as part of that whole renovation and revitalization. Because as you renovate each of these buildings around the mall, you needed a place to put the people who were in those buildings, and there wasn't enough open office space to just move them anywhere else. So we were able to get that new building built. There are some permanent people who occupy it, but a lot of it is used for people who are moving out of buildings that may be out of that building for a year while it's being renovated and then move back in.

With all of those buildings, both the new and in the renovation, we obviously are trying to get them certified under LEED [Leadership in Energy and Environmental Design] to show that they are being built with energy efficiency in mind and that we're actually achieving the efficiency that was designed into that program.

So when you first open them all you can say is that we're going for LEED silver, LEED gold, or LEED platinum, and it takes some amount of time of operating and taking data to verify that you made your goals, but we have in all of those cases.

Then I guess the one other new building has been the astronaut exercise or rehabilitation facility. This was something that we had realized we really needed to upgrade as we went into ISS more full-time where we had more people coming back from six-month-long increments where you wanted to make sure you had a facility where they could readapt to Earth and make sure that they were working very closely with the specialists that help them regain muscle mass and bone mass and all of that and have them in a controlled environment. There's several weeks when they first come back where really their major job, other than having people experiment and take medical data, is to accomplish that rehabilitation. So we wanted to make sure we had the right facility for that.

ROSS-NAZZAL: In 2008 you were here. We had a major storm come through, Hurricane Ike. Were you here for that rideout team, or did you come back after the storm?

OCHOA: Well, the rideout team in general doesn't include people on senior staff. It's really a pretty team that is specialized in emergency management and in Center operations so we did

have a rideout team that was here on site. Different members of senior staff went different places, but we tried to reconvene by telecon as early as possible—the day after the storm hit.

Within 24 hours after that we had the initial assessment of the status of the Center and had people starting to work on getting buildings back in shape so that we could figure out how long it was going to take to reopen the Center and start working towards that. Making all the decisions about okay when's the right time to bring the next group on, which is really the facility managers and the teams that are going to help you do the cleanup and the repair and all of that, and then when you actually reopen the Center.

So in the first few days we had multiple telecons per day. There was really a core team that consisted of the Director of Center Ops and the Director of Information Resources and Director of Human Resources and our financial management, Chief Financial Officer, because those are the key people that had to come together to make sure we knew the condition of our Center and where our people were and the situation that people found themselves in as well as getting the Center back open.

ROSS-NAZZAL: A number of people were certainly impacted by the storm who work here. Natalie [V.] Saiz was telling us about her efforts to really reach out to people. Were you involved in that at all?

OCHOA: Well, she was statusing us at each of the telecons on what she knew about the Center as a whole. Of course the directorates have their own phone. They were reporting in overall, but they were working issues within the directorates themselves. So a lot of times the directorates form their own teams to help people, just physically go out to people's houses and help them

deal [with] the people who are hardest hit maybe, help them get them over that hump of I don't even know where to start, and I just need a bunch of hands here helping me figure out how I rip things out of my house and try to recover. In some cases people getting housing with other folks in their directorate. Or if they didn't have any friends or family, things like that.

So I think there was an effort that happened on multiple levels. Certainly HR was the overall trying to assess where we are, giving us overall information on the Center as a whole. Working with Center Ops and IRD [Information Resources Directorate] to open the Gilruth Center as a—what did we call it? Refresh and recharge center, something like that. Because one of the problems a lot of people had is their phones had run out of power, their laptops had run out of power. We were able to get in there and give people a chance to actually just charge their equipment, to get on laptops there that were set up for their use if they didn't have ones of their own. To just help them through that initial time period when you seemed to be completely out of contact and overwhelmed and can't even get messages to your family who may live out of the city or out of state. All those things that need to happen to help folks get back on track.

ROSS-NAZZAL: Luckily power came on at my house pretty quickly, so I didn't have to go over. But it would have been nice.

OCHOA: Yes there were people who were out for a couple of weeks or probably even a few that were longer than that. So that's a long time.

ROSS-NAZZAL: It is in the Houston heat and humidity.

OCHOA: Yes. They could take showers over at Gilruth too if they didn't have access anywhere else.

ROSS-NAZZAL: What involvement do you have in NASA endeavors—working with some of the other Centers or directives from Headquarters? Say—I don't know—equal employment opportunity. Are there things that you're involved in that aren't necessarily related to the Center but the agency as a whole?

OCHOA: Probably almost everything the agency does as a whole we're part of in one way or another. There's always efforts that are going on that we're a part of, whether it's various hiring strategies or EO [Equal Opportunity] either directives or guidelines. So that's just part of being a Center and part of being a federal agency. So yes, there's always things going on like that that we're working from the Center level.

ROSS-NAZZAL: Did you notice any change when Mike [Michael] Griffin stepped down as Administrator to when Charlie [Charles F. Bolden] became the Administrator at NASA?

OCHOA: Well, there's always a change I think when there's a change of administration and a change of an Administrator. There may be parts that are associated with a particular person's personality and what they're most interested in, but there's also a change in policy too. That's probably where you see the biggest change. Obviously with the cancellation of Constellation and that sort of thing that was probably the biggest change that came in with the new administration.

ROSS-NAZZAL: Kind of big. We'll see what happens next.

OCHOA: But that's part of working anywhere. There's always changes at the top. There's always personnel changes. There's always policy changes. Ours may be a little bit more regular with the election cycle, but if you work in any big organization and you're in senior leadership you always have to deal with that. So I don't know that NASA is really that much different, other than that there's a lot of visibility to NASA's major programs. I think far beyond the actual dollar value of those programs compared to visibility of other programs in the agency that may actually have a lot more money associated with them.

So that's a double-edged sword. We're glad, and we're proud that people follow us and are interested in our mission but it brings a lot of overhead with it as well.

ROSS-NAZZAL: Do you have any involvement with the international partners, being Deputy Director?

OCHOA: I had a lot more direct involvement when I was head of Flight Crew Operations because of the negotiations that we would actually do with the astronaut offices or operations divisions of all the other space agencies. At this point most of those interactions take place through either the programs or through some of the main institutional directors or within their areas. Human health and performance, they obviously have a lot of interaction in the medical community throughout all the space agencies. Same with Flight Crew. So I don't directly work with international counterparts, but as a Center we believe that again one of our strengths, one of the values we

bring to the agency, is our international partnerships and collaborations. We want to make sure that we're continuing on that and growing and expanding, because we know that's important for the future of exploration.

ROSS-NAZZAL: Pretty important I would think. JSC has recently celebrated its 50th anniversary. What do you think is going to happen over the next 50 years here at the Center?

OCHOA: Well, absolutely focus is on moving exploration forward. It's nice to think about looking out 50 years, but seeing how much things have changed just in the few years that I've been Deputy Director I'm not sure I'm really smart enough to know exactly what the 50 years will bring. But I do know we have incredibly talented people here, people who want to make sure that we achieve as much for the country as possible in the area of human exploration. We have the expertise. We have the talent. We have the desire. We're learning how to think and do things a little bit differently.

As I said the focus on both affordability and sustainability and because of that I am optimistic about the future and the fact that we'll be able to move exploration forward and continue to learn more about living and working in space and continuing to inspire people around the country and around the world.

ROSS-NAZZAL: Tell us if you would what you think your greatest accomplishment has been since you've been working here at Johnson.

OCHOA: I don't think it's about me. When I was in the Astronaut Office it was about whatever mission I was assigned to. I needed to make sure that mission was as successful as possible. Then when you're in Flight Crew Ops, taking a broader view. Every mission that we carry out we need to make sure that we're prepared and that we are working with everyone else at the Center and in the program and around the agency to make them successful.

Now I just have a bigger perspective of what that means. To me any time we accomplish something in space, I feel like I'm a part of that. I also want to make sure that everybody here in this community feels like they're a part of that. I think that's the greatest thing about working here at the Johnson Space Center, that people can say I understand that I played a role in that. Whether or not I was the astronaut in space or not, or I was the one that helped this critical contract get through that allowed us to do this work. There are a lot of different ways that people contribute here. I think that's one of the real rewards of being up at the Center Director level. You see how all those parts fit together and how each area here is critical to making that eventual success in space happen.

ROSS-NAZZAL: Have you had a particularly large challenge that you've had to deal with since you've been at JSC? We've covered a lot.

OCHOA: I think we talked about a lot. Yes it's been a lot of challenges. I don't know that I'd pick out just one, but there've been plenty. I haven't felt unchallenged.

ROSS-NAZZAL: You've definitely been tested. That's for sure. One thing I was curious about is since you've been at JSC have you seen women's roles evolve or change. There seem to be more women in leadership roles.

OCHOA: Oh sure, absolutely. I think just everywhere you look you've seen more women enter—I'll particularly talk about the technical areas because that's what I'm probably most familiar with—where women were most underrepresented as well a number of years ago. You see women all throughout the roles now that you didn't use to see women in, including all of the leadership roles. When I joined the Astronaut Office we'd never had a woman commander. We'd never had a woman Chief of the Astronaut Office. We'd never had a woman Director of Flight Crew Operations. All of that's happened in the time that I've been here. If you look over in Mission Ops and you look at flight directors, I think you'll see very much of that same evolution where many many of the flight directors now are women, and again you didn't see that when I was first here.

Of course our Deputy Administrator at NASA is a woman [Lori B. Garver] and previously has been as well. We have currently one woman Center Director. We had one here at JSC too in the '90s [Carolyn Huntoon]. So yes, you look around and you don't have to look far before you find women. It used to be it was very rare to see a woman in senior leadership or in a senior operational role, and it's not at all the case now.

ROSS-NAZZAL: What do you attribute that change to?

OCHOA: It goes all the way back to women fighting for the opportunity to be in careers that they didn't use to be in and the equal rights movement and Title IX and the first women astronauts being selected in 1978 and then that followed with women in other roles as well at JSC. So it's really been an evolution of all of that.

ROSS-NAZZAL: The only other question I have for you—you spoke last week at Sally [K.] Ride's tree memorial planting. You talked a little bit about Sally Ride. What impact do you think that the rest of the women astronauts have had on influencing young women and men to become scientists or engineers and study those type of fields?

OCHOA: Well, I think because of the visible role that astronauts are in, we do have that opportunity to influence and inspire lots of students. As you say, it's both girls and boys. I get letters all the time—well, not as many now that I'm in upper management—but certainly when I was in the Astronaut Office and for many many years. It wasn't just limited to girls who wrote to me and wanted my autograph and were writing a report about me for school. So the whole idea of going into space and exploring space and being an astronaut still inspires lots and lots of people. When there's something extra that a kid can relate to to you, whether it's because it's a girl relating to a woman astronaut or Hispanic kid relating to a Hispanic astronaut or someone from southern California relating to someone from southern California or someone who went to the same college as you relating to you because you went to that college, if there's something else extra there, for many many people that again provides that extra bit of encouragement.

So because women and minorities have been in general underrepresented in sciences and engineering, I think when they see that in the astronaut corps it does give them that extra bit of

encouragement, because it's that extra bit of identity. It's not just an astronaut, and I would like to be like that astronaut. Well, that astronaut has something in common with me. Or I have something in common with them, maybe one or two or three things. That gives me the courage and the encouragement to think about setting high goals for myself and thinking about doing something exciting like that.

ROSS-NAZZAL: I'm going to ask Rebecca. I think we have just five minutes.

WRIGHT: Just one. Go back to you being Deputy Director. You mentioned that you deal with the budget and you deal with technical issues, sometimes personnel issues. You brought your expertise from that leadership, from your astronaut days, into this role. Can you figure out which one you need more than others to do your job successfully? What skills seem to take charge compared to the other ones? Because they're so diverse, what you have brought into the job that you're doing now.

OCHOA: Yes. So partly I think it's making sure that you listen to other people. So we have really talented people who head all these organizations, then they have talented people that work for them. So I think part of it is making sure that you're taking advantage of that expertise. You don't want to come in with the assumption like, "I understand how all this works, and I can just make a smart decision." Now there are probably some people that would say I ask too many questions, or I ask for too much data. I'm a little bit on the side of the more data I have, the better I feel I can understand the issue. Sometimes I have to step back a little bit and realize okay, I probably don't need that level, but that is a little bit of how I get the information. I ask

questions, and I try to get the folks that really work in this world day to day and have worked in that world for a large part of their career to be helping me understand the situations, helping bringing me options. It's incredibly helpful when you have people who know that their job is not just to bring you problems but to bring you potential solutions and options. That's the kind of people we have here. So that definitely helps as you're trying to manage the overall situation.

WRIGHT: I'm sure rewarding to know that you've got those kind of resources.

OCHOA: It is. Yes.

ROSS-NAZZAL: Well, I think we're coming close to the end of time today. Is there anything else you think that we should cover as Deputy Director?

OCHOA: I don't know. Nothing I can think of right at the moment.

ROSS-NAZZAL: All right. Well, thank you so much for your time today. We appreciate it.

OCHOA: Yes, you're welcome.

[End of interview]