

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

ELLEN OCHOA  
INTERVIEWED BY JENNIFER ROSS-NAZZAL  
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ROSS-NAZZAL: Today is December 12, 2017. This interview with Dr. Ellen Ochoa is being conducted at the Johnson Space Center for the JSC Oral History Project. The interviewer is Jennifer Ross-Nazzal. Thanks again for taking some time.

OCHOA: You're welcome.

ROSS-NAZZAL: [I know] things are busy, but I appreciate it. I wanted to talk today, as much as we could, about Harvey, which was in August.<sup>1</sup> It was anticipated to hit Houston, and it was expected to be a major rain maker, so I was curious how senior staff was preparing for this hurricane to hit Houston.

OCHOA: We prepare for hurricanes every year, so we have a hurricane plan across the Center, and we generally have an exercise, the senior staff, about responding to a hurricane. Then more of our emergency ops folks do a more extensive exercise every year. We had already done that. We do that so that it's complete by the time hurricane season starts. Really the planning is more or less done ahead of time in terms of what people need to do.

Any time a storm comes up, you have to look at what are the particulars of that storm. For example, in this one, it wasn't anticipated that we were going to get high winds, and we did

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<sup>1</sup> Harvey hit Houston on August 26 and brought significant rain to the area.

not. Because of that, we weren't as concerned about things like losing power or about needing to make sure that people were not on site.

For example, we did not activate our backup MCC [Mission Control Center]. We continued to operate our MCC here, realizing that probably the biggest issue was going to be the ability of people to get on and off site, which was exactly the biggest issue. When people came on site, especially Saturday, they came with the idea of, "I may not be able to leave." They brought changes of clothing, and they brought something to sleep [in], and that turned out to be really good, because we did need to use that.

Certainly the flooding was more extensive than people thought a day or two ahead of time. Some of our folks that work in Mission Control were planning to use astronaut crew quarters to sleep, then just go back over to the other building, [Building 30]. But you couldn't really get between those buildings at the height of the storm, so people just camped out in MCC, never really left the building at all, and were using air mattresses in one of the other Mission Control rooms. But we never had any issue in terms of power or systems working.

ROSS-NAZZAL: Were you here in Houston as preparations were ongoing?

OCHOA: Yes.

ROSS-NAZZAL: You obviously were not with the ride-out team.

OCHOA: No.

ROSS-NAZZAL: You were at your home.

OCHOA: Yes.

ROSS-NAZZAL: How often were you in touch with the team? What were they sharing with you?

OCHOA: As a senior staff, we have two phone calls a day. We can do up to four. We plan 10:00 a.m. and 4:00 p.m., and if needed 10:00 p.m. and 4:00 a.m., which we really didn't need to do. We did end up shifting the time a little bit. After about four [or] five days we ended up going to once a day at 8:00 in the morning, and that's because people wanted, at that point, to start helping people recover. They were going to be going out to people's houses, and 10:00 a.m. and 4:00 p.m. wasn't a good time to call, because they were already away from their homes.

When nobody was going anywhere, that was good, and then of course there were e-mails in between if there were things that came up, and Joel [B.] Walker was posting on JSC SOS [JSC Emergency Management website], so senior staff could see it, and of course anybody else could see that. I signed up for the texts as well, so any time there's a message that goes out I could see that. There were some that did go out in the middle of the night, "We're closing Gate 1 because we've got to bring the guards inside," and things like that.

ROSS-NAZZAL: What were some of the big issues that you talked about during that time?

OCHOA: It was mainly trying to understand the situation, what the [impact to the] site was, and any interruptions to operations. We were able to keep ISS going. It wasn't really an issue with

that, but of course we just kept checking to make sure. Some people had to work multiple shifts instead of going home, because other people couldn't get on site. But we didn't really have any issue with supporting. We were in the middle of the James Webb Space Telescope test. The chamber was fine, and the test continued. We did have a number of water leaks in that building coming in through the roof, which was affecting the area where the test team was, so they got creative and took sheets of plastic and built up some shields so that it would protect their console area. At some point they needed to switch out people as well.

We did have one operation that we did end up shutting down. We had four people in our HERA facility, Human Exploration Research Analog. It's a module where they were doing a simulated 45-day mission. The people inside the module were fine, but the team that supports them, they had issues. You couldn't switch out people, because people could not get on or off site, so we did end up shutting down that particular one. We put the "crew members" up in a hotel just across the street and made sure everybody was safe. We wanted to make sure that team members who hadn't quite prepared weren't trying to get in to support the mission. That was the only thing I know of really that we had to cut short.

One of the other issues is we needed to get our G-V aircraft on its way to Kazakhstan. I think originally it was supposed to take off that Wednesday. The aircraft itself was fine, but you couldn't get the aircraft maintenance people in to prepare it for flight, because you couldn't drive around Houston. So we couldn't get it prepared on the day that we needed to get it prepared. Our Flight Ops Directorate spent quite a bit of time working with the ISS [International Space Station] Program looking at different options, and in the end we were able to leave about two days late. Instead of going all the way to Kazakhstan, it went to Europe, to Cologne, Germany, and the European Space Agency actually provided an aircraft asset in Kazakhstan. They were

able to get our crew from Kazakhstan to Europe, and they were able to do the medical data collection there in Germany, then get on our aircraft, and come back here and finish up the rest of the data collection.

We were concerned with not losing the science that happens right after crew landing and in the first 24 hours after crew landing. They ended up working out a good plan, and everything went well, but trying to get a crew back in the midst of all of that was a little bit interesting as well.

ROSS-NAZZAL: It sounds like a lot of negotiation.

OCHOA: Yes.

ROSS-NAZZAL: I imagine you were communicating quite a bit with the Acting Administrator [Robert M. Lightfoot] as well about what was going on.

OCHOA: Yes. After we'd do at least one of our daily phone calls, I would usually send him a note, just giving him a summary of what was going on on site so he'd be up to speed.

ROSS-NAZZAL: Were you also talking about what was happening with employees? At that point did you have a sense of what might be happening?

OCHOA: Initially we were trying to get accountability of all of our employees, and that was one of our highest priorities. When we got to that point certainly let him know that, so that he at least

knew the situation. It was a little hard to get actual numbers of people whose homes had flooded, but we knew there were lots of cases of that, so [I] just tried to let him know, “Yes, we have a number of employees, contractor and civil servant, whose homes are flooded and who were rescued by boat,” and that we were trying to follow up on that. But at least let him know that we had at least accounted for all of our employees.

ROSS-NAZZAL: How did you account for them? I think after Ike there was a big push [for a new emergency management system].

OCHOA: Yes. Every organization has their—it’s either an e-mail tree or a phone tree that ends up reaching out to all the civil servants.

ROSS-NAZZAL: When was the first time you had a chance to finally come back on site? What are your memories of what you saw at the different locations?

OCHOA: It was Tuesday afternoon. That was really the first time that the roads were clear enough, that I felt confident that I could get from my house to site. I live pretty close, so that’s helpful. In talking with Joel Walker, the recovery team was meeting that afternoon on site, a small group of folks. The plan was that the next morning, Wednesday morning, they were going to have all of the facilities managers, or at least all the ones who could make it to site, come in and start inspecting all the buildings. I went over on Tuesday. I went and talked to the small recovery team that was in the midst of preparing for this larger group to come. The recovery

team had really been here the whole time trying to fix roof leaks and trying to make sure everything was okay. I met with them. I went into MCC and talked to folks there.

I went over to the James Webb Space Telescope area and talked to the test team there. They were working on trying to get liquid nitrogen deliveries. That was something that they needed to do to continue their test. Of course that was disrupted for a few days, because you couldn't get around on the highways, but they were able to find an alternate vendor who was closer. I think Wednesday is when they got their first shipment back on track for that.

Then I came over again Wednesday morning and met up when all the facility managers came in. They all got briefed about what they needed to go do. I was there for that meeting. Checked back in with MCC and the James Webb folks.

Then we started to prepare the Gilruth [Center]. At first we were thinking of using it as a refresh station, as a place for people to go if they needed things that they didn't have in their own place. Of course a number of people were displaced, but we didn't really end up needing it so much for that. During Ike, the whole area was without power. We were able to get power up in the Gilruth, and it was a huge help because people could go there, get power, and take a shower. We had good water, we had good power when a lot of the area didn't.

In this case, for anybody who wasn't flooded out, almost everybody had power and pretty much everybody had water. So it really morphed more into how can we use this space to help the people who have been flooded out. We ended up really making it more of a donation site, so in the latter half of the week [we] had the ability for people to come in and bring all kinds of donations, whether it was food or cleaning supplies. We had folks there who were really trying to put together work crews to go to people's homes and help them clean out.

ROSS-NAZZAL: I was going to ask about lessons learned from Ike. Obviously that was one of those lessons learned.

OCHOA: Yes. What you try to do is [think about two questions]: what do our employees need and what can we provide them that will be most helpful.

ROSS-NAZZAL: The Center, originally I think you closed for one day, and then there was a decision made to close a second day, and then finally for the week. Can you talk about that decision and how that came about?

OCHOA: That's one of the things we just talk about on the telecon when we get together as a senior staff twice a day. "Okay, what's the situation of the Center right now? What's the forecast?" Then how does that play into the Center reopening?

I think it was—I'd have to look—Tuesday when we made the decision not to open until the following Tuesday, which was the day after Labor Day. It was based on a lot of things, and in the end definitely the right call. We were going to have to inspect every single space on site. We were going to have to do a number of repairs. They were mainly from roof leaks. We did have water coming up from drains in bottom floors because the back pressure was so high, and we did get flooding in the Sonny Carter Building, so that building was taken out of commission.

We knew it would take a while to do all of the inspections and then to get everything back into a place where when you invite your employees back on site they can actually go to their work area and get productive work done, and it's a safe area and they're able to use it. That was a big part of it.



There were so many areas still that you could not drive around, and it wasn't clear for a while how long it was going to take [to dry up]. There were no airports operating at all until—I think they started coming back up on Thursday, but I don't think they had a full load of flights till at least Saturday. Again that [decision to close] was mainly based on you just couldn't get around Houston. The workers couldn't get to the airport. It was the same here. You couldn't necessarily get to and from the Center; there were just too many areas where the water was too high.

Finally, the other consideration was the people who weren't flooded out wanted to help the employees who were flooded out, and [they] wanted to take those days at the end of the week and over the weekend to be at employees' homes and help them, because it's just a horrible mess. You have to take every single thing out, and it's just gunky horrible nasty work. You need about 20 people at every house to really do it. That's what our employees wanted to focus on for those few days rather than it's time to show back up at work, other than the things that we had to keep going, like Mission Control and James Webb. That all played into it. I think that in hindsight you always say, "Did we make the right decision?" I would say absolutely yes, we did.

ROSS-NAZZAL: So many people in our org tended to be well-off, but then there were those few people [whose] homes were just completely underwater. Hopefully your home was not one of those.

OCHOA: My home was not impacted, so I was fortunate and I was able to try to see what else I could do to help.

ROSS-NAZZAL: It makes life much easier when you don't have to completely recover and be at work. We talked about providing needed supplies for employees. Was there one person that was pushing for that? Or was that all senior staff?

OCHOA: We put a whole process in place where we would send out notes about what people could donate, where, and when they could bring it by. Then we had an ability for people to call in and say, "I'd like a work crew to come by," or something like that. We had folks out at the Gilruth who were taking all the phone calls and logging all the needs.

Randy [Randall T.] Suratt was really helpful in that and Debbie [Deborah L.] Denton were two of the folks that were helping out there. Lynnette [B.] Madison was there. They put that process in place.

ROSS-NAZZAL: You had mentioned how Joel Walker was putting out these feeds for employees. Would you talk about the use of social media and other technology to keep employees apprised of what was going on here at JSC and decisions that were being made?

OCHOA: Yes. We do have a Twitter account, and you can also sign up to get these messages by text from the JSC SOS account, which is really designed just to tell people about the condition of the Center. That's the one I was mentioning that Joel Walker was populating pretty frequently during the storm.

Then there's an actual Web site, [jscsos.com](http://jscsos.com), which is available outside the firewall, which was another lesson learned from earlier hurricanes. When you don't have power or you don't necessarily have access to the network, you still need a way to check on the condition of

the Center and whether it's open or closed or what the situation is. So we have a Web site that people can go to and check on the condition of the Center. That way it's another way for them to get information about when is the Center reopening. Or, if I'm a facility manager, have I gotten the latest information about when I should be showing up. There's information about the roads right around JSC. Can't really do all the roads in Houston, but there are other Web sites for that. But at least to let you know right around JSC what the situation was.

ROSS-NAZZAL: Yes, I found that really helpful actually, was on there quite a bit trying to keep up with things.

OCHOA: Good.

ROSS-NAZZAL: Can you talk about the amount of damage that JSC sustained and really what the cost will be and how that will impact the budget?

OCHOA: As I said, lots of roof leaks, and therefore damage inside. Whether it was an office or some other type of room where the roof was leaking, quite a bit of it was associated with that.

We've let [NASA] Headquarters know what we think the right amount of money is to recover from that. It includes both what we spend on repairs as well as a couple larger buildings that we think actually need new roofs, so that if you would have another rain event you would feel a lot better that you would not have these leaks. You have to separate those things. We provide estimates of that to Headquarters, and then they work it through the legislative process. There's nothing yet that's been allocated to NASA or as far as I know actually any damage to

any federal facility. All of the moneys that Congress has designated so far have been directly to FEMA [Federal Emergency Management Agency]. We hope in a future allocation that there will be some for repairing federal facilities.

In the meantime, of course, we've made the repairs that we need to. They get it back to a safe configuration. What they don't do is necessarily protect you for the next time you have a big rain event.

ROSS-NAZZAL: This money then comes out of the M&O [Maintenance and Operations] budget?

OCHOA: Yes, the M&O.

ROSS-NAZZAL: How will you balance that with the Center's needs?

OCHOA: Other work that was going to go on, other maintenance work or other preventive maintenance, that falls by the wayside, because obviously you've put a premium on doing this work.

ROSS-NAZZAL: I was at a meeting the other day, and they mentioned some of the demos they planned to do they weren't sure if there would be funding available. I presume that's where the money came from.

OCHOA: I don't know if it was specifically that account or not. But yes, at a larger sense it's all the same account.

ROSS-NAZZAL: You and some of the astronaut corps went up to NRG Stadium.

OCHOA: NRG Center, yes.

ROSS-NAZZAL: Would you talk about that and why you thought that was important?

OCHOA: Sure. As you were watching the news, there were obviously lots of different efforts to address the morale of people who had been flooded out and were now at some sort of temporary shelter. Of course there was a big one at George R. Brown [Convention Center]. There were so many people going there that they ended up opening this other one at NRG Center that nonprofit BakerRipley was putting in place. I had seen in the news—various sports people had gone there. NASA is part of the community, and astronauts are a visible part of NASA, so it just seemed like it would be a good thing to go see if we could go talk to some of the folks up there, both the people staying at the shelter as well as the volunteers who were there working, or the first responders who were there working.

I think we got five of us or so to go up. Was that on Sunday? Either Sunday or Monday. Can't remember.

ROSS-NAZZAL: Trying to remember from the *Roundup*.

OCHOA: Can't remember which day. It might have been Monday, which was Labor Day. It was either Sunday or Monday. Five of us went up and spent a little bit of time down there. Talked to

some of the people who were working there, talked with some of the people who were sheltering there. They had an area for kids who were sheltering there, and so we went and talked to them for a little bit.

ROSS-NAZZAL: They probably really enjoyed that.

OCHOA: I hope so, yes.

ROSS-NAZZAL: I would think so. One of the other things, you mentioned first responders. I had seen in the *Roundup* that there were some law enforcement officers that were provided a tour here at JSC.

OCHOA: Yes. They were from seven different police departments and sheriff departments from other parts of Texas in addition to here in Houston.

ROSS-NAZZAL: What was the idea behind that? How did that idea coalesce?

OCHOA: I actually don't know who was the one that invited them. I think some of our folks who work in our emergency ops probably reached out to them and said, "Hey, since they came here to Houston and helped out Houston, we'd like to offer them a tour." Of course we're always happy to do that.

ROSS-NAZZAL: There was an event on October 24<sup>th</sup>. It was the hero of Harvey event, and you gave out ice cream and cookies. I saw a lot of senior staff outside. Would you talk about the idea behind that event?

OCHOA: Yes. We were just trying to figure out how can we help thank folks here at JSC who helped other people in our community here during Harvey and of course in the aftermath of Harvey. So the ice cream was for everybody in the community, but we did try to reach out and make sure that we thanked people who had done certain efforts as well. We had little pins [for the] heroes of Harvey, the Power of One pins. It was just a way of thanking and recognizing folks for pulling together and helping out fellow members of the JSC community.

ROSS-NAZZAL: Are there any lessons learned from this event that you would put forward for your future Center directors?

OCHOA: Oh gosh, there's always lessons learned. I think we came up with a list that we have going forward. But each storm is a little bit different, so what I would say is I don't think there's anything big. I think we have an idea of how we need to respond to certain events, but each one is a little bit different. I don't know that there was anything big, but there's always little things. "How could we have been a little bit better prepared to put together the work crews?" or something like that. But overall I think we did a fantastic job.

ROSS-NAZZAL: I thought it was interesting because on our contract we were asked to start getting prepared for the event, but I don't recall that the Center ever moved toward those levels of preparation.

OCHOA: We ended up, I guess it was Friday afternoon, sort of shutting down. We never really shut down the e-mail system or really said, "Hey, you're on your own," simply because we weren't in a situation [where] we were expecting to lose power or where people were really going to be leaving Houston. They were just leaving the Center to go to their homes in most cases. It was quite a bit different than Ike and when we evacuated for Rita. You're always trying to make the right call just based on the circumstances.

As you know, Houston as a city never evacuated, which would have been a nightmare if you'd tried to do it. You would have just seen thousands of cars swept away, I think. It was really more about hunkering down in your home, and then obviously there were a number of people that had to be rescued. But I don't know that there was any way to avoid that. We had 43 inches of rain here at JSC in what, three or four days, and as much as over 50 in some areas of Houston. There's just no way where you have a storm like that where people aren't impacted. They really tried to minimize injuries and deaths, and I think overall the city did a fantastic job in doing that.

ROSS-NAZZAL: Yes, I know there's been criticism of the mayor about not evacuating; it's been a big discussion.



OCHOA: That's only by people who have never participated in an evacuation. They don't realize what it means till 4 million people get on the road. That's crazy, especially when the rains were going to start. It would have been a parking lot on the roads. You know how the roads flood. People were much safer in their homes than out on the roads.

ROSS-NAZZAL: A lot of those people weren't here for Rita. I do remember that, being stuck [on the interstate].

OCHOA: Exactly, yes.

ROSS-NAZZAL: I wasn't sure if there was anything else about Harvey. I didn't have a lot of information, just looking through the *Roundups*.

OCHOA: I don't know. Our team pulled together, they did a great job, made sure we continued with the operations that we needed to continue with, and I think are continuing to try to help out those people in our community who are obviously still in a situation which is—their whole lives have changed. If you've lost everything in your home, that's not something you recover from quickly. I think it's very very difficult for those people.

ROSS-NAZZAL: Absolutely. Just finding skilled employees to come work in your house, that's extremely difficult.

OCHOA: Yes, when there's 150,000 people that need them, or more than that probably.

ROSS-NAZZAL: Oh, absolutely, yes. We called somebody during the storm, and I think we'll see him this spring, maybe; it's crazy.

I just have some miscellaneous questions that I had come up with. One of those was establishing a spaceport out at Ellington [Field]. I wondered if JSC had played a role in that decision. I know we have a Space Act Agreement. Maybe the benefits for JSC [of] having a spaceport.

OCHOA: Yes. It wasn't our decision, this was done by the Houston Airport System, and so they are the ones that wanted to move ahead with that. They're the ones that applied to the FAA [Federal Aviation Administration] for a license. Of course we talked to them, and they did want to partner with us in some way, shape, or form, because they want to make the whole area around Ellington more of an aerospace hub, which I think has advantages for Johnson Space Center. They worked with our Partnership Office.

We did sign a Space Act Agreement, and the first part of it was for as needed, for us to provide safety training for companies that might come in to be part of that aerospace hub. Training in things that we know how to operate, like hazardous propellants or other types of hazardous testing associated with aerospace that we're quite familiar with. It was really just to say, "Hey, we're prepared to do that, as needed, and to just show support from NASA as the large aerospace hub that's already here."

ROSS-NAZZAL: I was curious if that tied in at all perhaps with commercial crew in any way.

OCHOA: We're not going to be launching or landing crews here for the International Space Station. But certainly one of the companies that is interested potentially in using the spaceport is Sierra Nevada, and we do work with them on the commercial cargo contract. We're not doing vertical space launches here, but you can imagine some other type of launch. What they were specifically looking at is using Ellington as a potential landing site, so they might launch from somewhere else [and] use it as a landing site.

At some point, once they're actually doing regular runs to the Space Station, they might be able to land here and provide some of our payload return materials directly to us. They'd just be down the road a few miles as opposed to SpaceX, [which] lands out in the Pacific right now. They're doing a good job of getting some items back to us within 24 hours, but you can imagine literally within an hour or two getting some of the medical samples and other things back to us much more quickly. So that is something Sierra Nevada will be exploring. They have worked with the spaceport.

ROSS-NAZZAL: It seems very interesting, just down the road here from us. We talked in previous interviews about JSC 2.017. I noticed that that had been updated at least since the last time I had looked at it.

OCHOA: We do try to update it every once in a while. I think we're getting ready for another update.

ROSS-NAZZAL: I was wondering about that. Are you working on JSC 2.018 and some of those plans?

OCHOA: Yes, we are. We had a senior staff retreat last Friday, and then we're going to meet again in January and finalize our thoughts. Part of it was reviewing what we had done this year, and in some of the areas did we want to continue, or do we have some other themes that we want to look at for 2018. We'll probably be rolling that out in January. In fact, I have an all-hands scheduled for January 19<sup>th</sup>, so we'll be talking more about that.

ROSS-NAZZAL: I wanted to ask about EM [Exploration Mission]-1. There was a decision made about putting a crew on that mission, and NASA decided that they wouldn't be putting a crew on there. Were you part of that decision? Were you included in those discussions?

OCHOA: Yes, absolutely.

ROSS-NAZZAL: Would you talk about that and the pros and cons?

OCHOA: Sure, yes.

ROSS-NAZZAL: I know there's a lot there.

OCHOA: John [A.] McCullough from the Orion Program here at JSC is the one that led the whole study for the Agency. Of course we had a number of people that provided inputs, but it was really looking at what are all the major items that would need to be changed in our planning in order to support that, and then what is our assessment of the added risk, putting crew on that,

given that it would be the very first flight of SLS [Space Launch System] and Orion together. I thought they did actually an amazing job in a short amount of time of really pulling together a lot of information.

Yes, it would have added to the risk of what we were looking at for EM-2, but in a way we felt given some actions that would have come out of it, if we had decided to do that, some things that we wanted to follow up on, assuming that some additional analysis and testing that we had identified came out positive, then felt it was a risk that we could probably accept.

But the thing is, it was going to require extra money this fiscal year, and it was really going to require acceptance by a new administration to buy into this new plan. We don't have a NASA Administrator. Obviously we have an Acting Administrator, and Robert is very forward-leaning and is certainly willing to make a decision. But it's difficult at a time when you didn't have an Administrator that was put in there by the administration. We hadn't had a meeting yet of the National Space Council. In a way, there wasn't really somebody set up to weigh that and say, "Yea, verily, this is what we want to do."

We did learn a lot of things from that. One of the things that came out of that was that we did end up moving the other test flight that needs to happen before we fly crew on board, which is Ascent Abort 2. We ended up moving that earlier. That was just one of the things that came out of the study that said what are other things that we could do even if we don't fly crew on EM-1 to make sure that we're getting crew on EM-2 as soon as we possibly can.

We flipped the dates of AA-2 and EM-1 a little bit. So AA-2 will actually be the next test flight for Orion. That's of course testing the launch abort system of that. That's exciting for JSC. Obviously this is an Orion test flight, but the way AA-2 is being managed is that JSC engineering is responsible for delivering the crew module and the separation ring for that test,

and so we'll actually be getting the structure for that here on site next February. We'll get to see that built up and assembled for the test during 2018 for a flight in April of 2019.

ROSS-NAZZAL: Was there any political push by the current administration to see that change happen, to put a crew on that mission?

OCHOA: That was part of where the question came from, yes. They asked us to look at that.

ROSS-NAZZAL: Did you feel political pressure though that that was something—how can I put this? That the Trump presidency wanted some sort of win, I guess, for the administration? That this would be great for him, look, we've got a crew that's going on a rocket? I'm just curious if you felt that.

OCHOA: What I would say is we were asked to assess it, and so I think we did a very thorough job of assessing it. As I said, I think there was a feeling that we could have done it. It did depend on some future work to mitigate some of the highest risks, which just as you do with any program, as you get into that, as you do analysis and testing, there was the possibility that you had less margin than you thought, and that you might want to change your mind at that point. But we're always doing that kind of risk assessment through any program, right? Really wasn't going to be outside of the normal processes that we do.

ROSS-NAZZAL: We talked a little bit about not having an Administrator. What impact has that had here on JSC? Has it been minimal or has there been a significant challenge for you?

OCHOA: I think it's been minimal. We have a lot of work going on right now, and so we've continued that work, and we feel that we know what we need to do. Now there's always the possibility that when you do get a new Administrator and you have that person again working with the National Space Council, they may ask you to be doing something different. Based on the very first Space Council in October—there was a signing of a directive [White House Space Policy Directive 1] yesterday, but they really sort of announced it in October. We want humans to return to the Moon, and we want to take the asteroid part out of the national space policy. That was something that came out in October, which was actually not unexpected.

It didn't really change very much about what we were doing. Obviously we had some focus on the Asteroid Redirect Mission, but we didn't have a lot of resources on that, and there were a number of things the Agency overall was working for that mission that still play into our plan forward, including solar electric propulsion.

It was really only the actual capture mechanism and some of the other things that really didn't need to continue to move forward once they said that. Most of what we were doing moved forward as far as we know under this little bit of new direction, because we're looking at this deep space gateway concept, which would have some infrastructure in orbit around the Moon, and would allow for a variety of different activities either around the Moon or on the Moon, because it gives you some infrastructure to support people up there for a few weeks at a time and the ability to support robotics and other types of things.

We still need to understand when the budget comes out next spring. That's really when we get to find out is this still the plan going forward or is there a little bit different plan. But

really I think what we've been doing moves forward under this new administration. We've just been trying to meet our commitments this year and continue to work on all of those.

We've been busy working and making sure that we're meeting the mission that we have, and so because of that, I don't think that there is a huge impact.

ROSS-NAZZAL: Was there any impact with the transition of administrations? You've got a new President now. Did that have any impact on the Center itself? Or like you said you were just continuing with the path?

OCHOA: Yes, other than that from the beginning they talked a little bit about maybe more of an emphasis on the Moon and not continuing with the asteroid, and they made that pretty definite in October. But as I said, there wasn't that much that we needed to change based on hearing that.

ROSS-NAZZAL: The President did release his skinny budget, I think, and in that he did cancel the Asteroid Redirect Mission, and then he also canceled the Office of Education. Did that impact education here at JSC?

OCHOA: That was in the President's proposed budget. What really matters is what's appropriated by Congress, right? We have draft appropriations bills, but we don't actually have the actual appropriations bills. The draft bills did include money for education.

Given that there were some concerns about what NASA was doing and trying to make sure that what we do doesn't seem to duplicate what happens in any other agency, NASA Headquarters reformulated that office, and it's now called the Office of STEM [Science,



Technology, Engineering, and Mathematics] Engagement. So [NASA] really tried to focus the activities, and as we submitted a budget it was somewhat reformulated based on what we feel will be supported by Congress as well as we hope by the administration. We still have to really wait and see when Congress actually passes a budget this year what is in there for STEM engagement or education.

ROSS-NAZZAL: I remember when that announcement came out, seeing people trying to figure out what the next move was. Have you guys been preparing? I know for a while there there was a discussion about whether or not there might be a shutdown. Now we have an extended CR [Continuing Resolution] until three days before Christmas.

OCHOA: Right, yes, and they're working on another CR, which would take us probably into late January or something like that. Based on everything that we're hearing we expect that CR to go through.

ROSS-NAZZAL: Do you do any work in terms of senior management, or do you just let that roll and figure things are going to work out?

OCHOA: We take our cue from Headquarters. Headquarters takes it from OMB [Office of Management and Budget]. Really OMB was saying, "You really don't need to prepare for shutdown." Every agency has a shutdown plan, so we look at that once a year anyway just to see what differences there are. For JSC, the main thing that we update is what are the activities associated with the International Space Station that we need to make sure would continue if we

would go into a shutdown at a particular time. They look at the actual launches coming up and talk about what needs to be supported. The philosophy is all the same, you're not really changing your plan, but you are updating with specific vehicles and launches of what's coming up.

ROSS-NAZZAL: You think this might be a good place to stop?

OCHOA: Probably, yes.

ROSS-NAZZAL: Okay. Thank you very much.

OCHOA: You're welcome.

[End of interview]