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

CAROL L. WEBBER
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is July 13th, 2016. This interview with Carol Webber is being conducted in Houston, Texas, for the Orion Oral History Project. The interviewer is Jennifer Ross-Nazzal, assisted by Sandra Johnson. Thanks again for taking time out of your very busy schedule.

WEBBER: Oh, no, thank you for doing this.

ROSS-NAZZAL: We really appreciate it, and we're looking forward to talking with you today. I wonder if you could share with us how you became involved in the Orion Project.

WEBBER: I'm trying to think what year it was. I didn't think about that. I was involved in the program from the beginning. For the contractor, the beginning is the proposal phase. Once NASA put out the draft RFP [Request for Proposals] and the RFP, I was involved from that instant. I think that would be 2004, 2003, somewhere in there. I was on the Lockheed proposal team studying what NASA was interested in and how they wanted to, even back then, change how they were doing business from lessons learned from Shuttle. [I was involved in] the other development programs and the studies on how to replace Shuttle dating back to 1978. … This [program] was intriguing because it looked like NASA was very interested in making this development program really take off.

If you looked over the history about 35, 40 years, each Shuttle replacement program ended up only going into Phase A and then being canceled for the most part, not every single one but most all of them. There's actually a poster in the Senate-House Committee that illustrates that view of all the development programs. I was interested in driving something through development into production as the pinnacle of my career.

Cleon Lacefield was the Lockheed program manager to begin with. He asked me to get involved with him. He and I had worked together on X-33 and over the years. I had a pretty strong background not only in the Shuttle and External Tank Programs but also in development programs in general and new technology.

That's how I got involved in the program. I was very interested in being a driving force in it, and that was the role that Cleon and I discussed I would have, in the event we would win the Phase I study and then Phase II going into the DDT&E [Design, Development, Test, and Evaluation].

ROSS-NAZZAL: What did you guys initially propose for that first phase?

WEBBER: Another interesting thing, Admiral [Craig E.] Steidle had a vision [for the program, and] I was very familiar with that from the work I did within Lockheed on JSF [Joint Strike Fighter]. He was trying to model some of the elements [from] the acquisition strategy for JSF [when he was with the] Department of Defense. After we submitted our proposal, there was a change with Mike [Michael D.] Griffin coming in and discussions between him and Steidle. So they wanted to throw it out and start over. These proposals are a huge amount of effort. I think

each of the contractors tried to step up and point out how [the Phase I RFP provided NASA with flexibility to modify any key elements without completely starting over].

Luckily for everyone, that's what they ended up doing. They evaluated the proposals. We were awarded Phase I along with the Boeing-Northrop Grumman team, so that was nice not to have to redo all that. It's a lot of work.

ROSS-NAZZAL: I had also read that I think it was in 2006 Mike Griffin—or maybe it wasn't Griffin. The Orion Program came out with some specifics about what they wanted for the crew cabin itself. Would you talk about that and how that shaped your vision for Orion?

WEBBER: There were a lot of things that came out.

ROSS-NAZZAL: I think this was after Phase [II]. NASA came out and made an announcement that they were looking for specifics about the cabin. This was the first time that they were looking for those things.[1]

WEBBER: In the Phase I study, first of all they wanted Orion to be easily upgradable; they wanted technology roadmaps, which is smart. You're not just building a spacecraft for a few flights. You're building an Enterprise Program. It's multiyear, like Shuttle, but you want to plan it like an airplane, with planned upgrades and planned technology insertion points, because over the course of 30 years on Shuttle, look how much technology changed. Computing technology,

[1] For the first time, the Phase II Request for Proposals specified a configuration for the spacecraft: an improved, blunt-body crew capsule shape. For more details see http://www.nasa.gov/home/hqnews/2006/jan/HQ_06026_CEV_RFP.html. Unfortunately the RFP is no longer available online.

electronics change so quickly in our world today. I think that was absolutely a spot-on strategy to have the spacecraft easily adaptable to the future. They made that very clear.

They also made it clear that they wanted each contractor to explore the latest state-of-the-art technologies. For the crew cabin, they wanted certain things for the crew, all based on lessons learned from Shuttle, which is again totally understandable. However, some of those requests were looking at two things specifically. One was in Phase I, which was the latest in application of materials to building the crew cabin and minimizing cost. I would say again, as part of the acquisition strategy driving a design, an architecture that was affordable and upgradable was the foundational piece of the program that I think was pretty spot-on. I'm trying to think of what specifically you're referring to, but we were all tasked to look at different materials systems, not just the crew cabin but the entire spacecraft, the latest technologies, and how they would apply or not apply.

There were certain trade studies done in Phase I, and of those trades I think two were highly revisited in Phase II once we were awarded Phase II. So now you're down to one contractor. We essentially repeated the trade study for the all-composite crew cabin, and validated and explained why that would be a higher risk approach for the crew given the state of the technology. Then the second area we revisited, where we did make an architecture change, was the overall avionics and power system for the spacecraft. In that area we did come up with an architecture and leveraged the next generation state of electronic systems, highly densified electronics for Orion. That is one where Mike Griffin had certain ideas, and then we had leveraged some folks in our corporation, brought them into the trade study, and they were able to explain to Mike how some of his assumptions in that area were not as applicable or wouldn't be in the best interest of the spacecraft as some other solutions.

We came up with what they call the PDUs or the Power Distribution Units for the spacecraft, and actually the Orion spacecraft is flying the very next generation of electronic systems and power on board, so that's a result of that. Mike did a great thing pushing everyone. The composite crew cabin obviously we did not pursue, as it's not the right application for that technology yet.

ROSS-NAZZAL: It sounds unusual having the Administrator be so involved technically. Would you talk about that?

WEBBER: I think you probably have plenty of NASA people who can talk about that. I think Mike is just an engineer who's just extremely brilliant, and he had a vision. One can say dating back to Wernher von Braun, he had a vision for the entire space program and was technically, extremely, involved in setting that vision. I think Mike was maybe about as close as we've seen to that. To be in that position, I think he just couldn't help but take an active role, because you are setting not just a one-of spacecraft, it's a multigeneration enterprise. I think with so much at stake for NASA and replacing Shuttle, I can understand where an engineer—it's very hard if you're really good to just let go of your insights and not weigh in with the team, which he did, so I totally get it. Not a usual thing.

ROSS-NAZZAL: It just seems very unusual to me. They seem to be more bureaucrats than engineers. Would you talk to us or tell us about that moment when you guys found out that you had won the RFP?

WEBBER: We were not slated to win. In fact we were given a call the day before or a few days before from a company that manufactures hats and T-shirts, I guess. They had gotten a big order from the Boeing-Northrop team and wanted to know if we wanted to place a similar order. It was a huge order. We just politely thanked them for calling and said, "No, we're not ordering anything right now."

We had worked very hard in Phase I. We worked very hard before Phase I to put together a proposal addressing what we thought would be good for the nation, for the mission, for NASA, and answering the RFP. In Phase I we worked very hard on all the trade studies. I think we had put together a really strong team. When you live and work in this industry, it's pretty tight. We were not viewed as the human spacecraft strong team. The human spacecraft expertise was more on the Shuttle side, and that was definitely the Boeing part of the Northrop-Boeing team. …

However, we did have key folks on our team that had that insight and many folks with very solid backgrounds and strong technical expertise. I think when we found out that we won, we all sat in this conference room across the hall from us, and it was a nail-biter for us; I'm sure it was an equally [tough] day for the other team. On the contractor side, when you put your energy into winning, you're basically not stopping. You're working 24/7, you're really trying to put forth all the best ideas.

As great as we all felt in that room, we were also pretty sensitive to [the other team that lost and we did not want] to [celebrate in any public area around Houston]. … [Instead], we went to Cleon's house to celebrate [in private. It was a thrilling day, one we won't ever forget. Big Victory for our team that day.]

It was a pretty awesome moment. Cleon retired a couple summers ago, and we actually put a videotape together that had snippets of that moment in the room, photographs and video. Somebody had taken a video I guess of us all sitting in there, just waiting for the announcement. It was pretty awesome. It's still pretty awesome, even 10 years later. Pretty cool.

ROSS-NAZZAL: I'm sure a lot of pride at that moment.

WEBBER: Absolutely, day-to-day is always hard. Your jobs are hard. There are days when you wonder, maybe you'd be happier as a Walmart greeter. It's just something spectacular to be part of a project where you're putting humans into space, especially when we're headed to deep space. What's of concern? How you think about it. While we leverage all the lessons of the past, where we're headed is very unique and different. So far the experience we have towards our future is strictly with unmanned spacecraft, so leveraging that and trying to be smart about humans in deep space, where you can't just get to them and rescue them the next day, it's pretty daunting. It was a pretty exciting moment to find out we won.

It's even more interesting to find out how many people are still so jazzed up working. We have not let up really in 10 years. We still have many folks who work seven days a week and endless hours extra just because they're so committed to the mission and what they're doing, which is I think pretty rare. Maybe you have it in the medical industry, when you're saving a kid's life or something. I think much more rare in the technical industry. I don't think if I was working for a piping company I would be staying late hours, unless there was a big problem. I don't know. Probably an odd way to look at it.

ROSS-NAZZAL: No, that really demonstrates the commitment that you all have to this vision.

WEBBER: I think that's what stands out to me the most about this Lockheed and NASA team. [It's] just different. I've worked with NASA most all of my career, but this particular team is committed and driven on a level I think that's just different [and stands out] to me.

ROSS-NAZZAL: Why do you think that is?

WEBBER: I don't know. Don't get me wrong. We don't all get along all the time, but we also have a pretty safe ability to say, "I disagree with your approach," a safety net of arguing or disagreeing. I think maybe it's the commitment thing that's binding. Maybe it's because we were canceled, and we came through that together, maybe that's part of it. I do think it's just very different.

ROSS-NAZZAL: I did want to talk about that, but I wanted to ask you about that trade study that you won an RNASA award for looking at the different trades for the crew cabin. Can you share a little bit about those details?

WEBBER: Awkward. It was awkward.

ROSS-NAZZAL: How so?

WEBBER: First of all, nobody does anything [alone]. That trade study was more than a trade study. It was Mike Griffin almost directing Mark [S.] Geyer to implement a composite crew cabin. I had worked very heavily in that particular technology area for years. I knew the pros and cons, and I knew the pitfalls. To be directed to do it, I knew what that meant.

Again, we had a very small team work tirelessly for I think six weeks or eight weeks to put a package together just to lay out what it would take to do exactly what Mike wanted. I think we went about it in the right way; at the end, it turned his decision around. But to then have someone nominate you for an award because you overturned his decision, and he's sitting right there I think is awkward.

What was really awesome about Mike though is he was getting the big award that night, and he then mentioned in his speech why I won that award, why I was able to turn him around. That was pretty hard to turn him around on anything he was bent on. He was so funny and gracious about it, but it was awkward. How do you explain that to anybody? Even my kids look at the write-up and they're like, "You won an award for proving somebody wrong?" Yes. Awkward, especially when they're sitting there. He came up to me at this last RNASA and took a picture, and he said, "You're still the only person who's won an award for proving me wrong." I'm like, "And I still feel awkward." It's a weird story.

ROSS-NAZZAL: Yes, it's interesting. You did mention the fact that you got canceled. Would you talk about the impact of that decision? How did you find out that the Obama administration made that decision? Did you get a phone call? Or did you open the *Houston Chronicle* at your house?

WEBBER: No. February of 2010. I think sometime in—I can't remember when. Before it was formally announced, which you never know in DC, you get lots of feedback from lots of folks. People aren't supposed to talk, but there's always a groundswell, especially with big drama. We had been given a heads-up that it looked likely I think at the end of the year before, so about maybe four weeks before.

As soon as I heard that, I thought that we needed to be ready in the event they would propose that. [We had been engaged with and] listening to the Augustine hearings, so you knew it was headed in that direction. Although everyone else kept affirming, no, no, it wasn't going to happen.

Again, our management team got together on weekends and at night on our own time, and we started looking at if that did happen what would we do different. How could you offer taking all the work that had been done, and how would you repackage that so that the nation would have what it needed? NASA would have access to Space Station. We did that in preparation for the announcement. When we knew was when they rolled out the President's budget in the press conference. That's when we heard it and knew it was a real proposal.

At that point we probably went into high gear trying to figure out what to do next, because it is just a proposal the President makes. At that time Congress was enraged at not being aware. They had come out and said there was no way to get a spacecraft to Space Station by 2013, and that was not the case. We had put together the plan and the schedule that showed, if the nation wanted to, you could take Orion and you could get there. Our company put, I think, a one-page full ad out that day or the next day and said, "We believe in the mission; [we know Orion can deliver crew to the International Space Station in 2013, and] we believe in this for national security and United States permanence in space," something along those lines. If the

nation wanted to go to Space Station with U.S. assets, we can do it, and we can do it by 2013." That was just an unexpected [bold statement so publically] from a corporation like Lockheed Martin to step out and make, but we believed it. …

We started working with the Hill and Congress and with the data to show that Orion had a foothold into the future, if Congress and the President wanted to. That's where our work began, when that was announced.

ROSS-NAZZAL: What did you do until Charlie [Charles F.] Bolden finally announced MPCV [Multi-Purpose Crew Vehicle]? Were you just continuing to work on CEV [Crew Exploration Vehicle]?

WEBBER: We were still on contract. We continued. It was hard to focus the team then. I'm sure Mark Geyer went into great detail about that. It was tough, very tough. A lot of people stopped coming to meetings. It makes it hard if you're trying to evaluate a solution to something.

We told our team for the folks that could ride through the wave that this was politics, and politics make it hard to focus, especially if you think you're going to lose your job. On the contractor side, there isn't a guarantee that if this program goes away you have a job in the company. [This environment was tough to get the team focused], a little more challenging I think, not to minimize the NASA side by any means. I think it's hard to stay focused if you've been told you're done.

Our team, we met with them, and we told them what we were planning. Keep focused, keep working. We were still under contract; nothing had changed. The thing that we could do

that would be the most beneficial would be to maximize government dollars we were given to do the job. I would say for the most part our team, several obviously left the program and got other jobs, a lot of really good people left, but a lot of great people stayed. We got more focused and more driven than we had been previously, which you wouldn't have thought was possible because I think people were already pretty driven and focused.

That's what we did. We rolled up our sleeves. We looked at what we would suggest for recrafting the development program as an input to NASA, how to take some increased risk and reduced cost for the development program. We put that on the table for them to consider.

Meanwhile we just tried to drive the team and keep them focused and move as quickly as we could to maximize the dollars. You can't complain about the level of funding we had. It was a lot of money, and we needed to produce, in spite of what was going on around us. I think that's what we tried to do here. Keep the team moving and focused. We didn't let anyone sit around and feel bad about it. Just keep moving.

ROSS-NAZZAL: It's our understanding that as a result of the MPCV decision that Mark Geyer came up with this EFT [Exploration Flight Test]-1 idea and concept. Can you talk about that?

WEBBER: We expected the funding was going to be cut again. Like I said, we had been off trying to come up with a way to streamline the development program to meet the funding level we thought we would be told to work to. Mark had not come over and talked to us yet. I actually had gotten a small group of our management team that I thought were pretty forward-thinking and innovative, and we had them fly to Houston. We kept it pretty small, and then we just laid out a game plan of what we believed was possible and what we thought would be

essential to driving the development of the spacecraft to the next level in a very focused fashion. That's when we crafted EFT-1. July 28th, 2010, I think is the exact date.

After we did that, Mark came over to meet with Larry [Laurence A.] Price and myself to let us know. Cleon was on vacation. He wanted to let us know about the reduced funding, and what he thought would be the plan. We said we were ready to meet, and we had ideas. We put the EFT-1 idea on the table, and he listened. The great thing about Mark, one of many, is that he was very open to listening to new ideas or a different approach. We put that idea on the table and asked him to soak on it, and he did. Then we asked to have a small cadre of his management team sit with ours, and let's talk about what additional risk it would be to demonstrate the spacecraft.

EFT demonstrated all of the key systems, all the key elements. … Pretty daunting at the time. … We were told the odds were so against us, but then again we were canceled. We really, as a management team, believed this was the best path forward for developing that next generation. We all met and agreed as a management team to pursue it, and then it was a series of meetings after that to enable it. Then Mark said, "Yes, this gives the team focus. We agree with the repackaged development plan." It was a way for us to get maximum mileage out of the team focus. We're going to do this flight test and this timeline.

I think it probably sounded a little nuts back then. We were canceled, but we were going to go get our own rocket and demonstrate the spacecraft. Actually, it was I think almost a bit better development plan, because then you're on a known rocket with a new spacecraft. The spacecraft has been wrung out once. We're going on a new rocket with the spacecraft going the second time, and the spacecraft is what holds the human beings. It seemed like it worked in the spirit of burning down risk in a different way than they had originally planned. That's how we

came up with the idea, and until we were announced as MPCV and even after that it took a while. We had to ask our company to go at risk to put a down payment on the rocket, because those launch vehicles, they get allocated by different buyers. The Air Force has obviously got dibs. It's their assets.

We had to ask the company. We had to go through all kinds of hoops to get a hold on that particular launch vehicle for Orion, until NASA and everyone else approved, and then we had to find a way to cover the cost of it. So it was a lot of work. Mark Geyer and Cleon [spent] endless hours convincing external stakeholders and the management chain of the benefits, how we were going to do it, and how it would pay off for the Agency and for the rest of the SLS [Space Launch System]/Orion Program.

The beauty of EFT-1 was it wasn't an Orion flight test, it was Exploration Flight Test. GSDO [Ground Systems Development and Operations] had their role in it, Marshall/NASA [Space Flight Center, Huntsville, Alabama] with SLS. The upper stage is the same upper stage as they have on EM [Exploration Mission]-1. Their integration work, they had the adapter. A lot of stepping-stones for everyone that's involved in SLS and Orion in EFT-1, which was I thought the beauty of it. Everybody had that opportunity to get in and do the first run for the next one, which was EM-1. I think it was a huge payoff from that perspective.

ROSS-NAZZAL: What was your role in EFT-1?

WEBBER: Besides getting the team to come up with it in the first place, spearheading it through the system, my job back then was to really break barriers. I was staff to Cleon. Like the trade studies, if there was a big technical barrier or big issue, my job was to go tackle those. That's

what my role was. My title was program integration back then, but my role with that title was breaking barriers. There were areas of the program that got in a ditch, my job was to get them out of the ditch on cost, schedule, and technical, so that's what I did.

On EFT initially I was driving it, but I was doing some of the other things as well. At some point Geyer wanted more focus on EFT, and I was still working a lot with the Hill to keep the program sold, and so Cleon did not want me to just do EFT when we had EM-1 and EM-2 in the wings. We needed EM-1 to get going as well.

Roger McNamara was named the Lockheed EFT-1 lead, and I focused on helping him where I needed to and then really driving to get EM-1 and 2 going when no one thought they could go, because everyone was so consumed with EFT. …

ROSS-NAZZAL: Sounds like you wear multiple hats.

WEBBER: Yes.

ROSS-NAZZAL: Was there one significant challenge that you faced that you would point to at this point from EFT-1?

WEBBER: … Pushing the team, keep pushing in spite of the barriers. Then of course on the launch day what was really gratifying to me was to be at the party after the launch and have so many folks who were part of the nay-saying just come up and say, "This was all so worth it." You just felt like you moved the dial. It was a moment in history for the United States space program, for NASA, for the nation. … That was pretty cool, very cool.

ROSS-NAZZAL: Yes, you must have stuck your chest out a lot that day.

WEBBER: Not too much, because [we had] EM-1 [moving along in parallel with its own set of challenges. We all felt ecstatic that day.] … I don't think anyone who was part of it can describe that feeling into words very well. Gosh, launch day, seeing that thing go. Just absolutely amazing.

Then the flight was so near flawless. It was incredible. [It was more than a flight test], it represented a team that persevered against all odds. How cool [is that]! … That's what we had. People making a difference, and people not accepting what they're told. We were told we were canceled; we didn't accept it. We just said, "Okay, let's just get the facts on the table. Let's get our other perspective on the table. Don't accept something just because somebody says that's what they think." That's awesome. That's the ultimate American dream. Beat the odds. It's what you go to movies for. [Like the] movie, [*Miracle*, about] the [U.S.] hockey team. This [was our] time, [and we all went for it].

I think that's what we had our team do. It's our time to get this development spacecraft up and going and show what it can do. It was our time. With NASA and Lockheed together, let's all just go take it, in spite of what people say. That's cool.

ROSS-NAZZAL: So you'd say that was the biggest accomplishment of EFT-1?

WEBBER: Oh my God, yes. Absolutely. That was a moment, yes.

ROSS-NAZZAL: Do you think there's a time or a moment that you can say, "This was my most significant contribution to seeing that come to fruition"?

WEBBER: I think coming up with the idea in the first place and selling it to everybody, my management team, our team of workers, people who just stopped believing. I think that was my pivotal role. It's the biggest moment in my life, truly. Truly was. I can't describe it. Pretty cool.

ROSS-NAZZAL: You've talked about the fact that you were almost canceled. Were there other decisions that were made, like other policy decisions or budgetary decisions, operational decisions that impacted EFT-1 that you can point to?

WEBBER: When we were canceled, for everything we tried to do to keep the program focused, we did get policy changes on term liability that required us to shut down a whole lot of things to carve out money. There's some painful parts in there. NASA did business a certain way for 40 years, and suddenly these two big programs now we have to put the brakes on. There was a lot of politics going on between the White House, OSTP [Office of Science and Technology Policy] and OMB [Office of Management and Budget], and NASA Headquarters that were tough. Very tough on the team.

I can't really go into the specifics. I would leave that to Mark to describe. I think there's enough documentation out there that talks about how hostile and how toxic the environment was back then and how that bled into the teams and that made it very tough to come to work every day. Very tough to execute, very tough to keep our company believing they should continue

when the behaviors and the directions all seemed to point to why the company should just stop, when we weren't. … I recall Gene [Eugene F.] Kranz came to give our team a talk when we first got canceled. Maybe Mark shared this with you already. He talked about "Hey, this happened to us on Apollo. We had our day jobs doing the technical, and at night we worked the politics. This is just politics." Then after about three or four months I think Gene came back and he goes, "Yes, I've never seen anything like this in my life." Neil [A.] Armstrong came out of retirement. What does that tell you? That's how bad it was. …

ROSS-NAZZAL: You mentioned you spent some time on the Hill. Can you share some details about that experience with us?

WEBBER: We worked that pretty hard. Back then there were a lot of mischaracterizations of the program, mischaracterizations of the spacecraft, of NASA. With the Hill staffers being hungry for data, [it was easy to provide clinical data they were asking for]. … [U.S. Senator] Barbara [A.] Mikulski and [U.S. Congresswoman] Gabby [Gabrielle] Giffords along with [U.S.] Senator [Clarence William "Bill"] Nelson and [U.S. Senator] KBH [Kathryn A. "Kay Bailey Hutchinson] were your four biggest advocates for NASA, for the mission, and [actively worked to understand all the data]. …

ROSS-NAZZAL: That's pretty fascinating.

WEBBER: It was. We stayed pretty tight with Mark and them, so they knew what we were saying, so we weren't mischaracterizing. We weren't marketing the spacecraft or saying, "Oh,

we can go anywhere and do anything, and we can solve your world energy crisis while we're at it."

… I think we worked 24 near 7 for a year to turn the thing around. Many of us did not sleep too much that one year. When you learn how our government works and when you learn how people make decisions, it's a very critical time. … But that's what it takes to turn stuff around in DC. It takes laser focus and data. We didn't try to market or schmooze. We just tried to provide data. …

ROSS-NAZZAL: We thank you very much for your time. I don't want to go over, I know you've got a busy day. But thank you so much. This was very interesting. Very educating for us.

WEBBER: Thank you guys.

ROSS-NAZZAL: Thank you.

[End of interview]