NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
EDITED ORAL HISTORY TRANSCRIPT

JOAN E. HIGGINBOTHAM
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is August 24th, 2012. This interview with Joan Higginbotham is being conducted in Morrisville, North Carolina, for the JSC Oral History Project. The interviewer is Jennifer Ross-Nazzal, assisted by Rebecca Wright. Thanks again for taking some time to meet with us this morning.

HIGGINBOTHAM: You're quite welcome.

ROSS-NAZZAL: We appreciate it. Tell us the story of how you became a NASA employee, having been a graduate of SIU [Southern Illinois University, Carbondale].

HIGGINBOTHAM: It was very interesting, because that wasn't necessarily my preplanned career path—or my intent to go work for NASA. There are some people that always wanted to be an astronaut or they always wanted to work for NASA, and I wasn't one of those. I was actually going to work for IBM [International Business Machines]. I had interned with them for several summers during my college years. They were just a really great company, and they thought I was a good employee.

Unfortunately, about the time I was graduating, IBM had a hiring freeze on engineers. What they did offer me was a position in sales, my choice of 10 different cities, with the understanding that when the hiring freeze for engineers lifted that they would move me over to

the engineering department. That sounded really great. It was money. But I'm not a salesperson so I didn't flat off say no because I didn't have any other job offers at the time. In the interim NASA, who normally interviewed at our campus—and I didn't know this at the time—was not going to come on campus that year, and they asked for the resumes of graduating seniors majoring in mechanical and electrical engineering.

This was in 1987. This was in preparation to gear back up for return to flight, because after *Challenger* [STS-51L], there was a reduction in workforce and NASA was beefing back up the engineering staff for return to flight. One of the gentlemen in Florida [Kennedy Space Center, KSC] received my resume. He called me in my dorm room one evening introduced himself to me and said that he was hiring for two positions in his department. Was I interested in working for NASA?

At first I thought it was a joke, because I didn't know that resumes were sent to NASA. I never applied to NASA or inquired about NASA; and really didn't know a whole lot about NASA, except for *Challenger*. Obviously that wasn't a plus. So after he convinced me he was on the up-and-up, he told me about the two jobs that he had in his department, and I thought about them for a while.

I asked if I could get back to him within a week. It sounded intriguing, but in all honesty I really didn't know anything about NASA. It meant leaving friends and family and everything I knew. It sounded exciting. Who doesn't want to go work on the Shuttle? I expressed those concerns to him. The outcome of that was a trip down to Florida, which is rare, to interview, which is a rarity. They don't normally do that. So I flew to Florida and toured the Kennedy Space Center and interviewed.

I think it was OPF [Orbiter Processing Facility]-1. Very few of the payload bay tray covers in the shuttle were installed and there were wires everywhere.. You could basically see all the guts of the Shuttle. My first thought, "Why aren't there more accidents?" It was just very complicated-looking. Then they took me out to the launch pad which was absolutely amazing.

I think I pretty much made the decision right that I would probably accept the position; although I didn't share that thought with them. I figured I'd give it a shot. Five years or so later if I didn't like it, I could always go back to private industry.

ROSS-NAZZAL: And you ended staying for quite some time.

HIGGINBOTHAM: For 20 years and two months.

ROSS-NAZZAL: Why don't you give us an overview of the things that you worked on at KSC before you became an astronaut?

HIGGINBOTHAM: I began as an aerospace technologist in the Electrical & Telecommunication Branch. My role was to check out the electrical systems for every Shuttle mission, and ensure all the wiring was good. We were checking for good connectivity and good signals throughout the wire from the shuttle cockpit to the point where it connected with either the satellite or whatever they were flying in the payload bay. A lot of the wiring was specific to the particular payload that was flying. It changed every mission.

We did a wiring check with nothing in the Shuttle, make sure the wiring was good. Then we'd install the payload, and go out to the launch pad and do the same thing: checking through the wiring, through the payload, to the switch.

The other thing I was responsible for were the orbiter experiments [OEX] on Space Shuttle *Columbia* because these experiments only existed on *Columbia*. There were a set of seven experiments installed on the Shuttle because for a long period of time, the Shuttle was considered an experimental aircraft. One of the experiments was checking for the temperature that the lee side or the upper side of the Shuttle was exposed to upon reentry. We had another experiment in the nose cap that essentially sucked the atmosphere, into a mass spectrometer, which would then identify components and identified the percentage of each. There were seven different experiments they had, and *Columbia* was my baby when I first started working at NASA.

ROSS-NAZZAL: Sounds like a great job for an electrical engineer.

HIGGINBOTHAM: You're working for NASA, you get to see astronauts, you get to see Space Shuttles take off. Yes, it's pretty cool. .

ROSS-NAZZAL: For a while I think you worked as the backup engineer for *Atlantis* when they were putting in the Mir ODS [Orbiter Docking Station].

HIGGINBOTHAM: I did. I was promoted to the Orbiter Project Office [OPE]. Instead of being a systems engineer as I was before and working on every shuttle, I essentially owned a Shuttle.

All the system engineers reported up through us. My job was to make sure that the Shuttle was ready for flight. I would attend the Flight Readiness Review [FRR] and present to all of NASA management, every engineering problem that had occurred on the prior Shuttle mission. I would report that either the problem was fixed or if the problem reoccurred during flight, why it was not going to be an issue.

I was a backup Orbiter Project Engineer reporting to the lead OPE on *Atlantis*. This was during the time where NASA was still trying to figure out what the Space Station was going to look like. My boss at the time, Ed [Edward J.] Mango, was sent off to DC [NASA Headquarters], along with a dozen other people, to redesign the Space Station again.

This was literally within a month or two after I got to the project office. At that time, *Atlantis* was being refurbished out in California. It was my job to go out there on a monthly basis and check on the progress of *Atlantis* and make sure all the testing was going well and it was on schedule.

It was a little daunting for me, because I'd only been in the position a short time and was still in 'learning mode.' I was really very green, didn't know much, and my boss was leaving. It's one of those times where you learn through a fire hose, trial by error and you just do what you have to do to get the job done.

ROSS-NAZZAL: Why was the ODS put in at Florida instead of in [Palmdale] California?

HIGGINBOTHAM: It was a scheduling issue. That conversation went back and forth and back and forth. Of course the folks in California built the Shuttle, so they felt they had a lot of the

expertise and should be responsible for the installation. However, we really didn't have the time so we processed it at KSC, and we did a bang-up job.

ROSS-NAZZAL: It led to them doing the OMDPs [Orbiter Maintenance Down Periods] later out at KSC.

HIGGINBOTHAM: Yes.

ROSS-NAZZAL: So you returned to *Columbia*, your original vehicle, as the lead engineer.

HIGGINBOTHAM: Right. Now I can't remember. I think it was Paul Valerie who was the lead OPE. I think either he was retiring so I was promoted to lead orbiter project engineer for *Columbia*.

ROSS-NAZZAL: How exciting, the original vehicle, the first one to fly.

HIGGINBOTHAM: Yes, went back to my baby. So it was pretty cool.

ROSS-NAZZAL: While you were there, Mae [C.] Jemison took that first historic flight, first African-American woman to fly in space. What are your memories of that mission?

HIGGINBOTHAM: It's funny. I don't remember the mission itself, but what I do remember is meeting her. She had flown to KSC, just as astronauts do, to check out the flight hardware. At

that time we worked in a trailer. Someone came down and said, "Oh, Mae Jemison is in the trailer." And I said, "Where, where?" They told me she was at the opposite end of the hall. So I just start running down the hallway. As I'm running, I hear somebody say, "Oh. So you don't want to see me, huh." It was Charlie [Charles F.] Bolden, also an astronaut. I just blew right past him on my way to Mae. I was so embarrassed and said, "Oh no, no, really, I want to meet you too."

It's really funny now. He does not remember that story though. Charlie and I and his wife Jackie, are really good friends. We lived very close to one another in Houston when they returned. I reminded him of that story one day, and he didn't even remember. That was my first introduction to Charlie Bolden, blowing past him trying to get to Mae.

It was neat seeing somebody like me; a FEMALE African American astronaut. When I worked at KSC astronauts seemed 20 feet tall and almighty, and so it was always neat to see an astronaut on the space center . But it was even better seeing the first African-American female. I remember that day very well.

The mission itself, like I said I don't remember, because I worked like every single mission. The mission itself did not stand out as much as the first time that I got to meet her.

ROSS-NAZZAL: Did that plant a seed in your head that maybe you might consider [becoming an astronaut]?

HIGGINBOTHAM: Absolutely not, no. I was like that's so cool. I'm so happy for her. I'll be there watching. But no, I was really happy doing what I was doing.

ROSS-NAZZAL: Happy staying an engineer?

HIGGINBOTHAM: Yes. It was a pretty cool job. How many people get to work on the Shuttle every day, then walk outside their office door and see the Shuttle launch?

ROSS-NAZZAL: What finally led you to decide to apply?

HIGGINBOTHAM: That would be a man named Jay [F.] Honeycutt. I was Jay's Bubba, as we affectionately call the role. Bubbas were the up-and-coming engineers who would job shadow Jay for four to six months or so.

During my tenure as Bubba, Jay mentioned that astronaut selection was coming around, and that he thought I'd make a great astronaut. I thought we were just making small talk. He chuckled, and I chuckled. This little conversation went on for several months. He would ask me, "Well, did you apply?" I said, "No." A week later he said, "Did you apply?" I was like, "Okay, I get it, you're going to keep asking me until I apply." I applied just so that the next time he said, "Did you apply?" I could say, "Yes, Jay, I applied."

So I applied. I was at home one day, and I get a call from somebody at the Astronaut Office asking me if I want to come down and interview. I'm thinking, "Yeah right," but they were serious and I went down. So Jay was the whole impetus for me applying. I wasn't necessarily expecting anything to come of the interview, but thought it would be cool to be selected, but it's an extremely competitive process. The year I applied they had nearly 6,000 people apply and ultimately selected 15, and I wasn't one of them. They only take a dozen or so every time. But it was a cool experience, that's for sure.

ROSS-NAZZAL: You did end up getting selected in ’96. I understand that you had applied and weren’t selected but then you were the next time.

HIGGINBOTHAM: Right. So I applied in ’94, got an interview for ’95, was not selected for that class. They normally do it every two years. But I think what happened is when they selected the ’95 class, it should have been the ’94 class. They skipped a year. They knew Space Station was coming up, and they were really trying to enlarge the corps so they had enough resources for Space Station. NASA literally turned around a year later and conducted another selection process and I got selected in the ’96 class.

ROSS-NAZZAL: That was a fairly large class.

HIGGINBOTHAM: It was the largest, and they’ll never do that again, because it probably strained every resource they had. There were 44 of us. They called us the sardines because there were so many of us. We had 35 Americans and 9 internationals in our class. It was the largest class ever.

ROSS-NAZZAL: Tell us about some of the training that you participated in. What did you enjoy most, of that training?

HIGGINBOTHAM: The first thing that we learned how to do was fly. We began with ground school for the T-38. Then actually before we climbed into the cockpit we had to go through—for

those of us who were not military trained—water survival and land survival. I don't know how long that took, but it seemed like it took forever.

Part of that training was conducted in Pensacola [Florida]. We learned survival skills by being dropped off in some little forest in Pensacola for a couple days with no food, basically left to forage food on our own and find little bugs in the woods to eat. We also did our water survival there so there was a lot of training in the pool and the lake. We also did ejection seat training in the event we ever had to bail out of the jet. Once we completed survival training we actually got to get into the cockpit and start flying. That was pretty cool albeit a little daunting, especially for someone who had never flown taking flight lessons.

I think I had one flight lesson in a Cessna before I left Florida. I really had zero skill level as far as flying was concerned, so that was a tad bit intimidating. We also had to get scuba-qualed [qualified]. That was some of the initial training. Those were just the physical things.

There was also an educational component to training. We were the first class that received structured Space Station training. It was like being in grad school again.

ROSS-NAZZAL: You had already completed two masters. So this was a third.

HIGGINBOTHAM: Oh yes. I literally finished my second master's after I relocated to Houston. . I remember I was in my office in the Astronaut Office filling out the last of my paperwork to send off my final exam. So I l had just finished my second master's degree as I began astronaut training.

ROSS-NAZZAL: So you'd been in school for about six additional years beyond.

HIGGINBOTHAM: Way more than I needed to be.

ROSS-NAZZAL: Tell us about some of your assignments once you officially had gone through training.

HIGGINBOTHAM: Let's see. The first assignment. Oh, good Lord, this is going back.

ROSS-NAZZAL: I think you worked payloads out at KSC, an applicable position for you.

HIGGINBOTHAM: Well, it was a little different, in that I worked on operating the payload from the flight deck, so it was a little different than working on the actual wiring for the payload or satellite. One of the other jobs that I had was in SAIL [Shuttle Avionics Integration Laboratory]. That was essentially testing the software that would be used on the Shuttle. The 'lab' was a mockup for the Shuttle flight deck. The test software was loaded into the mock Shuttle and I would fly the specific portion of the Shuttle mission the software controlled. The purpose of the testing was to find any 'glitches' in the software. This assignment included shift work again, and I was remember thinking, 'Oh no, not again", because I did a lot of shift work at the Cape [Canaveral]. It's really difficult trying to remember all my assignments now.

ROSS-NAZZAL: I think you were CapCom for several Shuttle and expeditions.

HIGGINBOTHAM: Oh yes. How in the world could I forget that? Initially there were four original CapComs for the Space Station. This was incredible, because when the Space Station was first 'manned' we were in mission control 24/7. This wasn't a like Space Shuttle mission; and it had been some years since Skylab (the 1st American floating laboratory). We were navigating new territory again.

Initially, the thought was that we needed 24-hour coverage, and we manned mission control 24/7. Since were only four of us. It was very taxing. It took away a lot of time for us to do flight training, get our T-38 hours, do sims [simulations] and all the other things. It was really grueling at first. It was one of those jobs that would burn you out really quickly because it's all consuming. There wasn't a lot of communication at the time. We were using the Russian assets, the satellites. We'd get a pass maybe every hour and a half or 15 minutes if the com [communication] was good. Of course the Russians would speak to the crew first, because it was their asset. We would coordinate with the Russian Glavni [CapCom, Russian Mission Control Center, Korolev, Russia], to discuss what needed to be relayed to the crew during the next com pass. The Glavni would speak first, and then we'd get some time to speak to the crew. It's funny how many times we never got to talk to the crew. They talk about the hardware stuff, what's really going on, and then they go, "How's the weather?" The Glavni would talk about mission related items, then they would talk about non-mission related thing like the weather. Mind you we haven't had our chance to speak with the crew. We were very happy when we got our communication assets and could talk any time we wanted without having to coordinate with our Russian counterparts.

ROSS-NAZZAL: Which expeditions were you assigned to?

HIGGINBOTHAM: I was assigned to all of them. Like I said, it was different because we only had a few CapComs. I must have worked through the first 5 or 6 expeditions, probably even longer than that. I just worked them all, because we were the only people who were trained as Space Station CapComs.

Then we went to a little different model where we had to train other people because we were seriously overwhelmed at the expense for our other training.

ROSS-NAZZAL: Is that when they started allowing non-astronauts to become CapComs?

HIGGINBOTHAM: No, that happened a little bit later than that. I can't tell you exactly which expedition it was, but at some point they realized that even with all of the astronaut CapComs, it was just too time consuming. That was a really tough call on the part of the Astronaut Office because—you know how we're steeped in tradition. It had always been an astronaut in mission control talking to another astronaut onboard the Space Station, because we not only understand psychologically what's going on with them, but we understand the hardware. I think it's more of the psychological component where we, as astronauts, added value. The crew is up there and they're experiencing a multitude of things. As a CapCom we need to know how to read their moods and be sensitive to it. It can be a little delicate situation sometimes. You don't want to torque off the crew. They're up there in a tin can with no direct access to family or friends and the creature comforts we have here on Earth, so you really want be as accommodating as you can to them.

It was a really hard decision for the Astronaut Office to come to, to let non-astronauts actually become CapComs. The non-astronaut CapComs went through some pretty rigorous training and found out there are some people who have a talent for the job, and some do not. It's the same with astronauts. There are some that are better at this type of job than other people, because they understand all the different dynamics that are going on with the crew.

ROSS-NAZZAL: How do you think being a CapCom helped you once you were assigned to a mission?

HIGGINBOTHAM: It helped tremendously because I understood the mission from both perspectives, crew and CapCom. I think it helped me better determine what's really relevant in the short amount of time that CapComs need to relay information to the crew, especially if something's going wrong. As a CapCom, we need to have the ability to determine what is crucial to relay to the crew and what information can wait to be relayed. It also helped knowing how mission control, the room, operated, because as a crew member awaiting information from the ground, you may think, "How come it took 20 minutes to get us an answer?" Once you've been CapCom in mission control you're more cognizant that, for example, the flight controller is talking to another flight controller to gather information for the crew. Then they need to give the information to flight director and CapCom, who then relays it to the crew. Being a CapCom helped me understand the dynamics of the mission.

So I think I had a better feel for what was going on in the room. As a matter of fact, it was so funny because when we were up on orbit, something happened, and I said, "Oh I can tell you what they're doing right now. They're doing this and this and this. We should have an

answer relatively soon, depending on who's on console." I also learned the capabilities of the flight controllers who are on the console—their strengths and weaknesses. I had the ability to gauge what information is going to come up, and how it's going to come up. It's a really good position to have. I think it gives you a good perspective for being a crew member and for working in mission control.

ROSS-NAZZAL: I saw that you also worked in the Robotics Branch for a time. Can you talk about that?

HIGGINBOTHAM: After I came back from flight I was assigned to the Robotics Branch. I don't think there were a whole lot of the robotic operators in the office at the time. I think there were only two or three of us that actually had experience and weren't training for a mission. Part of my job was to take the procedures that were going to go to be used by the up crew aboard the Space Station and go "fly" them in the simulator, comment on the procedures, and other things that I thought would be of benefit to crew. I also sat in mission control while the crew flew the robotic arm in space. That was a pretty fun job.

Robotics was hard for me at first. For some reason I just wasn't getting it. All of a sudden it just clicked, and that made it much more fun.

ROSS-NAZZAL: You also did some work with ISS [International Space Station]. You did some work on crew interface.

HIGGINBOTHAM: Right, after that I was the lead for the Crew Interface Office. There were several things that we were trying to outfit the Space Station with eventually. We're going to add additional crew quarters in the lab, and put a restroom in there, so it was really incumbent upon the Astronaut Office to make sure these items were feasible from a 'fit and function' standpoint. The original plan was to put a lab that stuck out halfway into the aisle, and that was just silly. It was a restroom. It's like, "Do you really you need to stick it in the middle of the lab?" My role was to follow the outfitting of the Space Station, to make sure it made sense, and to make sure that it was functional from the crew standpoint.

ROSS-NAZZAL: You had been up there, so you had a sense of what worked and what didn't. Tell us about being called and being told that you were assigned to STS-117, which you didn't end up flying.

HIGGINBOTHAM: Actually I was in the car. I think it was Rommel [Kent V. Rominger], head of the Astronaut Office at the time who called to inform me that I was going to be assigned to 117. I was like, "That's pretty cool. Who else is on there?" That's important too. It so happened that one of my really really really good friends was on there so I was really excited. I called him, and we chatted. So of course we couldn't tell anybody. I don't think they were making the announcement until the following week, so we could only tell our families.

I went out and celebrated that Friday and no one but my boyfriend knew why.

ROSS-NAZZAL: You started training, and then there was the *Columbia* accident [STS-107], which must have been difficult for you because so many of your classmates were there, and you had also worked on that vehicle.

HIGGINBOTHAM: I had three classmates on board, but I knew the entire crew. So yes, it was a really difficult time. I woke up that morning I remember, and I think I had a bad day in the robotics lab the day before or something, so I was having a little bit of a pity party. I woke up, and the first thing that was on the news was that they had lost communication with the Shuttle. I'm thinking to myself it must be a really slow news day, because as you're coming in there's always a period of time where you could possibly lose com with the Shuttle. The communication instructors tell you this, and you have a window of time where it might happen [where you can lose com].

This was the first I was hearing of this. Then the news anchor went on to another story, but then came back to the Shuttle story. They said, "They've lost communication with the Shuttle, and they've also lost tracking." That's when I stopped, because you never stop tracking the Shuttle. Even when the Shuttle goes into the zone of exclusion, which they call the ZOE, you know where the Shuttle is. It's still being tracked.

So that's when it caught my attention and I started paying attention to what was going on. Within five to seven minutes, it was reported that someone had seen debris coming in over Texas and I was thinking, "This is so not good."

I just remember being glued to the TV. One of my girlfriends who's also an astronaut called to ask what was happening because she was at a 5K race and had begun hearing 'rumblings.' She called me, and said, "What's going on?"

I told her, "They lost com with the Shuttle". She said something. I said, "I think they're gone."

Several of my friends started calling me to see how I was doing. Someone called me to see if I had eaten, and I really hadn't. Probably about 2:00 or 3:00 that day we got a call. NASA wanted all of the astronauts to come into the office. Right where the big NASA Johnson Space Center sign is on NASA Parkway, the public had already started this big memorial with bears and flowers. I went to my STS-117 crew office. One of my crewmates [Richard A. "Rick" Mastracchio] was in. We just looked at each other in disbelief. Then all of the astronauts and support staff assembled in the conference room up on the sixth floor. I remember we were waiting for the meeting to begin and I just started bawling. I just lost it. The management team was talking about what had happened and what they knew so far. They asked for volunteers to work various aspects of recovery and family support, etc.

That was a really difficult day. Everyone went off to do various things. For a while management kept telling us we were going to continue crew training. For a short period of time we actually continued training.

We were supposed to fly in September of that year [2003], and this was February so we were on a pretty accelerated pace to get ready for September. Then we were told that we probably weren't going to fly for a while, so training slowed down a little bit.

I was assigned to work at the Cape reassembling the vehicle, since I had worked on that vehicle and had a lot of knowledge. We were working in the big warehouse putting the Shuttle debris pieces back together like it was a jigsaw puzzle.

ROSS-NAZZAL: That must have been so hard, having worked on her for so long.

HIGGINBOTHAM: Well, it was funny because someone—a reporter or someone—had asked me about *Columbia*. "So how did you feel about losing a national treasure?"

I was like, "I didn't think about it just now till you asked me that. It's a Shuttle. Yes, it's sad that we lost a Shuttle, but my mind was mostly focused on the crew." There were just so many things that we had to get through on a personal level. The families went through so much. So who's caring about a stinking Shuttle at the time? I worked on the vehicle, and I was sad because it was lost forever. But that didn't cross my mind for quite some time.

ROSS-NAZZAL: Did you help at all with the recovery out in East Texas?

HIGGINBOTHAM: No, I did not want to go out; I just couldn't do that. I didn't want to find pieces of the Shuttle; I didn't want to find my friends. That was just not something I wanted to do. I opted to do the job in Florida; I thought that was a better fit for me.

ROSS-NAZZAL: How long were you out there?

HIGGINBOTHAM: We would come and go. I'd go down there for three or four days at a time, come back home and do stuff. I don't remember how long the task took in total.

ROSS-NAZZAL: At what point did you start gearing back up for flight training?

HIGGINBOTHAM: It was a while, because I remained assigned to STS-117 for three years. Then I got a call saying, "Come up to the office." I thought I was in trouble. Nobody wants to get called to the "principal's" office. But the visit was just to inform me that Mark [L.] Polansky and I had been taken off 117 and put onto [STS]-116. There were several crews reassignments. Our flight date was December—I think we probably started training a year to a year and a half out.

ROSS-NAZZAL: Tell us about the crew relationship, the crew dynamic. You were on one crew, and then you shifted to another. How did that change things?

HIGGINBOTHAM: Well, it is funny; you get used to your crewmates. You bond. I was on a really good crew. So when I was told that I was moving, I was a little ambivalent. Then I was told that Mark was moving with me, which was a good thing, because he's a great guy, a really good friend of mine. After getting married this year [2012] and getting 'bonus children' I can tell you from experience that it was like being in a blended family. I moved into the new crew office thinking "Are you going to like me and accept me into the crew 'family'?" The other good thing was Robert [L. "Beamer"] Curbeam was already on the crew. He's just a great friend of mine and Mark. Billy [William A. Oefelein] was the pilot. He's a really great guy. Then Nick [Nicholas J.M.] Patrick came in. So we all got along. Christer [Fuglesang] was already on the flight too.

It was important to forge new relationships on the newly formed crew. The management in the astronaut office recognized that and suggested the crew participate in a NOLS [National Outdoor Leadership School] trip to Utah. I was like, "Really, we're going to be camping in the

Canyonlands [National Park] for how many days? Nine days? Great." My idea of roughing it is a 3-star hotel.

We hiked 12 miles that first day. We rappelled the next day up like a 500-foot cliff, and I hung in there. The instructors were really impressed with me, telling me I was a trooper. Like I said it's not necessarily my favorite thing to do. But you do what you have to do. So they gave me a lot of credit for just muscling through even though that was not necessarily my cup of tea.

ROSS-NAZZAL: Did your assignment change at all from 117 to 116?

HIGGINBOTHAM: It did. That too was being part of the whole blended crew. Everyone had pre-existing crew roles. I was on the flight deck coming and going on 117, but they had already had their crew assignments on 116. When Mark, as the commander, asked everybody what they wanted to do. I said, "I'm not trying to kick anybody off, but I'd like to be on the flight deck at least one way. I'm not going to say put me up there both ways. If I'm not up there either way I'm good. But I would like to be on the flight deck one way."

I think it was great because we all knew that roles were going to change a little bit and people were flexible. The basic roles didn't change. I was still going to be the robotic operator. The EVA [Extravehicular Activity] crew didn't change. It was the secondary roles that changed a little bit. I got to fly on the flight deck coming in. It was all good.

ROSS-NAZZAL: Tell us about training. What sort of things were you working on before you went up?

HIGGINBOTHAM: We had a SPACEHAB in the payload bay, and we were taking up about 3,000 pounds of equipment. So my primary role was to be the robotic operator first, and that was really tricky because we had a lot of robotic ops [operations]. We were taking up a truss, so we had to get the truss out and install it. We also had two or three EVAs that were going to require robotic operations as well, so we did a lot of robotics. I practiced the procedures in the lab by myself first. Then I practiced at the NBL [Neutral Buoyancy Laboratory, Sonny Carter Training Facility] with the crew. There was another robotic arm simulator at the dome, and VR [virtual reality] lab. There were plenty of opportunities to practice.

My secondary role was to be the loadmaster—that's the person who takes care of all the stowage, equipment and other items that we brought up in the Shuttle. That was something that was really good for me because I'm just a little bit meticulous. You need somebody who's meticulous and detail-oriented, because you don't want to get stuff lost or leave it in the wrong place. They knew that was going to be my job, because I am just a little—they had another name for it, but we'll just call it meticulous.

The worst thing about being the loadmaster is as you're launching you don't know what the down manifest looks like. So the second day we're on orbit, they sent me like an 80-page message. There were three books that covered all the transfer items. I had to take the 80 pages and replace the old stuff with this new stuff. I know that doesn't really sound very hard, but when you're in space and you have a three-ring binder and you open it up all the pages go flying around.

To me, being meticulous and detail-oriented, the way I would have sent up the message is I would have sent up all the change pages for one book, followed by all the change pages for the

other book, followed by all the change pages for the third book. But no. They just sent it up however. So I'm pulling book and book and book. I was like okay.

So my first request was, "Guys, when you send me messages will you please send all the changes for one book at a time. That will make my life a little easier."

I had books, I had gold clips, putting the papers up under the gold clips. I remember one day Misha [Mikhail Tyurin] was helping me. I was over in the Service Module. He said, "Oh I will help." I said okay. First thing he does is he opens the three-ring binder, and all the pages floated out of the binder all over the Service Module. I'm like, "No! Misha, thank you. I will do it."

Then we had tons of other tasks. I was the com guru, so that's always fun. When something doesn't go right, "How come we don't have communications? What's wrong?" However, it is better than being the IT [Information Technology] guru, because the computers always crap out. I'd rather have been the com guru.

ROSS-NAZZAL: Tell us about that launch day. What are your recollections of that moment and that time?

HIGGINBOTHAM: Well, launch attempt number one. The weather is iffy, and despite that I'm excited because this is the first time I'm getting suited for real. Let me go back. We have our last meal. The press is taking photos as we're eating. We start getting dressed and go out to the pad. It's really surreal; all the training and studying culminates in this moment. I'd never been at the launch pad, obviously, when we've been that close to launching.

The vehicle is alive, spitting and spewing gasses. We're looking up at the Shuttle thinking, "This is so cool!" We get in the elevator and go to the 195 foot level. The commander and Suni [Sunita L. Williams] get strapped in first simultaneously. Mark is on the flight deck and Suni on the middeck. I think I was like third or fourth to get in, and so the first thing I did while waiting to be strapped in is go to the bathroom. I just could not 'go' in the diaper; that doesn't work for me psychologically. Then I called my family and said, "Hey, we're good, we're launching." They were heading to the launch site.

I got strapped in and waited. The launch team is discussing the weather the entire time; low clouds at RTLS [Return to Launch Site]. The crew is thinking, "Seriously? Come on people. Let's launch. How often does the Shuttle have to return to the launch site right after liftoff?" But in reality, we know that the rules are in place for a reason; and we respect the decision of the launch team. We get to T minus 9 and still had an issue. They weren't 'go' for weather. They decided to count down to T minus 5 and polled the weather guys. Weather was 'no go.' "We're going to just have to call it for the day."

So we get out and go back to the crew quarters and get undressed. Major bummer! The launch team was really trying to decide whether or not they were going to try to launch the next night, because there wasn't going to be much change in the weather.

They opted not to go the next night, but tried on the 9th [of December], with similar weather conditions. That morning I'm thinking to myself, "This is dress rehearsal number two. We're going to get dressed and go sit out there for two and a half hours, and we're going to come back." The decision to get us suited for a launch attempt came a little later than usual. They're like, "Go!"

Out to the launch pad we go again. I remember the tech [technician] was putting on my gloves, and we were a little bit behind the timeline. Everyone's feeling a little bit pressured. As he's putting on my gloves, he jammed my [finger]; I was like, "Stop, stop, not my pinky," so he pulls the glove off and repositions it and puts it back on. Before I entered the vehicle, I remember calling my family, and nobody was answering their phones.

So I called my boyfriend at the time. I said, "Where's my family?"

He says, "Oh I think I saw them. Let me go look."

I said, "Well, I don't want to hold up the phone. I'll call you back." So I let somebody else use the phone, and called him back.

He said, "I don't see them anywhere." I began panicking and asked, "What do you mean you don't see them?"

So I called my brother and said, "Where are you?"

He says "We're on our way." I think he was still at the condo or something.

I screamed, "Leave now," and hung up the phone. I called my girlfriend who was the crew support person, taking care of my family. I said, "Don't let those buses leave until my family gets there. They're on their way."

She says, "I won't let them leave."

As I'm getting strapped in, I'm thinking, "Where's my family? I wonder if they're at the launch? I will be so mad if they don't make it there in time!"

Then I think, "I should not be thinking about this right now. There are more important things to think about, such as the mission." I decided not to ask anyone if my family had made it to the launch site, because I will be so torqued off if they didn't make it there in time to see me launch.

We're counting down again, and get down to T minus 9. I think they gave us a go for weather. We count down to T minus 5. We're holding our breath. Working in the space program for so long, I know the count can get down to zero and the launch still may not occur if the main engines shut down. So I refuse to get excited.

The count continues down to zero. Then, liftoff! Suni is on my right and Christer is on my left. So we all joined hands and raise them in celebration. It was so cool! It was just like we were in a sim, except there was real motion!

I could hear the harmonic of the vehicle. I could feel it going faster and faster. I heard like this little hum. You really didn't feel a whole bunch until we got to roughly launch plus six minutes into the flight, where the Gs kick in. and my breathing became labored. It felt like there was an elephant on my chest.

Then they called MECO [Main Engine Cutoff]. Christer had to get up really quickly because he had to get up and photograph the tank falling away. We had practiced this a million times. He takes off his helmet, gives it to me, and I stuff it in his equipment bag. He takes off his gloves and grabs the camera out of the locker.

Suni and I unbuckle and float to the ceiling; we're giggling like some schoolgirls. Then the fun is over. It's time to prep this vehicle, to get it ready for operations. It was a pretty cool day long in the making.

ROSS-NAZZAL: No space adaptation syndrome for you?

HIGGINBOTHAM: We had a round tunnel that went from the middeck to the SPACEHAB, and I had to deploy a smoke detector in the tunnel. As I was bungeeing it to the pipe, I was oriented so

I could be in a better position to secure it. I came back out of the tunnel, onto the middeck and immediately my brain said, "These lockers that here are normally here in front of me are now on the side."

I had actually rotated about 45 degrees so I immediately righted myself up. Suni and Beamer were in there. I looked at them and said, "Hmm, either I'm really hungry, or I'm going to be sick."

ROSS-NAZZAL: That's an odd feeling.

HIGGINBOTHAM: "I think I'm going to be sick." This is the funny part about space adaptation sickness and regurgitating in space, depending on your sense of humor. The sick bags are essentially sandwich bags that have diapers sewn onto the edge of them. What's supposed to happen is you regurgitate into the bag, and use the cloth to wipe your mouth. Well, what they neglect to tell you is that the vomit is not going to nicely fall to the bottom of the bag like it does on Earth. I'm regurgitating my 'last meal' and it's coming up out of the sides of the bag. "Okay. That's really attractive."

Beamer and Suni start handing me wipes. He says, "I've got to leave." So he's outta there.

I get all cleaned up. I think I actually had got some in my eye. I took my contact lenses out and put on my glasses. After that I felt great. I was probably out of commission for about 10 minutes while I was doing what I had to do; cleaned up and got back to work. That night I took a shot just to ensure I'd get some good sleep and not be sick in the morning. Worked like a charm.

ROSS-NAZZAL: Tell us about getting ready for rendezvous and docking with Space Station.

HIGGINBOTHAM: There was a lot of stuff going on. My job was to basically track how we were. I was MS [mission specialist]-1 for that. I was supporting the commander, ensuring we were following the checklist and making sure we were properly configured for our maneuver burns. As we're coming in for the last couple hundred feet, my job was to ensure that we were coming in at a steady rate.

It was just like we were in the sim, at least for me, because I wasn't the one flying. The commander, however, was a little bit on edge. We saw the Space Station the day after we launched. It was this bright white star, far off in the distance. As we're getting closer I'm looking at the thing saying, "Holy moly, this thing is huge!" It's was just looming over us.

We're coming in for our rendezvous with the Space Station, and we're doing really well. I'm calling off 10 feet, 5 feet and so forth. It was perfect, perfect docking. We got the docking. As soon as we got the 'capture call,' our other crewmates began the actual latching of the CBMs [Common Berthing Mechanisms]. The docking went very smoothly.

ROSS-NAZZAL: Tell us about installing that P5 truss.

HIGGINBOTHAM: The truss. The day began with the guys going out for the EVA. Suni and I were in the lab working the robotic arm. Both robotic arms were being used. The commander and Nick were operating the Shuttle arm. They had taken the truss [Puny] out of the Shuttle payload bay and positioned it on the port side of the Shuttle near the nosecone. Suni went in,

and we grappled the truss and positioned it off the port side of the Space Station. Everything was just going smoothly. It was the first time Suni was at the controls—first time either one of us—but she was actually doing the flying that day and I was backing her up as MS-2. It was really interesting because I could tell she was a little stressed. There are three monitors which enable us to look at several views simultaneously.

She was asking, "How am I doing with clearance here?"

I fall back on my CapCom skills, and say, "Suni, on this monitor you can see that we have really good clearance here. We're doing really well." The EVA crew was in place, waiting for us to bring the truss within 20cm.

During training, we were told that there was a possibility that before we got the truss fully installed, the arm could possibly stall, and we'd have to perform this contingency procedure. Just like clockwork, the arm stalled. We ran the contingency procedure and it worked like a charm.

The EVA crew helped us tremendously. They were at a great vantage point to tell us how to maneuver to get the truss 'capture latch' indicators, which let us know the truss was fully installed.

The next day when it was my turn at the controls, I said, "Suni." I was asking her, "How's the clearance over there?"

She's said, "Joanie, we have really good clearance in this camera here. We have a secondary cue here." So I understood the way she was feeling the first time she was at the controls the first day. It's a little daunting. I was thinking, "Okay, so I have what, a $35 million arm, and I have a crewmate, and I can bash them both in the side of the Space Station. That wouldn't be a good day, but no pressure."

ROSS-NAZZAL: Did it work as you expected on the ground? Any differences?

HIGGINBOTHAM: It's a little different feel. The controls up there felt a little different. Also because you have that giant arm with all that momentum, there's a little difference in when you needed to ramp out the inputs in the controller, so that the arm would stop where you wanted it to stop. It was a little bit different, but they modeled it pretty closely on the ground. There were some little tweaks that I had to make, but nothing significant.

ROSS-NAZZAL: Tell us about moving all those thousands of pounds of items in the SPACEHAB. How long did that take? It sounds like a lot of work.

HIGGINBOTHAM: Well, we moved a little every day. There was a 'transfer' book with details of what item got moved in what order. It was similar to a game of Tetris. There was some stuff that couldn't be transferred because it was needed for EVA and other tasks. My goal was to get ahead of the curve, because everyone who had been a loadmaster told me that the last day you're throwing stuff through the hatch before they close it. I was determined not to be doing that. The first day of transfer went really well. I looked ahead and called the ground to ask if we could transfer some items early. I would verify with the ground to make sure they were okay with us moving stuff early, and they usually were.

Like I said, the loadmaster needs to be detail-oriented; you need to look at your notes and just keep really really copious notes about what you're doing. If you do anything differently than the checklist, it's good to let the ground know. They are your friends. That way, if you

don't remember what you did they can remind you that "Oh yes, you still have four things over there that you took out of the kit that you need to put up".

Due to the solar array getting stuck, we had unplanned robotic arm operations which took me away from my transfer duties. We had the backup loadmaster and others running transfer during that time. It got a little disorganized and the commander said, "No one touches the book but Joanie. This is her book."

ROSS-NAZZAL: Tell us about releasing those satellites. I understand you were in charge of releasing a few.

HIGGINBOTHAM: Yes, we had a couple. They had to be done at a precise time. I just keep looking at the watch and the timer saying, "Hey, we're doing this in 10 seconds, 5 seconds, 4, and release." Those went off without a hitch as well. But again it's that whole thing about please don't let me screw up. Someone's been working on this for 10 years. I don't want to be the cause of them not getting their data. Unfortunately one of the experiments didn't all separate into all of its pieces as expected. I think the first three came out really well. The last two were stuck, so they didn't come out quite on time. It was nothing we had control over. That was one of the last things we had to do before went home. We hadn't messed up yet and I wasn't planning to mess up now.

ROSS-NAZZAL: What are your recollections of landing, since you got to be on the flight deck.

HIGGINBOTHAM: Landing. Again, we were late leaving and late coming home. The weather was crappy everywhere. We had stayed up an extra day and we had to come home that day. The weather was cruddy at the Cape. It wasn't any better in California [Edwards Air Force Base]. At one point they were considering taking us to White Sands [Space Harbor, New Mexico]. We were glad about that, because that meant no poking and probing by the flight docs, because that's the only place they don't send the medical team. We're like, "Ooh. We can go get margaritas." That was also the only place we didn't t have clothing, so that would have been interesting.

The landing team decided to bring us home, so we got suited. The team still wasn't sure where we were landing: the Cape or California, or maybe White Sands. As we were getting close to the deorbit burn, the weather wasn't looking good anywhere. They said, "We're going to wave off this rev [revolution] and hold off on your fluid loading, which is the most important thing, because you don't want to have to do that twice.

Everyone took a nap. We set the alarm so we'd wake up on time. The team literally waited to the last second to tell us we were 'go' for deorbit burn. Because of that, we actually had a lot of cross-track to make up. So as we were coming in we were pulling a couple Gs that you normally don't pull.

Part of my job was to get some footage of the flight deck with the lipstick camera. It's called a lipstick camera because it's about the size of a tube of lipstick. It does not have a viewfinder so the only way you know what you're filming is via the flip-top video camera that's connected to the lipstick camera via a wire. As I was scanning the flight deck, I would look on the monitor to see what I was recording. I had the recorder Velcroed on the back of the pilot's seat, which works well in zero gravity. However, as we were coming back in for entry interface,

gravity took over, the monitor fell off the seat to the ground, and it yanked the cable out of the camera. I was thinking, "I can't mess up now. My crew will never let me live it down."

So I tried to pick up the recorder and plug the cable back in. Unfortunately for me, the bulky launch and entry suit [LES] and seat belts hindered me from bending down and physically picking up the recorder. I used my feet to lift it. I lifted it high enough to reach it and plugged it back in. It was all good.

Actually the reason I knew I could not get the recorder was because I stupidly tried to bend my head down and pick it up, and that was not a smart thing to do. When I tried to get down there, I couldn't reach. Then my head was too heavy that I couldn't lift my head up.

I just remember all of a sudden laughing to myself. I said, "I went to space and got a big head." So I had to take both my hands and lift my head back up. That's when I decided to use my feet to pick up the camera. Engineering ingenuity at its finest.

ROSS-NAZZAL: Your family was at KSC waiting for you?

HIGGINBOTHAM: I told them not to come, because we would have been in Houston 24 hours later, and they had to get to KSC and then get to Houston. My brother showed up anyway because he had rented a condo down there for two weeks. He came and met me at crew quarters. He was laughing at me. He's an orthopedic surgeon. Watching me eat was like research for him. I'm at the dinner table with him and my girlfriend Stephanie [D. Wilson]. They had a big old spread for us and I was starving.

I'm eating very deliberately, slowly raising the fork to my mouth. My brother's just staring at me. He says, "That's really interesting. What other tricks can you do?" He was having a good time monitoring my motor skills since returning from space.

The crew left that next afternoon going back to the Houston. My brother caught a plane and literally arrived at Ellington [Field] as the crew was processing in for the crew return [welcome home] ceremony. That's why I told my family not to meet me in Florida.

Going to when we landed, and I was trying to get off the vehicle; I'm up on the flight deck and the ASPs [Astronaut Support Persons] came in to help me off. I went to stand up and immediately fell back down in the seat. I was like, "Wow." I felt so heavy; like an elephant. He says, "Take off your parachute." So I took off the parachute, stood up, and fell right back down.

He said, "Just sit there for a while." So I sat there, got my wits about me, stood up and climbed slowly down the ladder. I turned around to exit out of the hatch, which actually at a lower level, so I had to get on my knees and crawl. I crawled out the hatch and several flight docs were standing out there. I looked up at them and said, "I can't get up. You've got to help me up." They helped me up to my feet with all that gear on

I walk assisted to the crew transport vehicle [CTV] to get changed and slowly try to get my land legs back. I remember calling my mom. I said, "Hi, Mom, I'm back."

She was like "Oh. May I call you back? The ABC [American Broadcasting Company] people are here."

"Really?" I said, "Don't let me interrupt. I just returned from space, but please don't let me interrupt your interview." The TV station folks had come to the house to watch the landing with my mom and apparently they were still there. She didn't have time to talk to me. Whatever!

ROSS-NAZZAL: Her celebrity daughter.

HIGGINBOTHAM: Yes. She was a rock star. She was saying, "Oh so-and-so called. They interviewed me."

I said "Good for you, Mom. I'm happy for you."

ROSS-NAZZAL: How funny. After this mission I understand you were assigned to a second flight, but at some point you decided to leave NASA.

HIGGINBOTHAM: Well, now this is the interesting part. The class behind us had not really started flying, and then there was another class of unflown astronauts. We all knew Shuttle Program was coming to an end. I went to talk to Steve [Steven W.] Lindsey, who was the chief of the office at the time. I wanted to know what the plan was for me. I'd been there 20 years, so I'm trying to figure out my future: go into management at NASA or pursue another career. I was ready to go back to space, "Give me like a week to recuperate, I'm ready to go back."

Steve provided little insight. I had two or three conversations with him. It wasn't so much that I wanted to know if I was going to fly again, rather I was trying to gather facts so I could figure out what to do with my life. He's said, "Well some people have acted really badly if we told them we were going to fly them again and they haven't flown again."

I said, "Well, those people don't need to be astronauts if that's their attitude." I was sensitive to the fact that there were a long line of people who still needed to fly. It'd be nice if they flew before the program ended.

Long story short, Steve couldn't provide any useful information, so I just went fact finding. I wasn't necessarily trying to leave or anything. It so happened that I was talking with the folks at Marathon [Oil]. We were just in talks, nothing concrete. Then I was assigned to [STS]-126. It's like okay, cool, I'll go fly. Probably about a week or two later I got an offer from Marathon. I was like, "Oh crap. This is exactly what I didn't want to have happen."

Now I was faced with the daunting task of deciding if I wanted to fly again, or take this position. It was a really really really tough decision, because flying is an incredible experience. Not a lot of people get that opportunity, and NASA is a great place to work.

My first flight was so incredibly phenomenal, I didn't think the second flight was going to live up to that. So I said, "If I'm going to leave, I'm going to leave on a high note" and I did.

ROSS-NAZZAL: Looking back over your time at NASA, what do you think was your greatest accomplishment in working for the agency?

HIGGINBOTHAM: Oh wow. Greatest accomplishment. That's hard.

ROSS-NAZZAL: It is—over 20 years.

HIGGINBOTHAM: That is a really hard question. I think there are a lot of things that I am proud of. I know the easy answer is flying, but that may not necessarily be it. I think for me the best thing that I did was just be the best engineer and astronaut that I could be; I gave NASA my all. That was just my greatest accomplishment.

ROSS-NAZZAL: Did you have any major challenge that you had to work through when you were at NASA?

HIGGINBOTHAM: There were challenges. I don't know if there was a major challenge. Learning how to fly a T-38 was hard, but then it just clicked. Same for robotics. For me the first couple of months, it was just like Greek and then all of a sudden it clicked. It just made perfect sense. When I first began working for NASA, I was very young. They used to call us 'fresh outs,' meaning fresh out of college. At that time NASA had a whole bunch of fresh outs, then you had guys that were 40ish, then you had the 'seasoned' guys that were older. There was this huge age gap.

It took some time to gain the respect with some of the guys who had been around for years and years. Some people were just really very accommodating and nice and with other people I just really had to say, "Look, I'm very capable, so get over whatever issues you have."

I remember I had to take one of my counterparts' bosses to task one day, but I would probably have that in any environment, just being the 'newbie.'

ROSS-NAZZAL: You mentioned youth. I did want to ask you about race and gender. Do you think that that had any impact on your career at NASA?

HIGGINBOTHAM: It could have. There were not a lot of African Americans working on the Shuttle at the Cape. Matter of fact, I was the only African-American female engineer working on the Shuttle. They had one other African-American woman that was working on the Shuttle

software, and they had contractors. But for NASA, for a long time, I was the only one working on the Shuttle side.

I think I was so enamored with the job and what I was doing that it didn't faze me; probably fazed a few other people though. I was fine with it. My bosses were the greatest people in the world. So that was like never an issue with them.

ROSS-NAZZAL: Was it ever an issue in the Astronaut Office? Or was it kind of, well, someone else had laid that track for you?

HIGGINBOTHAM: It wasn't an issue—well, there [were] one or two times where some remarks were made. One of them was rather disparaging. I was a little bit surprised and upset, because it came from a colleague. I was like, "Really, that's your mindset," you would think—and don't ask me why I thought this—but you would think that at that level people are above that. But obviously they aren't.

Interestingly enough, there was never really a problem when I went to Russia. It was not an issue at all, which I would expect that a little bit more because in Russia obviously there aren't a lot of African Americans. There are a lot of Africans though. They could tell in a heartbeat if you're African or African American. We went to Star City, outside of Moscow, which is equivalent to an Air Force base, they are really a lot more isolated there than in the city.

It was so funny because the little kids would just come up and stare at me. NASA built three little houses there, three dachas, on the base, and the kids would come ask me for water. They'd always come and say hi to me in English; mind you, they didn't know many English

words. They were just like so enamored and really didn't know what to think. They were too cute.

ROSS-NAZZAL: I think we're coming to our end today. But is there anything else that you would like to talk about?

HIGGINBOTHAM: I'd probably say that I was very blessed in going to NASA in that I had really good bosses who, like I said, were not color-conscious or gender-conscious, and saw me for who I was. The gentleman that originally called me and hired me is Jose Garcia. It's so funny because we still talk today. He e-mailed me about a week ago.

When I was launching—he now has grandkids and he's since retired from NASA—his entire family had on their Higginbotham ground crew shirt. He sent me pictures and e-mailed me every day on orbit. He e-mailed me more than my family. It's so funny. He said that when I first flew to the Kennedy Space Center to interview, he said, "I told them they had to hire you. If they didn't hire you they were just missing out." It's so funny that people see things in you that you may not see in yourself. So he was my number one advocate from the get-go. Honeycutt was always a big supporter and was the one that in his own way got me to apply for the Astronaut Office. So I've been lucky in that my bosses have been really incredible people.

ROSS-NAZZAL: That makes your job, it really does, doesn't it?

HIGGINBOTHAM: It does, because I've had some not so good bosses too. You learn to appreciate the good ones.

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

HIGGINBOTHAM: You're welcome.

[End of interview]