

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

IVY HOOKS
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is March 5, 2009. This oral history with Ivy Hooks is being conducted for the Johnson Space Center Oral History Project in Houston, Texas. Jennifer Ross-Nazzal is the interviewer, and she's assisted by Rebecca Wright. Thanks again for joining us this morning. We really appreciate it.

HOOKS: Thank you for having me and asking. I'm glad to be here.

ROSS-NAZZAL: We're really excited. We're very interested in gathering history, especially about women. So few women worked at NASA during the sixties, so we're interested in hearing your experiences and contributions. I'd like to start out by asking you about your interest in math as a child. Could you tell us about that?

HOOKS: I don't ever remember thinking that I was interested in math and other people weren't interested in math, particularly. I just loved it. It was problem-solving, and I like problem-solving. It came naturally; it was very easy for me—and I know it isn't always easy for other people—but I really enjoyed it. So when I went to college, I started taking math classes, decided maybe I'd be a math major. I'm not sure what else I thought I was ever going to be. But I just liked the math.

The other thing I liked was English, but I liked literature and had taken a lot of literature classes. Quite frankly, the English has been as useful as the math, almost, in my career. That's always hard for most people that go into technical fields to understand, that you have to communicate. You can have the most brilliant ideas in the whole world; if you can't explain them to anyone, they don't go anywhere. Quite often, of course, you have to try to convince people. I think it was my second semester in college, I just got really fed up, and I wasn't getting along well with my math teacher, so my [college] suitemate and I decided, to heck with it, weren't going to go. Forget the math. Now, I guess I made it through. She dropped out. I struggled through, but I said, "No more of this," and then I changed colleges, and I went right back to math, so I stayed in it.

I felt I was very lucky when I came to the University of Houston [U of H] [Texas], which I did in my junior year, because one of the women who taught in the math department—actually I had known her for a long time—was a neighbor of my aunt and uncle. She mentored me along. She and another woman taught in the department; neither one of them had doctorates. They both had masters; neither had doctorates.

They'd started teaching in the Second World War, when women were just forced into teaching anything and everything in the colleges where they'd never particularly done it before, especially in technical fields, because the men were all drafted. Then at the end of the war, of course, they were all shoved out. People don't realize that. In this country, there was just this huge media push—put on by the government, I'm sure—to get women all to go home and have babies and stay home and let the men have the jobs. I've known women in my career who taught in engineering schools during the war, and at the end of the war were fired and could not get a

job. I came around right at the end of that period, and so there were these women that that had happened to, and yet they were being encouraging for me to stick with it and to take the classes.

Then I discovered physics classes, and I thought I'd died and gone to heaven. I mean, that was, to me, the whole purpose of math then, was to solve the physics problems. For me, it just seems like it just came very naturally, and I never thought about it much. Today, when I deal with students, especially junior high and those age groups, trying to encourage both the boys and the girls to stick with the math because there are so many careers that you can go into if you can do math. [They complain,] "I don't like it," or "I can't do it," and I think, "Oh, my gosh. What are they doing to these poor children? It's supposed to be fun." That's how I got where I was.

Then when I graduated, I had no idea what I was going to do. I was sure I was not going to teach school. That was an absolute; I was not going in the classroom. I didn't like that idea one bit. I looked around for jobs and wasn't offered anything that looked like anything I wanted to do, so I just kept going to graduate school for another semester. Then NASA [the Manned Spacecraft Center] moved to Houston, and a friend's mom cut out an article [from the newspaper] that said, "NASA's looking for women scientists and engineers." I assumed they were looking for me, and appeared on their doorsteps and said, "I'd like to apply for a job." That's how I got to NASA. Probably one of the best times I could have gotten there. The only thing would have been to have been a little bit earlier, with the guys building the Mercury and the Gemini and all, but I wasn't even old enough to do it then. I'm just lucky to have gotten to work with them and learn from the people that really started the whole space program.

ROSS-NAZZAL: Had you been following the space program prior to this point?

HOOKS: Only like everybody else in this country was—you know, whatever was in the news.

ROSS-NAZZAL: Did you know that they were going to build this space center in Houston?

HOOKS: Yes, I had read the articles that they were going to put something in Houston, but I hadn't thought about it in terms of me, particularly, until that little blurb came out in the paper.

ROSS-NAZZAL: Tell us about applying. Where did you go, and how did the interview process unfold?

HOOKS: Actually, that was pretty funny. The offices of personnel were in the East End State Bank Building which I think was off Harrisburg, which is not one of the better parts of Houston. It wasn't then, and it isn't now. It wasn't as bad then as it is now. I think I first filled out the application at U of H, and then I got called to come in for interviews. I went for one interview that was in a building off Telephone Road, and [previously] they had manufactured boxes in this building—you can imagine how elegant the building was—no windows, no nothing. It was really terrible.

I interviewed with a man there, and there was a woman who was in one of my math classes in graduate school in the room and another guy, and quite frankly, I thought they were a little strange. I thought, "I don't want to be in this box," and the work they were doing didn't particularly appeal to me. So I had met a woman at the beauty shop—you know how you want information, you go to the beauty shop, right?

I'd met a woman at the beauty shop whose husband worked at NASA, and she said she knew he was looking for people. I went and interviewed with him, too, and I said, "Well, that looks pretty good. I think I'll take that job." The money looked wonderful after making no money as a student. I accepted the job, and it was two or three weeks before I was supposed to start, and the school semester finished. There was some period of time in there—maybe it was two or three months; I don't remember now. I knew I had this letter that said show up on June 6 or June 9, I think it was, at the East End Bank Building.

So I did. I sat in the waiting room for hours. People were processed and processed, and I waited and I waited. "What is going on?" Well, the truth of the matter is they couldn't find my application. They'd lost it, and could I please go back over to U of H and get my transcripts and stuff, and they'd start [the hiring process]. I got to fill out everything all over again. I go back to U of H, get transcripts again, come back. So that was a whole [day].

Then the people that have hired me are calling and saying, "Where's our new employee?" and they were having to say, "She's still here because we haven't finished processing." I finally got finished processing at the end of the day and went to my new office for five minutes before the day was out. Then probably close to 20 years later—maybe 15 years—in the mail one day, I got—you know, in our brown internal envelopes that we pass everything around in NASA—there comes my original application.

ROSS-NAZZAL: Someone found it?

HOOKS: They were moving some desks, and when they turned them upside down, it all fell out, so it had obviously gotten behind the back of a drawer, fallen down in the drawer behind there

and been there for umpteen thousand years. It was really interesting because it also had the remarks and from the people who interviewed me in personnel and other things. So that was fun. I have no idea where I put that. It's stuck in a box somewhere in my attic, but to finally see it again.

ROSS-NAZZAL: How funny. What was your understanding of what you would be doing when you first started at NASA?

HOOKS: I hadn't a clue. The kind of odd thing was I was working in a group that were working on advanced stuff. It wasn't like structures or mechanical systems or propulsion or something; it was kind of a systems-type group that looked at advanced things. Quite frankly, it was in disarray—the organization was. A number of people there had job experience from Chance Vought [Aircraft] or other aircraft areas, so whatever they were working on, they kind of knew what to do. I would just be given kind of dumb jobs to do, frankly.

ROSS-NAZZAL: Like what?

HOOKS: I was getting very boring tasks like, "Go plot this," or you know. But it didn't seem to have structure to me, and it really bothered me. One of the interesting things was the things the guys told me—because you have to remember there weren't very many women. There was one professional woman in my immediate group and another one in a building across the way; we were in a set of apartment buildings at the time, up in town. In fact, at the time that I started

NASA, I think whatever the whole population of NASA not its contractors was like 3,500 or something at the time—there were 35 professional women. There weren't very many.

Now, I was really lucky, because there were professional secretaries. They were people who had experience, had worked up at Langley [Research Center, Hampton, Virginia] and had come down with the NASA group [to Houston]. They were very professional people, and they were really a huge help to me all through my career. I had a real cheering section from the women that were secretaries, administrative assistants, and all. I think it was a mutual thing, because I felt what they did was important, and I respected what they did. A lot of the guys didn't. If you're not an engineer, you don't count. They were supportive, but there was just very little of that.

So I'm watching, and I don't quite understand what's going on. The guys tell me that you can't go out to lunch and take more than 30 minutes. That's all we're allotted for lunch. You couldn't leave that building and go to a restaurant and come back in 30 minutes. It didn't matter. I was poor; I brought my lunch. They would go off and stay gone for hours, some of them anyway. One day, they came back, and I was sitting at the drawing board, doing this graph for them. I'd gone upstairs to where the drafting guys had their table because I was just dying to try that whole electrical eraser thing they had that I'd never seen before. Doesn't that sound high-tech? I'd gone through a number of pieces of graph paper, and I knew that was bad; you weren't supposed to waste the graph paper. You can imagine some of these things that were really important at that moment.

The guys came in, and I didn't realize they'd come in. They'd gathered up half the [employees from the] building, I think—must have been 15 or 20 guys in there. All of a sudden, somebody behind me goes (clears throat). I look back, and then I look over to the other side of

me, and there's all these guys standing there, all snickering. "What now? What are they going to pick on me about now?" Now, I have four younger brothers, which I have found was a very big benefit in going to this career because all the dumb things that people did to try to annoy you, frighten you, scare you, I'd probably been through it before, so it wasn't new. They bugged me a little bit, and I said, "What?" They point to the top of the drafting board, which is kind of far away for me, and they've got a computer printout or something laying over something, and they pull it away, and so there's this snake.

It's just a garter snake, for gosh sake. I grew up in the country, and I had four brothers. I earlier had seen people around the railing at the apartment, looking at something, and I'd gotten up and gone and looked. I saw there was a snake in the pool, and the guard that was down there was looking at the snake, too. I'd knew they'd found the snake that had fallen in the pool. So I was like, "What is?" I just reached over, picked up the snake, turned around, handed it to the guy nearest me, and said, "Go away."

That probably was a very good start to my career in NASA, because there were an awful lot of guys in that room that if I'd tossed that snake at them would have fainted. I've often wished I had, but that wasn't nearly as effective as just cutting it off and saying I didn't care. There were those kinds of pranks off and on for quite a while, and you'd go in a new group, and you'd get some more of that again.

But the people that were professional were so professional. Even they would pull pranks sometimes if they were really in a good mood, but some of these guys just weren't there. NASA was just hiring everybody, building up the numbers, trying to get ready to go. I just thank my lucky stars that I worked on this [program]. Lunar lighting was the first project I can remember working on. They came in and said, "We need to know what the lighting is like on the Moon so

we can build simulators to train the astronauts.” Oh, Heat, Light, and Physics was one of my worst classes in college—because the prof never taught it. He always taught the mechanical stuff that had been the class before, which I understood, but I didn’t get the heat [or] light. So I did what any good student would do; I went to the library.

Our library at the time was in the same apartment complex we were in, and it was in an office maybe twice this big. That’s it; that was our library. I went through all the little [reference] cards—we had cards—I don’t even think we had microfiche at the time. I found something on lunar lighting and asked them if they would get it for me. They said, “Is it classified?” That was a big thing. That was probably one of my most un-fun things working with the government is having to deal with classified material and worry all the time about whether your safe was locked, and not to say anything to anybody. So much of what we handled was classified. You couldn’t prove it to me why any of it should have been classified, but, you know, it’s the government, right?

They said, “Is it classified?” I said, “I don’t think so, because it was written by the Russians.” It was. It was a report written in 1924 by Russians who were studying the albedo for the Moon, how it reflected light. It was totally mathematical. For me, that was wonderful. I totally could understand that; I could convert that into what they needed to do their modeling for the Moon. I was happy with it.

Of course, I also found out about a jillion other people had dumped that project and didn’t want to work on it because it wasn’t what they’d studied in school. I thought it was so neat when I came to work at NASA that I never did anything I studied in school. I already knew how to do that. I was afraid, is all you do when you go to work is you just keep doing what you

learned in school? That doesn't sound very interesting. But it wasn't, it was never that; it was always something new. So that was my first something new.

The second thing I did was I left that group. They were just a little too trivial, and I got really sick of it. I left that group—still in the same major organization—and I went to work on the cost model. The cost model actually was for the guy whose wife I had met at the beauty shop. He came out of the aircraft world, and so he was building a cost model for NASA to use for spacecraft. He continued forever doing cost models for NASA. His name is Hum [Humboldt C.] Mandell. You probably have already done an interview with Hum, I don't know. He's at the University of Texas [Austin] now, as an adjunct professor. But he was really into cost models and with all of his cost models, the heavier it got, the more it cost. I said, "Well, that may be true on airplanes, but it looks like to me it's costing us money to make things weigh less." I didn't know anything, right? We had a guidance and nav [navigation] system, and I knew we had structures, and I kind of generally knew what those things did, but I didn't know how any of them worked, and I certainly didn't know what they cost.

So I would just get the phone book out and find that organization and call up somebody and say, "Can I come talk to you about this?" like guidance and nav or reaction control engines or whatever. Of course, here I am, a 22-year-old in a miniskirt, so I didn't get too much turndown. There are some real advantages, I'm sure, at that time to that. But what I found was people love to talk about what they know, and if you shut up and listen, you can just get a wealth of information. I started learning how this works or how that works and we didn't know much—none of them knew much about why things cost what they did, to be frank, because that wasn't what we dealt with. They knew technically what happened, and what was hard, and what was simple, and what was the same as something else.

I started learning systems. I loved—and I always have loved—learning. Anything new is just fun. I'm just a kind of an I-want-to-know-something-new junkie. Obviously. People were so generous with their time and explaining things, and you could go back and ask more questions and all, so we ended up building the first cost model that NASA had.

Several years later—it may have been when Hum had gone back to graduate school—but we had people in from [NASA] Headquarters [Washington, DC], and they were talking about doing these Mars missions in '84 and '85 and stuff—remember this is '63, '4, '5 time period. So they were always having us run these different cost analyses for them, and it was like, “Guys, you know, we only had a few data points.” We had Mercury, we had Gemini, and then we had projections for what Apollo was going to cost. The way the government keeps books, it's pretty meaningless as far as building a good cost model. It would be like having an accounting system in every group that kept the books used different codes. How on Earth are you ever going to put that back together to compare? It was all apples and oranges. You just did the best you could with what you had, but they would just take it so seriously.

I discovered that if I just rounded numbers off, to the highest million or billion or whatever it was back then, they didn't like that; that couldn't be right, but if you just put a few decimal points at the end, then it was obviously a good answer. So I was like, “Ugh.” The lessons you learn about how you have to get things done is part of what I think is hard, because if you're technical, you're math, you're physics, everything is black and white; everything has exact answers. In the real world, it doesn't, and especially if you're doing cost.

I worked in that area for a while. That was probably the starting point of where I really started finding my niche of loving to work on things that involved lots of systems, loving to work on things at the front end, when you're just starting something. I said I've never been a really

great detail person. Who wants to find out the last little decimal point or something? But I appreciate those people, because things don't get built without them. Somebody has to do the front end and think upfront and think big picture and be willing to think about things nobody thought about before. I loved it and others don't.

I think that's something that I really appreciated that NASA did, was the co-op program. We had so many co-ops come through. They've done well both in NASA and in their own businesses and whatever they've gone into and liked. But if they came, in and they were really treated right—and in the Engineering Directorate, we worked really hard to do this—you didn't try to keep them in the same place every semester. You let them work with people who did tests or people who did analysis or people who did something else so that they could see the different kinds of engineering that's possible—look at the big pictures, look at the details, those kinds of things. They could start finding their own niche before they got out of school so that they would focus more in school on what they wanted to do when they went to work, and also to understand that you could change once you got somewhere. You don't have to stay in one niche. We had rules. You could make copies forever, but you could never ask a co-op to go run copies for you. We didn't want to use them as gofers; we wanted to help them be the best engineers that they could.

That program was so great because they just got a whole view of what you could do in work while they were still in school, and you don't get that in school. You don't get it. The whole academic world, until just recently, everything you did in engineering, you just went to a class, you took notes, you took exams, and you passed or you didn't; you never worked as a team. The truth of the matter is nobody works that way. You really don't work that way. To get most projects done it takes more than one discipline, or you have to work with other people. So

they didn't teach them those skills of working with other people. Now, I think almost every university has a senior project where they have to work with a team and find out difficult it is to exchange information and things, but back then, that didn't happen.

The folks that came from Langley, like the [Maxime] Fagets and that group, and all the people who had worked for them that I got to work with, they were put under a senior engineer, and they worked with that engineer and did whatever that engineer wanted them to do for a year but watched what happened. Then they were given their own project, and they had to see it through from cradle to grave. There were usually six-month projects, but things would even go out and be tested. You'd build something, and go to the model shop, get it built, go get it tested. Well, they had this incredible background from beginning to end, so they could guide you through that.

What I really have seen over the years, and looking back and saying, "What happened to the space program?" There's nobody out there with that skill set, because we don't do that. We don't encourage that research side; we don't encourage the learning side. You come to work, and you sit in meetings. Then people believe that's work, that you're doing something. Meetings for me were something that I had to do to get some information from somebody or across or to discuss something, but they weren't something you just did as a way to go to work and earn a living. At one point, after I left NASA and had my own business, when things weren't going real well for a year or so, I was like, "What am I going to do? Am I going to have to go back to work at NASA or one of the contractors? I don't think I'm going to do that." I said, "No, I can't do that, because I cannot sit in those meetings. There's too much wasted energy, too much wasted time. Nobody's getting anything done." I didn't want to go back to that. That is the big change that was so obvious.

Bruce explains this—Bruce [G.] Jackson's my better half, and he's one of the ones that came from Langley. He started launching little rockets out at Wallops Island [Virginia]. When they formed the Space Task Group, he went over there, so he was on the Mercury program and all those kinds of things. A lot of what he did on our division—because he was my division chief when I was fairly young—he did a lot of things in there to try to help the engineers learn all these other skills you need to work as an engineer that they can't and don't teach you. But he did a plot. It started with Mercury, Gemini, Apollo, and then Shuttle, and it was the length of the time of the project, or the years it had happened, and how long it took to get it built, as based on how big the conference rooms were.

In Mercury, you sat around somebody's desk in a little bitty office. In Gemini, they may have had a conference room you could put six people in. On Apollo, they got to the 30-people conference room. By the time they got to Shuttle, they would put hundreds of people in the room. If you want to have a cheerleading section or something, I guess that's okay, but it's not good for managing programs and projects. The next project will never be finished because they have to have such big conference rooms, and if you look at that, in an infinite number of conference rooms, infinite time to finish the program. I didn't ever want to go back to those meetings.

ROSS-NAZZAL: I wanted to go back and talk to you a little bit more about these lighting models that you were working on. You mentioned that you went and you looked at the literature. Where did you go from there? How did you come up with these models? Were these mathematical equations that you came up with that you then shared with other folks, or how did that proceed from there?

HOOKS: What those models had was what the albedo was on the Moon, and so if the Sun was at a certain angle, what would come back at you type of thing. What I did was take that and relate that in some mathematical ways that some of the engineers could say, “Well, gee, if the Sun’s here when we’re landing on the Moon, then all the light’s going to come straight back. You’re not going to see anything.” Or if it’s at another angle, all you see is black shadows and stuff like that. Other than that, I can’t really remember. There was a paper published on that eventually by a guy I worked with.

ROSS-NAZZAL: This doesn’t necessarily have to do with your career, but I’m curious. In the seventies, Jim [James C.] Fletcher had appointed a new Equal Employment Opportunity person at Headquarters, and then she [Ruth Bates Harris] ended up getting fired for saying that NASA had not done enough to promote women and African-Americans flying in space and in their programs. Do you remember any discussions going on at JSC at the time about all of that, or were you just too busy working on Shuttle at that point?

HOOKS: What year was that?

ROSS-NAZZAL: I think ’72, ’73.

HOOKS: I don’t remember that. I was on [Christopher C.] Kraft’s staff in ’78 when we selected the first woman and minorities and all as astronauts. Probably the most disappointing one to me was not even that. I don’t think they did a whole lot to promote it, but I don’t think they’re doing

anything to not do it either. But you have to realize that until Shuttle, we just mostly hired pilots from the military, and there weren't any women pilots in the military, so why would we have hired anybody to be an astronaut that was female? There were darn few blacks, too, and again, we were picking from that already-filtered list, so I don't think it was a prejudice as much as it was it just didn't come up on anybody's screen that maybe somebody else could do this job.

But in—I'm trying to think of what year it could have been—it was after first flight, I think, so it must have been '81, '82, '83, somewhere—I can go back and look on my wall and see—I think it was when I got the Exceptional Service [Medal] or whatever they call that medal for designing separation systems on the Shuttle. I would have been thrilled, except the guy from awards stood up and said he was so happy to announce that nine women were getting awards at this ceremony, and that was more than had ever gotten them in the last ten years. One of them was our woman locally that was the EO [Equal Opportunity] head, who was an absolute nothing. Didn't do anything. I'm sure she meant well, but her contribution to the space program or the rest of us having anything was just nothing. It was like, oh, you just went and found every woman you could and gave them an award. That's annoying. It's like, "Can I throw it back at you?" But you can't, of course, throw it back, but it surely diminished it. It's not like you got it because you really did a great job, it's because we need a woman, and thank goodness you did something good so we can give you this little award. The insensitivity to people that they would say such a thing!

No, it couldn't have been that award, because when I got that one was when we all got ours after the Shuttle. It was earlier than that. It was sometime before we flew that they gave me that one, so it was a certification or something, a plaque for the wall or something. But to say, "We haven't given these out to women before." Of course, nothing happened. I'm trying to

think about what year it was, considering what office I was sitting in and what people said to me at the time.

You can kind of figure out where you were at NASA by what office you were in or how they reconfigured. Had to have been late sixties. It could have been very early seventies. But they had, besides your regular raises and stuff that you got as a civil servant—or promotions, if you got one of those for either living long enough or taking on a different job or whatever—they had these little awards they'd give out, and they were sometimes \$500. At that time, it was worth a lot more than you might think \$500 would be today. I never got put in for one of those, and I noticed that a lot of guys got them that didn't do much. I finally went to my boss, and I said, "How come I never get one of those? Didn't I do this job well? Didn't I do this well? Wasn't this useful?" "Oh, yes, but you don't have a wife and kids to support." I was like, "Oh, okay. This hasn't got anything to do with work. These awards aren't about work; these awards are about taking care of my buddy over there."

ROSS-NAZZAL: When do you think attitudes towards women started to change at JSC?

HOOKS: Well, you have to understand, there was always a group, I think, whose attitude towards women was they didn't care if you were a woman, as long as you got the job done. All right? It didn't matter one bit. You could have been a little alien and they wouldn't have cared, just as long as you did your job. They did theirs; you did yours. But then there were other people who were very much trapped in that male/female role-playing model.

In '81, I was on Dr. [Maxime A.] Faget's staff, and I took over a job that looked after the interns and the co-ops. What I inherited was a bunch of angry interns and co-ops, because the

person that had the job before me, that wasn't his interest, so he focused on some other job and just let that go. For years, we'd had a great guy named Jack [John M.] Eggleston there, and I'd learned a lot from Jack during my career. He'd helped when I'd first become a supervisor to make it better and easier to be a supervisor and trained us in a lot of things. I went back to the way he had done things and did a lot of things he did. I was just appalled. It was 1981! I'd been working nearly 20 years at that time. I knew things were some better. We had women astronauts by that time—still didn't have a woman flight controller, but eventually did that.

A group of three or four women came to see me, maybe not all together—they came probably one at the time—that were all interns, and they were in one organization, one division, and they were miserable. They were being treated very badly. One of them had a boss that had said he wasn't going to give any important jobs to women because they'd just get pregnant and leave anyway. I could have hauled his you-know-what up in front of the EO and gotten him in all kinds of trouble and maybe even gotten him losing his supervisory position, but that didn't seem like a very good thing to do. There were some other ones that said some other things. At least one of them, we sent to sensitivity training. I talked to the administrative assistant in that area and said, "What do we do?" I didn't think it'd do any good; I just thought maybe we'd use it as punishment, but actually, he came back from there a new person. He said, "They said all the things my wife and daughter and all have been saying."

I ran across a group that were really, really bad in a particular organization, and it was just kind of a shock to me, and I thought, "Well, they've kind of glommed together because they probably all think alike," but I didn't see that around the rest of the Center at all anymore, or at least not in the Engineering side. Ops [Operations] was another world, but certainly not in the

Engineering side. I was surprised that the sensitivity training actually worked on somebody, so I would never hesitate to try that again, because what you like is to get somebody out of that mold.

One thing—I don't know whether it broke the mold or not—but one thing I saw a lot of in the last ten years I was at NASA were men who would come to me and say, "My daughter is in high school. She's very good in math, and I'd really like her to consider becoming an engineer. Can she come talk to you?" So "my daughter" became a new way of looking at the world. "I want this for my child, and that fact that she's female doesn't matter; I can see that it doesn't matter because I know Ivy or I know this woman and I know that woman. They made it, and my daughter could make it, and this is such a fun world to work in. I would like her to be there." So that was one thing that I saw that I think people got into that mold that women were going to work, and if they were going to work, let's give them the opportunity to use whatever their talents are.

Also, by the time I left NASA, which was just a little over 20 years after I'd come to NASA originally, a large percentage of the people coming to work, and even some who had been there a long time, now had working spouses. When I first came to NASA, there were almost no working spouses. The wife stayed home, had children, raised children at home. There were just one or two guys I can think of whose wives worked outside the home. They had no model. If a wife did work outside the home, she was supposed to either teach school or be a nurse. I don't want to put down either of those professions. I'm very grateful to everybody in those professions who's helped me in my life. That would not have been my choice to do, but I'm really glad somebody else chose it. But, that was their only model, and that changed over the years, so that made a difference. There are probably guys out there today that still think that women can't do what men can do.

ROSS-NAZZAL: How did it start to change from so many women being administrative assistants and secretaries to more women coming into scientist and engineering positions? When did you see that change?

HOOKS: That started about ten years after I came to NASA, and as we would get more co-ops and as we would do more recruiting, there was much more recruiting of women. There were more women in the engineering schools by then. I can remember when I first became section head, I ended up with one woman who was just out of school, and then there were two or three other women in the building who had graduated within the last few years and come to work at NASA. So we'd kind of stand—like the guys would—we'd walk out of a room and end up together and stand there and talk a minute. It was really funny because we'd be doing that, and one of the guys would walk by, and you're not even paying attention to somebody walking by—you're talking and all—but your eyes follow them. One of the guys one day said, "Don't do that. You're making me so nervous watching me." We all went, "Oh, you shouldn't have said that!" Because how many years had we spent with groups of guys watching us walk by? So then we discovered we could really intimidate them by standing close to each other and talking low, where they didn't know what we were saying. They were all convinced we were talking about them, so we actually had a little fun out of that.

But by that time, there were more women coming in, and some of them were coming directly out of school, and a few of them had gone to work for contractors around here and then came over. In the group I was in, everybody was so supportive. One thing I didn't understand when I made section head—it didn't surprise me that I got the job, because I was doing lots of

things, and I needed people to work for me. It was years later before I found out that there were people in the group, managers up above me, who thought I should have been in a staff position. “Put her in a staff position and let somebody else manage the men.” They got told, “No.” So I was left to manage the work, and I had a wonderful time. I did. I did a lot of great things, but I always did them with other people. I can’t think of anything I ever did that I didn’t have some help from somebody. We turned out some really, really good work, and besides that, they trained me on how to be a manager. I’ll tell you the story of those in a minute. But it was years later that I found out that they got really harassed.

ROSS-NAZZAL: Did they really?

HOOKS: Mm-hmm. About, “Oh, you have to work for a girl. Nah, nah, nah, nah, nah.” So their whole attitude was, “We’re going to do the best job of anybody on this planet. Everything we do is going to be superior to everybody else’s. We’re going to make Ivy look so good.” They did. They did. They never let me know; never, never, never, until just a few years ago, one of them blurted out something about it.

ROSS-NAZZAL: How did you get that management position? Was that because Max Faget had recognized your work?

HOOKS: That was part of it. When we started on the Shuttle—I love to tell this story. You’ve probably heard it before. It was April Fools’ Day, 1969, and the phone rang, and it said, “This is Betty [M. Ensley]”—that was Dr. Faget’s secretary—“You need to go to building 36, the third

floor at 10:00 a.m.” It’s April Fools’ Day; we’re having fun here, but two or three others in my group or near me got the same call, so we looked up [Building] 36 on the back of the phone book—because we didn’t know where 36 was. We drove down there, and it’s only a two-story building, but next door is the high bay that clearly had three stories. There were people walking in that I knew, and we went in there. We went up this high bay, and all they used it for since they built it was to store furniture in, which would have been five or six years. It was filthy, and I was in white. We’re just standing around like, “What are we going to do? What are we going to do? What are we here for?” I would have still thought it was an April Fools’ joke, but there were people there that you would not pull an April Fools’ joke on.

There were people I knew from thermal and aerothermal, and the group I worked in had the aero guys, and I was doing flight mechanics stuff at the time, and there were people from propulsion. I knew a lot of these people because going all the way back to the cost model days, I’d met and known these different people.

We didn’t know what we were there for, and then Dr. Faget walked into the room carrying an airline garment bag, and unzipped it, and pulled out this funny-looking balsa wood plane, flew it across the room, and said, “We’re going to build America’s spacecraft. It’s going to launch like a rocket and land like an airplane. It’s going to be reusable. It’s going to go about this high, do this,” the whole thing. We spent six months locked up, trying to figure out if you could really do that. It was just fun; it was really fun. The only thing wrong was no windows. I am the windows person; no windows, and we weren’t allowed to tell anybody what we’re doing and what we’re working on. We just stayed in there, with one telephone in the room, one secretary, and us. I spent a lot of time going to the library.

Jim [James A.] Chamberlin, whom he'd put in charge of that, was an interesting man. I'd never even met him before. He was real tall and real stoic looking, and when he spoke, he didn't move his lips, so he'd talk like this. (Demonstrates) He was very hard to understand in the first place. Then we had these huge pipes running through the ceiling, and it was loud in there all the time. It was hard to hear him because he spoke so soft. He would sit behind this little curtain and do whatever he was doing, and we would all be working, and the draftsmen would be drafting, and the thermal guys would be doing something, my aero buddies would be doing something over here, and I'd be working on whatever job he gave me. He gave me every odd job there was.

One was to look at—since it had to land like an airplane—looking at putting jet engines on it for takeoff and landing. I said, (whispering) “The propulsion guys are over there.” He said, “They don't know anything about jet engines, they just know about launch vehicles and reaction control jets. They don't know about engines.” I had a pilot's license, and I think I was the only person in the room who had a pilot's license—not that I'd flown anything but a Cessna 150—but he knew that I knew at least some of the FAA [Federal Aviation Administration] regulations and stuff like that. He said, “We need to know what we have to have to go around at an airport and what we need for this, that, and the other.” Then he told me some other things, and he said, “Go get *Jane's All the World's Aircraft*.” He would tell me which books to go get in the library, to look things up in, but he just kept heaping jobs on me.

One of them was the separation part because I'd done some separation stuff on the Lunar Module. Actually, not even that, but the jet impingement from it. He said, “Well, you know jet engines, so you need to do this, and then you know about jet exhaust, so you need to look at this. Go take care of this.” I had a list a mile long of things I was working on, and about once a day,

he'd come over and ask for one of them—never the one that I'd been thinking was the most important. So finally when he would give me a job, I would ask, "Where would it go on the list in order, and do you want a ten-minute answer or a half-an-hour answer or a two-day answer?" I tried to teach people who worked for me later, "If you don't know that from your boss, ask the question." I think a lot of people mess up because somebody asks them to do something, and they go off, and they're going to do it to the *n*th degree, and all somebody wanted was just a [summary] and they just wanted it fast. What's more important, accuracy or fast? You've got to know that to do a job for somebody.

Of course, this was all very front-end stuff, and I had been doing analysis of all kinds of spacecraft and things for the last year or two before that of what kind of spacecraft we might have, and what we might do, and the performance of different things. I had knowledge to work from, but then I had a complete lack of a lot of things he was asking me to do. So I'd just go back to that library, start looking things up. I look at the Internet and go, "Oh, man, if we'd had the Internet." I'd probably have been bogged down forever because there were too many sources, but somebody's got to know something I can go look up and at least get started.

We stayed locked up for six months, and it was the secretary and Dot [Dorothy B.] Lee, who's aero/thermo, and she's one of the ones that came from Langley. That was us. We were the only women in the room—and it didn't matter at all in that group, it was just get it done. It was really fun. We got kind of annoyed. Right at the end, they brought in folks from McDonnell Douglas to look at all our work, and they put all the presentations together and stamped "McDonnell Douglas" all over them, and they hadn't done anything but do presentations. It was like, "Oh, well." That's also when I learned it doesn't really matter who gets the credit, either, as long as it gets done, because the real people, they know. So we came

out of that, and we went back to our own groups. They took some more people out of our groups and let them work on some specific projects locked up for a while. I don't even know what those were; I had no idea.

But I went back, and because I'd worked the separation system, that's where I ended up going, working on the separation systems. Because I had worked with jet plumes—exhaust plumes before in Gemini and Apollo—then all the exhaust stuff fell in there. I was in the group that did aero and performance. We were working those areas, and when they broke things up, it just got broken up into the major things like the entry aerodynamics, ascent and the aerodynamics for that, and then the separation systems. So it really wasn't, I don't think, a surprise, but I do know that at least one of the guys I worked for kept thinking I should be on staff, and Dr. Faget just said no.

ROSS-NAZZAL: He was one of the big supporters of women, you think?

HOOKS: Oh, yes. He had I think three or four sisters and no brothers that I remember—he may have had one, but I don't remember—and then he had daughters—one son and three daughters. I think for him, he wanted what was best for his daughters and, of course, like I said, he wouldn't have cared; he just wanted you to get the job done. I don't think those kind of things ever entered his mind. He was a big supporter, but there were other people in my own organization who were very good supporters. Like I said, the people who ended up working for me were just awesome. They truly were awesome.

ROSS-NAZZAL: Did you and Dottie Lee strike up a friendship since you were managers in the Engineering Directorate?

HOOKS: No. We knew each other. In fact, in my very early years, I played bridge with Dot and some of the other aerothermal folks because we were right on the same hallway, so at lunchtime we'd stay in and play bridge. I played bridge with her and all, but it never developed into any real kind of friendship or anything. I was about 20 years younger than Dottie, so that was probably part of it, and plus, she'd been the lone female engineer. There's another one in that age group, and that was LaRue [W.] Burbank, but she and I never worked close to each other, and I just would occasionally see her in a meeting or something. LaRue had made it into the management chain. Dottie for years, I don't think she was a manager. She was aerothermal subsystem manager-type thing, I think, but I don't think she ever managed a section or branch. She may have, that I just don't remember, but LaRue did. In fact, she was the first woman that I knew of that was a technical manager at NASA, and I realize that her having done it and done it successfully made it easier for people to say somebody else can do it. Somebody's got to go out there and set the stage so people can say, "Oh yes, that worked. That worked."

I joined the Society of Women Engineers in '73, and I saw that whatever was happening at NASA was not unique; it was in every industry that women engineers were in. It wasn't a NASA thing, it was a people thing, and it was our society. A lot of it had to do with all that brainwashing at the end of the Second World War. Times were changing; eventually it would get better. Maybe for your grandchildren, but even things back like when I was in college, in a sorority. That was in the late fifties, early sixties, and that was when [protest] marches were big, and the hippie movement started and everything. They would tell us in the sorority, "You can go

march for any cause. You're free, and you can go do that, but do not wear your sorority pin when you're doing it because you're not representing everybody else." I thought, "Well, I can understand that. You can't do that and say you're representing some group you belong to when you're just doing it because that's what you believed in." But I always found it was rather difficult being a woman, because you couldn't take that pin off that said, "I'm a woman."

I think it put stress on, I really think it did, that said, "Whatever you do, if you really mess this up, it isn't just you you're messing up. They will use you as an example." Because they don't say, "Guys gossip." Okay? They might say, "Joe gossips," but they'll say, "Women gossip." We just get classified in this group. That became something I was really aware of, and especially as guys would introduce me and say, "This is Ivy. She's really done so well, blah, blah, blah." I'd think, "Boy, I'm glad they're not saying the opposite of this," but when they say that and they're introducing me, they're giving me a step up with whomever they're introducing me to. You become a little wary. That has to matter. You have to think about that you're not doing it just for you; you're doing it for other people, too.

ROSS-NAZZAL: What impact did the Federal Women's Program have at JSC? Do you think it had any sort of impact when it was introduced? I'm just curious.

HOOKS: Anything positive? I thought the whole Federal Women's Program was a joke. I still do. I'm sure that somebody somewhere thought the intent was good, and maybe they did some things I don't know about, but I wouldn't have done any of the stuff they did. I thought it was just almost junior high, trivial. But there were people in there, I know, that really tried. One time, one of my friends and I, Karen [M.] Morrison, who just died this past year, had a heart

attack; she was a lot younger than I am. She was still working at NASA. We put together a time management thing for women at NASA; it wasn't just engineers. I came back and spoke at some of their events when they would do Women's History Week and stuff. I think for some of the younger women, being able to ask questions and talk to somebody, that was really good, but in the early days, I will tell you, I don't think it did anything. It was one of those things the government does to say, "We're doing it. Whatever you told us to do, we're taking care of it. We're doing it," but I don't think it was meaningful.

I truly do not think there was anybody sitting in personnel at NASA or in many organizations just saying, "I don't want women." I think there were pockets of people that maybe would never say it but thought it, but then that's life, like somebody doesn't like somebody that's tall or fat or has blue eyes, or whatever. People have a lot of prejudices that they don't know they have, and if you ask them, they would say, "No, I don't do that," but they do, because it's the old I-want-somebody-just-like-me syndrome. That was the hard thing, and I think it was recognition of that that made it a little easier for me to get through a lot of things, because [when I realized they thought], "I'm a guy, and I want somebody who looks and talks and walks and thinks like I do as my deputy or to work with me," then there are no surprises. I work best with people who love surprises, who like something different, who don't care if we go off on some crazy track that we never tried before.

People who have a very tenuous comfort zone, don't do that, and they don't want to do. That's more the reason I think people pick [employees] the way they do. Of course, all I can think of is, if I picked everybody who's just like me, where are we going to get any new ideas? If you think just like I do, I must not need you, because I can already do that part. I need

somebody who thinks things I can't think about, that does things I don't do. But there are an awful lot of people, that's not in their comfort zone.

The real joy, and I think really the thing that made it fun working at NASA was the going to the Moon, nobody had ever done this, and just the challenge of it was so unbelievable that you had to have a bunch of people who weren't like that, and you had a lot of them in very high positions, like Faget, or Joseph] Guy Thibodaux, head of propulsion. There were just a lot of people who didn't have those hang-ups, so I could fit in. I don't think if you'd thrown me in an oil company I'd have ever gotten out of the back room. So for me, somebody took really good care of me and let me go to a job that was awesome, straight out of school, at a time that you couldn't beat. I look around, and I think, "Oh, the rest of you aren't going to get to do that, and that's terrible."

ROSS-NAZZAL: It sounds like a great opportunity at a great time.

HOOKS: It was. It really was.

ROSS-NAZZAL: Especially during such an exciting time—this great adventure that the nation's embarking on.

HOOKS: Oh, yes. You had to pass by building two, and that's where the Lunar Module was at the time; it was behind a glass wall. I had a friend with me—she worked at Dryden [Flight Research Center, Edwards, California]—and she was in town, had her little boy with her, and he was about six. He said, "How did they get that in there?" I guess they brought it in in parts and put it together. So I came back to their building and said, "How did they get that in there?"

Bruce said, “Those walls come off. Those glass walls come off.” Oh. They put it together somewhere else and brought it in with a crane. But [at age] six, he’s asking—“How did they get that in there?” you know, and to encourage that. You watch, and kids want to say “Why?” all the time—“Why, why, why, why, why?” until you get sick of it, I know, everybody does. But they need to, and they need to get answers—or they need to learn how to go find answers and to stay curious, because otherwise, we’re not going to have it.

ROSS-NAZZAL: So before the break, I asked you to talk about some of the challenges you identified, one of which was the lack of bathrooms.

HOOKS: Bathrooms were really fun. In the early days, you’d go into a building, and it was an engineering building, and there were engineers in there, but there’d never been a woman there. There just wasn’t, so there wouldn’t be a woman’s bathroom. It’s like, “Oh, I think this presents a little problem.” Now, we didn’t have that when they built the Center here. They put women’s bathrooms in because they had the secretaries, thank goodness, or probably wouldn’t have had them here. We’d have one on one end of a building, and then there’d be a lot of other men’s restrooms. Over the years, that’s given them problems. They’ve had to go back and enlarge the women’s restrooms, but other women know what I’m talking about. Normally, we have a men’s restroom and a women’s restroom, and they have the same number of stalls. And of course, everybody knows how many men can go through relative to how many women can go through in a period of time. They never seem to take that into account, so even if you had them, you might get lines backing up.

Then there were the places there were just none, like at the wind tunnels. So you're going to run a wind tunnel test or you're looking at a wind tunnel facility or something, and there are no women's restrooms anywhere. You say, "Well, I have to use the restroom, and it's four blocks to the next building, so would somebody check and make sure this bathroom is clear and then guard the door for me?" They'd check for you, but then they wouldn't guard the door; they'd get to talking to somebody and forget. So you'd say, "Okay, when I finish hearing everybody at the urinal, I'll get up and rush out of here again." Again, growing up with four brothers, it wasn't anything that particularly bothered me.

We went up to Langley, and this was before—well, sometime between that 1969 and 1972 time period. We were having major meetings a couple of times a year where everybody was bringing all their research back, and this was on aerodynamics and all. I had done some work with people over at Lockheed in Huntsville, Alabama, on plume exhaust and the impact of that. I had a paper to give right after lunch. When we got there that morning, as soon as I got there, somebody handed—you have to remember, no e-mail, no cell phones, almost no phones—hands me a yellow sticky that somebody had called me from Houston and I needed to call the office. I went out and called the office, so I wasn't in there for the introductory speech. I came back and sat down, and they said, "Well, you weren't here, so you didn't get welcomed." I said, "What do you mean?" He said, "The guy that welcomed everybody said, 'Welcome, ladies and gentlemen,' and then he says, 'Oh, there aren't any ladies here. Okay, welcome gentlemen.'" That's all he told me.

We sit through the morning speeches, we go to the four or six blocks or whatever it is to the cafeteria at Langley—I'm sure it wasn't but a couple blocks, but it seemed like a long way—came back, and I'm next up, so I go downstairs to go to the bathroom, and all the stalls are

closed, and all the shoes under them are men's shoes, and I'm like, "Oh, shoot, they've told the men to use the women's restroom too because there aren't any women. Thank you very much; nobody told me." So I'm standing there, and I think, "I've got to go, so somebody's got to come out of a stall in a minute. When they do, I'm just going right in. Just please have your pants already zipped up, because you're going to be embarrassed. It's not going to bother me, but you're going to be embarrassed." I passed some poor soul, went in, went to the bathroom, came out, washed my hands with everybody else, went back up, and went on that stage going, "I wonder how many of those people are out there going, 'I just saw her in the bathroom.'" I got back to my seat and my coauthors, and said, "Thank you very much for telling me that they told the men to use the women's restroom." So that was the worst one. Truly, it was the worst one.

Then, when I was wind-tunnel testing in Ames [Research Center, Moffett Field, California], and this would have been—it was before I made section head—so again, it was this '71, '72 time period when we were getting all these wind tunnel tests run. It was before we went out for the procurement, and Rockwell won the procurement to build the Shuttle. We had all the contractors there and everything. There wasn't a women's restroom in the area where we were doing wind tunnel testing, but I could go downstairs and across a walkway or something and get to a women's restroom, except the women's restrooms then all had couches or cots, because women needed that kind of treatment. Actually, I loved it; I thought it was really neat. You know, you might have cramps or something, or whatever their theory was of why they had to have those in women's restrooms; they didn't in men's.

The problem was because they don't have them in men's, all the guys—there were never women there at night when they were running wind tunnel tests at night, so they would just—if you're through with whatever you were doing, and you're waiting for them to call you as a

technician, and until then, you've got nothing to do but sit in a chair, why not go take a nap? I would normally go in and out of there and there would be some guy taking a nap on the couch. I said, "I don't care if you guys come down there. You can be out there on the couch anytime you want to, just don't come in where I am and go use your own bathroom," since they'll never put the lid down or they'll pee on it. So "Use your own bathroom; I don't care if you sleep on the couch."

ROSS-NAZZAL: That's too funny.

HOOKS: It is funny. There are just things people don't think about.

ROSS-NAZZAL: Well, and that's why I'd like to get it on tape, because I don't think that people think about these things. They're just accustomed to what life is like today.

HOOKS: When they built the new engineering building at the University of Texas—this was in the mid-seventies, I think. And of course, to save money, they only put women's restrooms on every other floor because there weren't that many girls going to school there—to heck with the secretaries; they just have to walk. But then worse than that, they put the Society of Women Engineers' office on a floor that didn't have a women's restroom. It's like, "What do you do? Do you think?"

ROSS-NAZZAL: No.

HOOKS: No. No, no.

ROSS-NAZZAL: You've mentioned the Society of Women Engineers several times. Why did you decide to become involved in this organization?

HOOKS: The reason I even knew about it was I had gone through Atlanta [Georgia] on some trip and gone by and seen the lady I call Aunt Ivy, that I'm named for, Dr. Ivy Parker. She had information there about the Society of Women Engineers, and they were going to have a conference in Dallas [Texas]. I thought, "Maybe I ought to join that. Maybe I'll come to the conference and meet you at the conference." So that's what I did; I joined the society. At that time it was a really small group. Everything was done almost totally by volunteers. But they've been around, actually, a long time. In the early fifties or mid-fifties, there had been a group in Houston, but by the time I went to that conference, they had a thing they called the Texas Section of the Society—they call them sections, not chapters, for some reason. Everybody in it was in Dallas except for one lady down at Freeport [Texas] for that worked for Dow Chemical, so they put on that convention that year.

I met some of the most interesting women on the planet, because the ones that were Aunt Ivy's age, who had been engineers before the war and all, before you had to go back home—there actually were a lot more women in science and stuff than people realize, prior to the war. A lot of them had done some really great things. Of course, since Ivy knew everybody, I got to meet all these people. It was a whole new world, to be with a whole group of women, and all of them were in engineering, and they worked for every industry imaginable. You had the ones who never married and just had careers, you had the ones that had huge families. I mean, Lillian

Galbreth—what did she have, a dozen children? That's *Cheaper by the Dozen*. It was an awesome event. Each year, they honored women who had done really great things in engineering, and many of them weren't members of the society, but they sought them out to honor them.

Then, when they passed Title IX [of the Education Amendments of 1972] where everything has to be equal; well, you can imagine who they came down on—people like the Society of Women Engineers, because we didn't have male members, which was not what Title IX was about. But we just said, "OK, fine. You want to join? Join. We don't care." We don't think they're going to beat down the doors to join our organizations, because we're not going to change the name of it. We'd always had a men's auxiliary. Some were husbands, some were professors, some were just people who thought it was a neat organization. It was a very small group, but they had always supported the organizations.

Over the years, I just made some wonderful, wonderful friends in the organization. Eventually, I said, "I'm going to go start an organization in Houston," and they said, "Well, you can't, because we're exhausted from this conference, and there's not enough energy to start a bunch of new chapters." I ended up holding all the offices you could hold in the local area and eventually starting a chapter over in San Antonio [Texas] and starting the one in Houston and breaking the North Texas part off.

But the women I just met! I met a lot of them when they were very young. I was in the restroom over at Barrios [Engineering] one day, and I came through the restroom—and it was after hours—and there was a young woman lying on the couch. She looked really pale. I said, "Are you okay? Do I need to do something for you?" She said, "I was just changing clothes. I was going to go to the gym, but now I feel really awful. I must be coming down with something.

I thought I needed to lay down a minute.” She looked at me, and she said, “Don’t I know you?” She did, because I’d met her in the Society of Women Engineers. She had come to work here for Orbital Sciences and ultimately became an astronaut. There are others I knew that have gone on and done all kinds of just really neat things.

One of my friends locally that helped me start the group here, she worked at Texaco, and she had a doctorate from the University of Texas in chemical engineering. When I’d get really discouraged with something going on in the government, I’d call her up and say, “Tell me a Texaco story,” because whatever dumb happened in the government, Texaco could out-dumb it, I can tell you. Their bureaucracy was so much older than NASA. So one day, I got invited to go down and speak to their brown-bag lunch group because I was on the speaker’s group at NASA so I went and did all kinds of speaking engagements. I went down there to do it, I got up, and that’s the first thing I told them. I said, “When I get really disgusted with the government, I call and get a Texaco story.” I had them then, because they know. People know in an organization what’s going on.

They have lots of scholarships for women in engineering. They do a lot with Engineers’ Week, judging the science fairs and stuff, and then they put on things for Girl Scouts and others. I haven’t been to a national convention in years. I used to go to those regularly. But the group that was in San Antonio that we started, it covered the Austin area—well, the whole center of that has moved to Austin. Since I’ve been in the San Antonio area, we’ve tried to get something started down there, but it just hasn’t worked. Occasionally they have something that I actually go to. But over the years, there are all these people that I just have this history with that all goes back to being in that organization. I think what they do and what they try to accomplish for women is, and in engineering, especially important.

Their conventions are awesome now because when people started trying to recruit women engineers, obviously that's where they went. Then when you go to their conventions, the goody bags and stuff that they hand out are really good. In the early days, they'd send all the guys to do the recruiting. Now they send the women engineers from the companies to do it, realizing that we actually like to talk to each other. We're really not wanting to impress all those guys anymore, really would like to see somebody else that's done well within that organization to talk to.

ROSS-NAZZAL: Was that something that you did for NASA at any point in your career? Did you go out and try to recruit?

HOOKS: No. I did speeches for women at colleges. By the time when I was doing so much of that, we were in one of those "you can't hire anybody" phases. We hired so few. That hurt NASA. I think there are two big things to me—maybe three—that have really changed the flavor of NASA. One, of course, is it became a bureaucracy. It wasn't in the early days. Now, Congress meddles in it like it does in everything else. It's just part of the pork-barrel politics like everything else. So you have to have all these Centers everywhere, whether you need them or not, and so the money's spread too thin. All the projects have to be spread everywhere, so you have no Centers of excellence. You can't do that; it just doesn't work well. Another one is we don't really have research going on. We don't have real research labs to draw on to go do new things. Nobody puts the money in the research, and operations take so much money that there's no money to do anything else except operate.

And, it's too introverted. There's not enough new blood coming in; there's not enough circulation. If you do something and do it wrong, then that becomes the pattern for how to do things—and this will get in me in all kinds of trouble to put this up anywhere—but there are people over here that believe the Space Station is a great success. It isn't a success; it's total failure. It hasn't killed anybody yet, but instead of \$8 billion and whatever we said we'd do it for, it cost at least \$30 or \$35. It probably cost ten times that, and we don't even know most of it anymore. Up until just recently, all we could put up there were two people at a time, and all they could do is survive. We've done no science, no anything. It overran its budgets; its schedules have been a joke. It was a mess from day one, and we have a whole generation of people that that's their only work experience, and since they think they're a success—because they don't know how to measure a success—they just want to repeat what they've done before. “Well, we did it this way on Space Station.” I'm like, “That's a good reason not to do it, okay?” It's horrible to have that—that's your only knowledge base, okay?

That was the other thing about the Society of Women Engineers for me was that I didn't just see NASA projects and talk NASA projects. I saw other people's projects; I saw people outside of NASA. I was interested in things going on in other industries, because you can get to think that you're the center of the universe, and hardly anybody is. You won't belong if you can't get new ideas, if you can't see things other people are doing. So to go other places, see what other people do, see their challenges, to me, is just fun.

Then like not very long ago, they had their PM Challenge—it's a project management conference that I've gone to for several years and talked at some of the time. This year, because they said, “You can't go to any conferences or conventions, but you can go to the training session,” nobody was there. No vendors were there, nobody else was outside, speakers or

anything. Everything was totally from inside NASA. Let's just close those doors down and sit around the fire and say everything's okay and we don't have to know what's really going on. But then they're not getting any new ideas. Nobody's bringing in things from the outside for them. They don't go outside. In the military, so many times, they'll take their people and put them in a plant that makes something for them; they send people out more. NASA just almost never did that, and I don't think it's healthy. For a while, it was there was just so much going on and there was so much new coming in, but then everything stagnated. When I went to work at NASA, the average age was under 45, and that's healthy.

If you don't have new people coming in, and new people coming in at various ages, and if you don't have anybody ever going out—some people shouldn't stay. I stayed 20 years and left. I told them sorry, it was time for me to go. I had never been a very civil servant anyway, and it wasn't fun anymore. I didn't want to be there anymore at that time. I didn't want another 12-year project like the Shuttle had been, from beginning to end, even though I worked different things. I didn't want to start another long project, and there they were starting on Space Station—and doing really weird things, in my opinion, when they started it. I was like, “I don't want to be a part of this.”

“Oh, we're going to put this Space Station in the sky, and we're going to do it for this little bit of money. We're only going to have eight people up there, and it's going to take care of all these orbiters and do all these things and everything else.” These are the guys that have 10,000 people sitting at the Cape [Canaveral, Florida] to take care of an orbiter, and in zero-G, they're going to do it with eight people. Right. Reality check, reality check. Where is it?

ROSS-NAZZAL: We just have a few minutes, maybe to end on a positive note, what do you think made Apollo successful that didn't make Station successful?

HOOKS: It helped that Congress said, "Just go do it," and so they didn't meddle. You had incredible leadership, and they weren't being questioned every step of the way by Congress and all these other committees and everything else, and they were in control of their people, too. Someone like a Faget or a Kraft or somebody said, "Do it," you did it. So there was just so much leadership, and there was all that knowledge of people that had been doing experiments for years and doing projects for years to take and put it on a grander scale.

Leadership matters. You've got to have a certain amount. I'm not saying there are not any leaders in NASA, but there's not enough leadership in NASA. It's just too pork-barrel, I think that's one of the biggest things, and people given management jobs that couldn't manage. I'm not saying that some of their early leaders were great managers either, but they knew it and put somebody on their staff that managed. I think there's the thought, "If I'm really brilliant technically, then I must be a brilliant manager," and of course, that has never been true at NASA or anywhere else. It sometimes is, but it isn't necessarily. It's not just at NASA, because the work I do now, we do with lots of different kinds of organizations and companies.

I see a lot of people who don't want to work. "Well, that's too hard; isn't there an easier way? Don't you have a tool that will take care of this?" It's like, "No, go get your hands dirty." But I'm not saying it couldn't be done again because it could, but it's not going to be done in the environment that's going on now, and that's sad.

I asked Dr. Faget about six months or a year after he retired, I said, "What makes it so different now?" One of the things he talked about was the bureaucracy problem and the pork-

barrel politics. He said, “It’d be really nice right now if they just took NASA and said, ‘This is the end. You did wonderful. You did Apollo, you built the Shuttle, isn’t that nice?’ and then you have an organization that goes off and flies spacecraft, and then you start a whole new organization to develop the new stuff—and get it really small again, and you hand-choose who you want in there and that sort of thing—and let NASA’s name just retire with all of its glory.” Then he said, “But that won’t happen,” but that’s life.

ROSS-NAZZAL: What an interesting idea, interesting proposal. I think we should end, that way we can wrap things up. Thank you so much for coming in.

[End of interview]