Stennis Space Center History Project

An Oral History

with

Elizabeth Messer

Interviewer: Charles Bolton

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John C. Stennis Space Center
History Office
B-1100
Stennis Space Center, MS 39529
(228) 688-2646

Biography

Elizabeth Messer was born in Tupelo, Mississippi, in 1964. She grew up on her grandfather's farm, which was located between Verona and Plantersville. Her father was a farmer and a line worker for a tire company. Her mother did factory work until she earned her GED and then she became a counselor for the Adult Handicapped North East Regional Center in Tupelo.

Messer developed an early interest in math and science. She was influenced by her eighth grade science teacher and her high school chemistry teacher but it was her pre-calculus teacher who made her want to go into engineering. After one year at community college, Messer transferred to Mississippi State University, studying agricultural engineering. She switched to aerospace engineering and graduated in 1988. In her junior year, Messer began working for the Raspet Flight Research Laboratory, a research laboratory at Mississippi State. After graduation she was hired by Raspet and worked there until 1989, when a position came open at NASA.

In 1989, Messer went to Marshall Space Flight Center, working in the turbine machinery analysis and design group, the technology test bed group, and finally, for the test area. Messer was the only woman engineer in the test area. She was also the first woman to conduct tests at Marshall, but she avoided publicity, preferring not to make gender an issue in her job performance. In 1996, management of the test stands was transferred from Marshall to Stennis Space Center, and Boyce Mix talked Messer into moving with the program. She continued in engine testing until 2000, working first with the B2 and then the E1. She was the first woman to conduct a test for NASA with the 250k hybrid engine. In 2000, Messer became assistant to the chief of operations. In this capacity, Messer is responsible for creating processes to improve testing efficiency, training new engineers, and furthering collaboration among the various NASA centers.

Messer met her husband, Brad, when she was a student at MSU. They married in 1990. They have two boys, Joseph, who is seven, and Luke, who is eight months old.

AN ORAL HISTORY

with

ELIZABETH MESSER

This is an interview for the Mississippi Oral History Program in conjunction with the Stennis Space Center History Office. The interview is with Ms. Elizabeth Messer and is being conducted on July 7, 2003. The interviewer is Charles Bolton. Also present is Paul Foerman.

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(brief interruption)

Bolton: Let me thank you for taking time out to talk to us today. We really appreciate it.

Messer: Oh, you're welcome.

Bolton: And could I just get some background information. Could you tell me like when and where you were born and where you grew up?

Messer: OK. I was born in Tupelo, Mississippi.

Bolton: OK.

Messer: Birthplace of Elvis Presley. I grew up outside of Tupelo, in a little area southeast of Tupelo between Verona and Plantersville—

Bolton: OK.

Messer: —on my grandfather's farm out in that area. So I really liked it. My mother still lives there.

Bolton: OK. Now can you tell about when you were born?

Messer: Oh, I don't mind. (laughter) Nineteen sixty-four.

Bolton: Nineteen sixty-four. OK.

Foerman: And still a child.

Messer: Oh, yeah.

Bolton: You would have been fairly young like when the moon landing happened. Do you remember that?

Messer: I was. I do remember watching it on TV. My mother thought that, you know, she set us—my brothers and I—all down in front of the TV to watch it so it was kind of neat. That was cool. What I remember, it was neat.

Bolton: Did you like science or space when you were growing up? Did you have an interest in that?

Messer: I did. I had an interest in math. I really liked math at an early age, like first, second grade, I really liked it. And about eighth grade I started really liking science. I think it was the teacher, I had an awesome teacher.

Bolton: OK.

Messer: And she made it fun. She let us destroy things basically, blow things up. (laughter) Maybe that's why I like testing. But yeah, so we did a lot of little experiments in eighth-grade science, it was fun. And in high school I had a really good chemistry teacher. I hated chemistry, but she was a good teacher. And she made—she'd think about things, and I had a good physics teacher. But really what keyed me to wanting to go into engineering was my pre-calculus teacher in high school. That was the first year they had offered pre-calculus at my school. It was a very country, small country school, but I took pre-calculus and I loved it. I wanted to go in engineering, I decided then.

Bolton: OK. Did you know what in engineering you wanted to do, or you just liked—

Messer: You're going to laugh. Don't you share this. I shouldn't say this. I started in agricultural engineering. (laughter)

Bolton: OK. Well, that makes sense for someone that lives in the country.

Messer: Right, right. I liked driving tractors and things like that, and I thought well, you know, I wanted to design better farm equipment. So I went to Mississippi State. Well, I went to a junior college for one year. Then I went to Mississippi State, the ag-engineering department, and I worked for the ag-engineering department while I was there. And we were designing better nozzles for applications of herbicides and it was hard work. You know during the summers up at 4 a.m. and in the field. And then I met my now husband there, and he was in aerospace engineering. He said, "Well, if you like designing nozzles, you ought to go try aerospace." So I took the intro to aerospace and fell in love with it, and I guess the rest is history.

Bolton: OK.

Messer: So I graduated in 1988 in aerospace engineering.

Bolton: OK. And what did you do after you graduated?

Messer: Well, NASA had a hiring freeze on at that time. I was hoping to go to NASA, I really was. But they had a hiring freeze and I worked—the start of my junior year, I started working for Raspet Flight Research Lab, which is a research laboratory at Mississippi State. And they had a Honda contract to design and build a prototype composite aircraft and test it. So I went to work for them as a undergraduate. And when I graduated I could have gone to work for other companies, like McDonnell Douglas was hiring in Texas, but Raspet hired me as an engineer. So I worked for them until hiring opened up again at NASA and I got on with NASA.

Bolton: Did they do any work with NASA?

Messer: We used the Cray [Inc.] at NASA to run all of our models. We would build finite element models. We were doing composites for, some of the early composite things for aircraft. And we would build them and then send them to the Cray and let it crunch overnight and so that was interesting. We were doing some DOD [Department of Defense] projects on crew recovery aircraft and that was interesting. You know, it's basically remote-controlled aircraft they would send in across enemy lines to recover personnel. So we did some of that testing.

Bolton: So how long did you work there?

Messer: Till 1989.

Bolton: Nineteen eighty-nine.

Messer: Yeah.

Bolton: So not too long.

Messer: No, the end of 1989.

Bolton: You were just waiting for the NASA job.

Messer: I was. It was only a year and a half. But I took a pay cut to go work for NASA.

Bolton: Really?

Messer: I did.

Bolton: Wow.

Foerman: That's how much you wanted to be with NASA, right?

Messer: Well, and my husband was in Huntsville, or my fiancé at the time, so yeah.

Bolton: And so you went to work at Marshall [Space Flight Center]?

Messer: I did. Went to work for Marshall in the turbine machinery analysis and design group. So that was a fun group.

Bolton: Well, what did that, what kind of work did [you do]?

Messer: Well, started off learning how to read data, from turbine machinery flight testing data, from the space shuttle main engines. And they had analysis there. He had been doing it, I guess, since the shuttle. He was there during the Apollo days, so he trained a lot of us younger engineers on how to look at data. And we would try to interpret whether the bearings were rubbing, you know, where they were wearing. And then we would also look for things like blade erosion, you know, try to interpret that from the data. And that was fun, but it wasn't as hands-on as I liked so I asked to be put on TTB, technology test bed. So, I guess, the second year there I got to work on that program and that was the engine 3001 which is instrumented engine. I don't know if you know it, but the only engine that NASA has ever owned—we rent the rest of them so we could blow it up (laughter) if we wanted to but we didn't want to. So it was an instrumented engine, and so we were trying to anchor a model SSME [Space

Shuttle Main Engine] to try to do improvements to the SSME. And we had instrumented turbo pumps, and part of my job was to make sure requirements were correct on how we tested those and to inspect them after each test and to look at the data after each test to make sure they were performing and we were meeting our parameters as far as models. So I did that till '94, and then I went to work for the test area, doing engine operations on the shuttle engine and that was fun. That was just fun.

Bolton: (laughter) What made that so fun?

Messer: I don't know. I guess getting to go out on the engine deck. And it was always a rush, rush, rush, you know. That's the way testing is, feast or famine. But trying to get ready for a test and seeing the test, oh, that was awesome. Of course, you've seen a test here, OK.

Bolton: Yes, I've seen a test, yeah. You're right, that is pretty awesome.

Messer: And to be a part of that. Everybody who worked there was a part of it and we did make improvements. We eliminated—I forget—we eliminated, I think, a third of the inspections that they were doing after each flight, which saved a lot of money and also the turn-around time by improving things and testing things out. We tested the first Pratt and Whitney pumps there, which are now flying. So it was fun.

Bolton: Obviously, this is a field that more men than women [are in]. How was that, working in that environment? Or I assume that I'm right. Is that true?

Messer: You are right.

Bolton: OK.

Foerman: She said that when we walked in.

Bolton: OK.

Messer: Well, when I worked for Raspet Flight Research Lab, the engineers I worked with were Japanese. They had just—

Bolton: Hmm. It was a Honda—

Messer: They were Honda North, R&D North America, and they literally brought them from Japan to do this project. Most of them did not speak English, so it was very

shocking for them to work with a woman. But they—actually, after a few months they welcomed me and, you know, hated—I still keep in contact with some of them in Tokyo.

Bolton: Uh-huh.

Messer: And so I got used to working with men in that test environment. And then when I went to work at NASA, my turbo machinery group was actually half women.

Bolton: OK.

Messer: And so I never experienced any discrimination as far as, you know, "You can't do that because you're a woman" kind of thing. But when I went to the test area, I was the *only* woman there.

Bolton: OK. So it was almost [totally men].

Messer: It was all it was. I think the secretary was a woman and there was a—they had a typist that processed plans that was a woman. But nobody on the engine deck was a woman so that was different. And they would watch, try to watch their language but after being there a little while (laughter), they'd forget you were there. And they kidded me because the worst cuss word I ever said was "sugar." But after four years I think I picked up some of their language ,(laughter) which I try not to use that. But it is a *fun* environment because everyone there, they joke a lot. And you all have a, you know, I think that's how they alleviate some of the stress, is by joking a lot because it is very stressful trying to make test dates and make sure everything works right. And it's also a hazardous environment so a lot of joking went on. But I did not have any problems with that.

Bolton: Now how did you end up coming to Stennis?

Messer: In 1996, I believe that's the year they turned over the Marshall—the test stands used to be managed by the Marshall Space Flight Center and they turned it over to Stennis Space Flight Center, that whole operation. I'd actually worked there before on a detail from Marshall.

Bolton: So you'd been down to Stennis before.

Messer: Right, in 1990. I had been married two weeks and Otto sent me, Otto Getz sent me down here. He said, "Oh, it'll be good for you." (laughter)
Foerman: He's a character.

Messer: Yeah. And so I was here and I *hated* the weather. Oh, it was awful, so muggy.

Bolton: OK. A little bit different than north Mississippi.

Messer: Yes, a little bit. But, anyway, so I knew what to expect. But in 1996 Boyce Mix approached me literally in the hallway at the chief engineer's office at Marshall and said, "Hey, we're moving all the engine testing to Stennis. You need to come down there," because he knew I liked engines.

Bolton: Right.

Messer: So I did. I came down and I interviewed and they came up there and interviewed some people. And only a few of us came unfortunately. I was hoping all the test guys would come because they have so much knowledge.

Bolton: Did they just move into other things? You had a choice? You could have moved into other things—

Messer: I could've—but if you were going to stay with engine testing—

Messer: You had to pretty much come here, yeah. Yeah, I could have gone into small component testing or moved into an analysis group, which I had that opportunity because that's where I came from originally, but I really wanted to do engine testing and I felt that was my—I felt like I could probably offer NASA more by doing that. So I talked my husband into moving here.

Bolton: OK.

Messer: But he's from Cleveland, Mississippi, which is the Delta so he knew what to expect, mosquito-wise.

Bolton: (laughter) Probably an improvement from there. All those insects, that's true.

Messer: Probably so.

Bolton: So you've been working here since '96 on the engine testing.

Messer: I worked engine testing till 2000.

Bolton: OK.

Messer: I did. I worked on B2 when we started up. You know, the B2 had been vacant.

Bolton: Right.

Messer: I don't remember how many years. You remember? It was fourteen or fifteen years, and it had been—whenever you have a mothballed stand, everybody goes there to get spare parts, so pretty much it had been gutted.

Bolton: OK.

Messer: So our job was to bring it back to life. I did the preliminary designs to put systems—LOX system, RP1 system—back on the stand, helium. We brought up the deluge system, fullpower, and the flame bucket. That's pretty impressive. We actually made wakes in the water when we floated. Had a raccoon out there trying to catch fish. We have him on tape doing that. So that was fun bringing it back to life.

Bolton: (laughter) How long did that take?

Messer: I think by late '97 we had it running, we had activated almost all the programs and then I think they tested the fast-track engine. I went to E1 after the initial work was done for the early design. In 1998 I went to E1. They were starting to build *that* facility and then they went on and tested low-cost technology engine, the B2 fast-track engine. So I think it tested [in] '98. So I was on E1 when it—I went over to see the test and, you know, it was kind of nice. But E1, then I went to E1. We started—it had been started in 1988, believe it or not, but they ran out of funding. It *was* built for solid rocket boosters, the ASRM [Advanced Solid Rocket Motor]. That's what it was built for *originally*, and then that program was cancelled so it kind of laid vacant. None of the high pressure systems had been activated, none of the tubing had been run. So we started doing that, me and another—I mean, I guess there was, I was going to say, about five NASA engineers and probably five contractor engineers on that team. And we started working toward bringing it to life. We had an activation. We activated it in 1999.

Bolton: So this was a little bit different work than what you were doing at Marshall?

Messer: It was.
Bolton: You were actually involved in setting up a test environment, right?

Messer: Right. And it was challenging, it was. I learned a lot and I enjoyed it. It was fun. It was stressful at times, I mean, *long* hours.

Bolton: Right.

Messer: And I was trying to think. After activation—my husband was on the same team and that's the first time that we had ever really worked that closely together, so it was good. I mean we survived. (laughter) They say you should never—yeah, but we had worked together at Mississippi State so I guess it wasn't too hard. But the hours were long. Then we tested, the first thing we tested on E1 was a 250k motor, a hybrid motor. I don't know if you've heard of those.

Bolton: A little bit. Tell me about them.

Messer: Well it—basically, the fuel is a rubber substance. I mean it—you can pour it, you can pour it into any design you want. It's a mold that they make. And it's very similar to—I was trying to think—you know, the rubber bouncy balls—

Bolton: Oh yeah.

Messer: —your kids play with? That's what it's similar to, once it's dry. And you flow liquid oxygen under pressure through an injector into that and you ignite it. We tried two different ignition systems, TTAB, which is a hypergolic, and then GOX with some spark plugs, for [lack of] a better word. So we—and the GOX system seemed to work better. And that's the test I got to run, and it was the first full duration test on E1. Dale Sewell is the other test conductor and he hates that. He wanted to have the first, (laughter) so it was funny. His got cut. He did the TTAB test and it got cut early. But, so we tested it and it was a pretty impressive test in that it was a technology—they were exploring a technology. And it was a consortium of seven different companies who had gone in together to do this design, hopefully to replace the solid rocket motors that now launch with the shuttle.

Bolton: Right. Is that still being developed?

Messer: Put it this way, it's left twice and I heard it's coming back.

Bolton: OK.

Messer: So we never throw anything away because it'll always come back. So I have heard rumors it's going to come back to test at E1 again with a different—they're

trying to find the right design to get the most thrust, because if you have a smooth burn you can produce the most thrust.

Bolton: Right.

Foerman: I was out there for your test on the 250k.

Messer: You were?

Foerman: I had just gotten here. And I heard you were the first female conductor out there.

Messer: First NASA female test conductor. And I had conducted tests at Marshall on an oxygen (inaudible) facility, but they didn't make a big deal of that. I mean, you know, that's good. It is. And Robert Lightfoot was my boss then and he says, "Hey, we need to put this in the paper and make a big deal." And I said, "I'd really rather you not, you know, because I think it doesn't, it *should not* matter what your sex is if you're doing your job." And so that was good, but yeah, I get a little ribbing about that occasionally.

Bolton: (laughter) Well, what is your job now? Tell me what you—

Messer: Well, in the year 2000—I have a son that's seven, which he was one year old the day we moved here. And we moved on his birthday, matter of fact, but with all of the testing that I was doing it was very difficult. I wanted to have another child. So I approached my boss and I said, "You know, I'd like to have another child before I'm forty." And he said, "Well, I really don't want you to leave the test area." I said, "Well, I don't want to leave the test area, but I need a job that has more flexible hours." Because when you're a test conductor you have to plan *everything*. You have to keep your arms around the electrical controls (inaudible), everything. And you're on call twenty-four hours a day if something breaks. So I said, "Well, how, you know, how can I contribute but have better hours?" And so at that point Robert Lightfoot—they let me become assistant, assistant to the chief of operations. Basically, my job was to come up with processes to help us be more efficient in testing. So I created a work control system, which they hated it when I made it but they love it now. So anything new, I guess. And my job is to train young engineers on that, and we're also to write operation instructions on how we do business and I do training on that also. And the other thing I've been doing since then is collaboration efforts. I'm trying to expand so we can rely on other centers to do some of the work that we may not have the expertise to do quickly. We do it but we may not be as efficient. Say, like dynamic analysis. Marshall has an awesome dynamic analysis group. If we could

send them our work real time and let them do that and get back to us, then I think we could save some time and money for testing. So I see my job as to reduce cost in testing to make us more competitive. Believe it or not, we have to be competitive in NASA. We're testing for private companies now and, you know, they look at the bottom line as, "How much does it cost and how long does it take me to get to test?" So we are having to be more competitive. So some of the things that I've been assigned are tasks that are going to help us move down that row.

Bolton: It sounds like you've done a lot of different things associated with testing, you know, everything from actually managing tests to, you know, designing test environments to now looking at the overall—

Messer: It's the more of the big picture.

Bolton: —big picture.

Messer: It is. It's far from where I came from. At Mississippi State, you know, my job was in the minute details.

Bolton: Right.

Messer: And then I was a little broader, you know, at Marshall, and then more into testing. Marshall gave me good experience to prepare me for what I was going to face here at Stennis and that was good. I had a really good experience with that.

Bolton: Well, how do you think that testing has changed maybe over the last, since you've been here in '96? I mean, how has—

Messer: Well, in '96 the funding was set. I mean, they were trying to get the test stands up and running so there was funding there. I mean, you knew if you ran over that it would be covered because you were trying to establish something new. Now that money's not there. You know, if you run a test program over you could just kill the program by an overrun or a slippage on your schedule. So that's why I think that it's changed a lot. Well, if you look at it, we're going to full cost accounting now. That was never done before.

Bolton: Because you knew you always had that flexibility there.

Messer: There were different pots of money and you never knew exactly which pot you were pulling from. (laughter)
Bolton: Right.

Messer: But it was always there when we needed it.

Bolton: You knew somebody would cover it.

Messer: Exactly. And now it's going to be full-cost accounting whereas the federal time, our hours will be charged to the program as well as the contractor. Overhead will be charged whereas it was not before. So it makes it even *harder* to be competitive against maybe test facilities that are managed by the air force or even private test facilities like Pratt & Whitney.

Bolton: What do you see in the future of the testing out here at Stennis, and maybe for you personally, your own job?

Messer: I think there's going to be down times. Most of my mentors were old test guys and they said there's downtimes. Like when you're really pushing a new design, you've got to have that design phase so there may not be much testing going on. And I think we're getting into one of those slow periods right now, but I think it's going to pick back up because I don't think our administrator and our president will let us stop. I mean, they have a vision, we have a vision as Americans for what we think NASA should be. I just don't see any way we can stop. If you *ever* want to reach beyond where we've gone today, you've got to create new engines. You've got to create something better than what we have, and that's where Stennis can *really* be a benefit, because we have the facilities, we have the know-how, [the] dedication. The people are very dedicated. I've never worked with a group that is more dedicated. And they all love NASA, too, which is I think [because] they're patriots, I really do. I get a little cornball, I get embarrassed.

Bolton: Well, you shouldn't be.

Messer: (laughter) I know but I just think I feel very strongly about that. I think that, as a good American, we should keep pushing the envelope, because everything we've done thus far has helped Americans and really people all over the world. The medical advances we've made, most of those would not have been made if we had not made the race for the moon. So I think we need to still keep pushing and I think Mr. [Sean] O'Keefe, [Administrator of NASA] is probably the man to lead us that way. And I know our group here will test whatever they send our way.

Bolton: Right.

Messer: We will test it.

Bolton: Well, it is, you know, nice to have this facility here.

Messer: It is.

Bolton: It would be sad to see it mothballed because you know personally how difficult it would be to get it back up.

Messer: It's very hard. They mothballed a stand I worked on at Marshall, and it's very hard to see a part of history remain dormant when you know it could be used for so much more. I would hate to see that happen here. Our buffer zone is *really* what keeps us alive. They can't test large engines at Marshall anymore because people live right up to the gate. So we need to maintain the buffer zone.

Bolton: Well, that does make this a very unique place.

Messer: It does. And we need to position ourselves to test small things as well as large. Because during those early design phases, for any new vehicle that may come along, you're going to have component testing. And if, you know, if they really are going to design something new, at a higher thrust, then they're going to have to have component testing of *every* component that goes into that engine. There's not enough test stands in *America* to test that many components, you know, in a timely fashion. So I think that's more than enough work for all the different test groups, Marshall, Plumbrook, us, White Sands, I mean all of us would have a lot of work to do if we position ourselves to do that. And then when the large engine, the system engine testing comes along then we'll be ready for that. And my job, hmm—

Bolton: You remembered my other part of my question. (laughter)

Messer: I did. As my boss says, I'm a jack-of-all-trades.

Bolton: You seem like you have a broad base of experience in the testing world.

Messer: I try to do whatever I'm asked to do, you know, in response to helping testing. I see in the near future my job being to try to continue my efforts on collaboration and to automate some of our processes. This past two years I led a project to automate our change request system, which is how we maintain configuration controls of our test facilities. So we automated that. And that's one of the big things, I guess, we've done recently to try to improve processes.

Bolton: Has that improved?

Messer: Oh yes. We went from a six-month to a twenty-four-hour turnaround.

Bolton: Wow.

Messer: (laughter) It's amazing what you can do when you track it electronically.

Bolton: Yeah.

Messer: So it's electronically signature routing everything and electronic, the technicians have access. The reason I pushed this system *first* is because it gives the technicians in the field the latest and greatest drawing at their fingertips without ever having to go to an engineer to print one out and wonder if they've got all the red lines. It's *there* electronically all the time, whether it's being updated by a drafter or not. So that was the big it was a safety issue in my mind. So that's one of the biggest improvements we've done recently. So we're going to continue that. And I see myself continuing trying to improve those processes over the next five years and also continuing to try to create collaboration. In my years with Marshall, Johnson, and the Cape, the consortium(?) centers primarily.

Bolton: That's good. Well, you mentioned that one of the things you do now is train new engineers. What do you see as being, you know, good qualities in a NASA engineer?

Messer: I saw that question. (laughter) Well, I'm not going to say a GPA of 3.9 or 4.0, because I really think a NASA engineer and a test engineer need to be able to think outside the box.

Bolton: OK.

Messer: They need to be innovative, a can-do attitude. I have friends that work for corporations that tell them how they want things done and "this is the way you do it." That doesn't really work at NASA, because you're not going to have anyone saying, "Well, this is the best way to do it," because most of the time it's never been done. Especially in R&D testing. I find that all the time. The customer comes to us and says, "Well, how [do] you think we ought to test that?" And it doesn't even have lifting lugs on the test article. I mean, that's happened. So you need to be innovative. I think you've just got to have a love for tinkering, for [lack of] a better word.

Bolton: Like any engineer.
Messer: Exactly. I think honest[y], integrity, definitely because we're not just

building *something*, we're building engines that possibly people are going to fly on and could lose their lives on. Where we all know, I think, that having a quality engineer look over your shoulder should not be needed. I think when you sign your name, an engineer signs his name, that that says, "To the best of my knowledge that is the *best I* can do." And I think we've got[ten] away from that. Bureaucracy somehow has pushed us into more paper. Whereas if you look at it in another sense, that's telling the engineer, "You don't have to be so right all the time. You don't have to take that responsibility on yourself." So I even wrote to Dr. [Chester G.] McWhorter at Mississippi State—he was one of the reasons I graduated. He told me what it is: "Success is 1 percent—" Oh, what was it?

Foerman: "Inspiration?"

Messer: "Inspiration, 99 percent—"

Foerman: "Perspiration."

Messer: (laughter) Yes. That was it. And perseverance, he told me to persevere. But I wrote him just a few years ago and I said, "If there's nothing else you teach engineers, I want you to teach them *ethics* before they get out." Because they're not teaching that, you know, as well as I thought they should, or at least when I was in school they weren't. And I said, "You need to teach them [that] anytime they put their name on something, that someone's life could be riding on that. So they need to be sure that that's as good as they can do." And so I think a NASA engineer—if I was going to hire someone, I'd want to know how many jobs they've had, were they hands-on jobs, and were they hard workers, and, you know, [if] they [are] a patriot at heart. Because what we do—the only reason I can get up and come to work is that I think what we're doing is improving the lives of the people in America. That's the only reason I can do it. Otherwise, I would stay home with my kids.

Bolton: (laughter) OK. Do you think that the engineers that you see coming up, these young engineers, do you think they have these qualities?

Messer: I *do*. We have two co-ops now in our group, and we've had—we have five summer students that are in college. They range from freshmen to juniors in college. They seem a little lost first, because they don't teach testing—

Bolton: Right.

Messer: —at all. I mean, you learn it on the job.
Bolton: You can't take a course in it.

Messer: No. Maybe they should teach one or at least introduce it, you know, in an introduction class or something. But they seem really nice, motivated. The young engineers, the co-ops I work with have been very motivated. Once you tell them what you need, they're going to go pursue it. And they're very fast. You know, things you would—you're trying to find them a job, you think it'll take a week and it [takes] one day. That happened. I said, "Are you already through?" So I think they're ambitious and they're trying really hard. And maybe NASA's not doing a good enough job getting the word out for what's really needed at NASA. By doing these summer programs like we're doing, I think that helps a lot.

Bolton: These students do they come from all over the place?

Messer: All over the U.S. We have one from New Jersey, one from Michigan, a couple from the Coast. So, and one from Rice. So, but maybe we need to go to the colleges, universities and get our word out, you know, "This is what we're looking for to build the next generation of engineers." So I think that would be good.

Bolton: OK. I think that I may have exhausted the questions I had, but, Paul, do you have some questions?

Foerman: No, I sure don't.

Bolton: Well, let me ask you, is there anything else maybe that I didn't ask you about that you wanted to bring out?

Messer: Well, I'm a mother of two.

Bolton: OK.

Messer: I've got to tell you about my kids.

Bolton: You said you had a seven year old.

Messer: I have a seven year old Joseph and an eight month old Luke, two boys, so they are so much fun.

Foerman: Will they grow up to be engineers?

Bolton: I was just about to ask that question myself. (laughter)
Messer: (laughter) Now my oldest is. He was in first grade this year and they won't

let him answer math questions anymore because he knows all the answers and they want to give someone else a chance in the class. He's been banned from answering math questions.

Bolton: Sounds like he's on his way.

Messer: Yes, he *loves* math, which I thought he would, but he told me that engineering is his second choice, baseball's his first.

Bolton: OK.

Messer: I said, "Why do you want to be a baseball player?" He goes, "Well, you get to spend more time with your family." He's buttering me up, right? And the second reason was he wanted to buy a stretch limo with a hot tub. (laughter) A *seven year old.* But he's been out to watch the test here and he does love them. And, as a matter of fact, there's going to be one here today if you haven't seen one.

Bolton: I actually got to see one in the spring.

Messer: Oh good.

Bolton: I've got a couple more interviews later so I won't be able to see the one today, but they're great. I love watching the tests.

Messer: I would just, I mean at your university and college, I would just try to encourage anyone out there, anyone in the high schools and junior high, that they can do anything they put their mind to, because my father went to the fifth grade and my mother went to tenth grade.

Bolton: What'd your father do?

Messer: He was a farmer.

Bolton: OK.

Messer: And then he—which did not pay the bills so he took a—he was a line worker for a tire company in Tupelo.

Bolton: OK.

Messer: And he's worked multiple jobs when that company, factory closed. But my

mother's always worked in a factory until she got her GED and became a counselor for the Adult Handicap Northeast Regional Center (?) up in Tupelo. So she's got a career late in life.

Bolton: Well, that's great.

Messer: Yeah, she's doing real well. But she always told me as a child, "You can do anything you put your mind to." And I was the first one in my family to go to college and it was *hard*. (laughter) It was hard paying for it and it was hard studying because I was working to pay for it.

Bolton: But it sounds like at least you had the support of your family so I'm sure that helps.

Messer: I did. They were very supportive emotionally and as much as they could financially. So, but I would just advise kids out there, if they're interested to go for it and try. I cannot tell you how many people helped me along the way to get me through college.

Foerman: How do you think we're doing here with ITB [Internal Turbine Burner] and RS-84 [Prototype Engine] and—

Messer: Oh, today's a bad day to ask. We just lost a program today. Friday our test article on USFE [Upper Stage Flight Experiment] they were testing, the test article with the flight tank, the helium flight tank in Arizona, and it failed Friday and destroyed the test article. So we've just lost a program overnight. So, but our other programs are going pretty good. Like any complex test article and test facility like E1, it's very complex. You're talking about fifteen thousand PSI on gases, eighty-five hundred on liquids, so very dangerous. So we're doing, I think we're doing pretty good. We've gotten smarter over the last five years. The valves we're working with, no one else in the country works with these type of valves as far as valve tuning and getting performance out of a test article. We're awesome in that, we don't advertise that enough. So, but I think we're doing pretty good. We're improving. I think we still have room for improvement though. And I think advertising is part of it. That we need to advertise what our weaknesses *and* strengths are so when a customer comes to our table, they know exactly what we're going to try to do for them. So we kind of have to sell what we're going to do and then what is it. "Say what you're going to do, do what you say." So that's what we've got to do. But we have some good people here, really good engineers and good, I mean, good finance department. Our public affairs department's wonderful.

Foerman: (laughter) Best in the business, huh?

Bolton: You've got to say that because he's here.

Messer: They keep us busy some days. (laughter)

Foerman: Well, we've got some pretty unique facilities here.

Messer: We do. E1 is the only one I know of in the world. It has three test cells, high-pressure hydrogen LOXs, high-pressure GN [Ground Network], helium, and we're adding an RP1 system for hopefully the next generation.

Foerman: You've got RS-84?

Messer: Um-hm. RS-84. So we're doing good there.

Bolton: OK.

Messer: I can't think of anything else.

Bolton: Well, thanks again.

Messer: Oh, you're welcome.

Bolton: You've been very helpful and I enjoyed talking to you.

Foerman: It was painless, wasn't it?

Messer: Thank you.

(end of the interview)