NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
EDITED ORAL HISTORY TRANSCRIPT

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INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is April 16th, 2008. This oral history with Mike Coats is being conducted for the Johnson Space Center Oral History Project in Houston, Texas. Jennifer Ross-Nazzal is the interviewer, and she is assisted by Rebecca Wright. Several months ago you participated in the NASA at 50 Oral History Project. You described your career as a naval aviator. I thought today we would pick up with that history and start by talking about that phone call you received from George [W.S.] Abbey in 1978. Would you share those memories with us?

COATS: Sure, yes, that was obviously a very special day because it happened to be my birthday too, January 16th. They had announced on the news the night before that they were going to announce the first class of astronauts in a dozen years. I think the last previous class had been 1967, scientist astronauts. But we were the first Shuttle class, so that was a big deal. They knew they were going to have the first females and the first minority astronauts. The news had a lot of coverage about that. Of course we had come down for interviews over the previous six months. I'd been in the first group of 20 back in August of '77. Then I got all excited after I came down and got a chance to see what the Johnson Space Center was all about. I really wanted to be selected then, even though the Navy was really good to me and I loved flying on aircraft carriers. I really wanted to be selected.

It was a big deal. We knew we were going to get a phone call. We thought it was just going to be if you got a phone call that meant you were selected. We didn't realize they were

calling everybody, even the ones that weren't selected. I was at Monterey [California] at the Naval Postgraduate School, and everybody in school seemed to know that I had applied and that there was going to be an announcement that day. Sure enough, I'm shaving at about 6:30 in the morning and the phone rang. Fortunately I didn't cut myself, so I put the razor down and ran across the bed, almost stepped on my wife to get to the phone. I didn't want to be late; didn't want it to quit ringing. I got over there and a voice said, "Would you hold for George Abbey," and I thought that was good news, that George was calling. So I was pretty excited.

Fortunately George came on and said in his own mumbling way, "Are you still interested in coming to work here at the Johnson Space Center?"

I said, "Yes sir."

"Good, we'd like to have you down here." That was about the extent of it. He did say, "Now, you can't tell anybody until 1:00 Eastern Time, when they're going to have a big press conference and an announcement. You can't mention it to anybody." I said, "Yes sir." I was all excited and immediately called my parents—which is a good thing—my parents and my wife's parents. My parents were in Colorado, and my wife's parents were back in Illinois. When they did have the announcements, the media came down on them very quickly, and they enjoyed that. They got a lot of attention for that.

Then I had to go to class, graduate school. I walked in, and the class was there and the professor was there and everybody's looking at me like, "Well?" I walked in and all I could do was smile. They said, "Enough said, congratulations." Big round of applause. That was nice. I didn't say a word, but the word got out very quickly there. In fact they had a nice party that night at one of the houses. We lived in a housing area at the postgraduate school, so we had a nice party, and it was really a pretty special group of folks.

We knew we were going to get a call. What I didn't know was everybody got the call, even if they weren't selected. He could have easily come on and said, "Well, we'd like you to apply next time." So I was delighted. That was a nice birthday present to have. I think he put the secretary back on the line to tell me they wanted everybody down there later in the month, here at JSC, to have a big press conference and unveiling.

I actually remember I had to leave Monterey a couple of days early because I couldn't get a flight out if I didn't leave early. I guess I could have driven up to San Francisco [California], but I'm not sure it crossed my mind. I was the first one of the 35 to get down here. George Abbey and Dick [Richard H.] Truly took me out to dinner at the Pour House with their wives, which I remember to this day, because Dick's wife started complaining about the Houston weather and how miserable it was here. George's wife at the time basically said, "Well, you can't do anything about it, why complain about it?" They got so heated in their argument. I remember George and Dick were turned away looking at the wall, and I'm between these two wives who are yelling at each other, and the manager actually came over and asked us to leave. So my first night here at JSC we got kicked out of a restaurant with George and Dick Truly, who later became NASA Administrator. That was my welcome-to-Houston moment.

I think my wife was excited that I was excited. She wasn't really excited about this astronaut business, because, as she put it, she thought all astronauts got divorced and she wasn't real crazy about that. I don't think the divorce rate's any different than society in general, it just gets a little more attention sometimes. She wasn't quite as excited as I was, but she was happy that I was happy. So that was a good day, nice birthday present, 30 years ago.

ROSS-NAZZAL: How old were you at that point?

COATS: Just turned 32. It's funny, because at the Strategic Management Council we just had with Mike [Michael D.] Griffin and all the Center directors and mission directors yesterday, we had some of the young people, the Gen Y people, come in and talk. Mike basically said, "Well, the group that took us to the Moon in Apollo were in their late 20s, early 30s. If you go back and look at the men that walked on the Moon, most of them were in their early to mid-30s." The flight directors, like Glynn [S.] Lunney, he used Glynn Lunney as an example, was 32 when he was an Apollo flight director, when Apollo 11 landed on the Moon. Now the average age of the JSC workforce is about 46. So that was a different time. Of course they were just starting the agency, so they were taking kids right out of college. It was a young group of people that did amazing things. Pretty astounding actually.

ROSS-NAZZAL: Would you tell us about that orientation that you went through when you were called down to Houston with your class? What are your recollections of that time period?

COATS: I remember sitting up on the stage over in the Teague Auditorium, all 35 of us up there. Of course the six women and the three African-American astronauts were getting all the attention, which was great. The rest of us really appreciated that a lot. I'm trying to remember what else they did during the orientation. It's an introduction to the world out there. We'd obviously spent a week down here before, when we were getting our physicals and interviews, so we knew about JSC. But they did sit us down and say, "Okay, you're going to report the first of July, and what do you need in the way of help and support." I don't even remember how long we were down here. It wasn't very long. Mostly they just wanted to get everybody together.

They did have us sign some pictures. We all had these pictures of what they thought the Space Shuttle was going to look like. We all got to sign some of those pictures. We signed each, like 35 pictures, so each one of us could have that group photo. It's nice to look at it, because we've lost a lot of classmates over the years. I don't remember much else about that visit down here, other than the press conference. We did get some individual interviews out there, but I remember my parents were really excited that the media was knocking at their door very quickly. They got to be on local TV up there in Colorado.

ROSS-NAZZAL: What were they asking your parents?

COATS: They just wanted to know about me and my background. I think they were disappointed I didn't grow up in Colorado where they were living at the time. They hoped they had a local boy. I'd mostly grown up in southern California, but it was nice for them. It's nice to call your parents and say, "I've just been selected as an astronaut." I think my dad was speechless for a while. He didn't have a whole lot to say, which was actually nice.

ROSS-NAZZAL: Did you have a chance to look around the Clear Lake area and map out where you'd like to live when you were down here?

COATS: Yes, we did. I actually told my wife I was going to use the trip as a house-hunting trip. We had sat down and come up with a list of what we wanted in a house. I had a realtor, because I had come in a couple of days ahead of time, so I had some time over that weekend. I had a realtor showing us around and I was looking at older homes, but then we were driving by the

Brook Forest area, which was under construction. Of course, now it's 30 years old. I said, "Oh, let's look in here." We drove around a little bit, and we found a house that was almost ideal. Everything on our list, our dream house, if you will, except it wasn't on a cul-de-sac. I wanted to be on a cul-de-sac and closer to an elementary school, because our daughter was five years old, about to start kindergarten, and my wife was pregnant with our second child. The realtor smiled and said, "Well let me show you something," and took us a few blocks over, which was a block from the elementary school. Here was the same exact house under construction on a cul-de-sac. Literally if you went down the list of about 20 items we wanted, that house had every one of them, but it was more expensive than we had hoped to pay. The good news was the banks and mortgage companies were falling all over themselves to give us mortgages. So we got a mortgage even though technically we probably didn't qualify for it.

It was fun to call my wife and say, "Well I found a house," and told her everything in it. She kept asking what the price was, and I kept telling her everything the house had. Finally she said, "You're avoiding the question here." I remember telling her, "Well, it's $93,000." She said, "Oh my God, that's out of the question." I think the house we'd sold in Maryland—remember this is a long time ago—we'd sold for like $45,000. She thought that was about the most we could do. It was fine, because it really was a nice perfect house to raise a family; a block over from the elementary school and on a cul-de-sac. Had everything we dreamed of there. Since it was under construction, we caught it so we could pick out the wallpaper and the tile and everything like that. We lived there for 20 years, and it was pretty nice. This is a nice area to raise a family. Good school system and so forth. I didn't waste that weekend anyway.

ROSS-NAZZAL: Dick [Richard O.] Covey told us, I think, that he ended up buying a house out there.

COATS: He was a street over from us, and so was Mike [Richard M.] Mullane. That's right. In fact, Covey has two daughters, and one of them is almost the exact same age as our daughter. So we used to take them to dance class and soccer practice all the time. He lives in a bigger house now.

ROSS-NAZZAL: Did you know any of the other 34 people that were selected in your class when you came down?

COATS: I knew the ones that were in the same group that I was in when we came down to interview. They'd gone alphabetically, so Covey and [John O.] Creighton were also in the group of 20 back in August. I'd met them already. I knew two of them; Hoot [Robert L.] Gibson and Jim [James F.] Buchli had been students of mine at test pilot school. I was an instructor. I had come back to the school as an instructor, and they were students there. So I knew those two, but that was about it.

It was a pretty diverse group, with scientists, and we had Air Force, Navy, engineers, and medical doctors. There really was a lot of variety there. Fascinating group of people. Of course we were sizing each other up. We went down all the biographies, and there were 20 mission specialists and 15 pilots. We noticed Dale [A.] Gardner was the only mission specialist that didn't have at least a master's degree. Of course a lot of them had doctorate degrees. It took us a

few days to figure out he was smarter than everybody else, and it probably didn't matter that he didn't have a graduate degree, because he was really smart.

ROSS-NAZZAL: You mentioned the diversity of this class. Some of your classmates have mentioned to us that because they were from a military background, they hadn't worked with professional women before. Was that the case for you?

COATS: Yes, pretty much. We had women at the Naval Air Test Center [Patuxent River, Maryland], but there weren't women pilots. So yes, women weren't really in the military a whole lot back then. Of course I'd gone to the Naval Academy [Annapolis, Maryland] before they admitted women, much to my regret, so it was new with the first six women in there. They were all extremely talented ladies and made a terrific impression on us right off the bat. They weren't exactly bashful. They were all strong personalities as well.

It was fascinating because you had 35 people from diverse backgrounds, and nobody was senior to anybody else. We were all equal. We had fascinating discussions about things, because the 15 pilots were all test pilots, whether it was Air Force or Navy, and because we had thousands of flight hours in high-performance airplanes, we'd essentially been trained to think alike. When you're flying, and especially testing airplanes, you're always thinking, "Okay, if something goes wrong, what's my out and what's my backup." It's contingency planning you just do naturally. Always giving yourself an out, if the engine blows up or something. Medical doctors were trained differently. Scientists were trained differently. Different thought processes.

When we came in, there were only 29 astronauts left over from the Apollo Program. We were 35, so we outnumbered them on day one when we came in. They were very gracious with

us and delighted to see us. I think they were quite glad to have some help down here. They essentially handed us a lot of the Shuttle development, operations development, the checklist development, things like that. It was fun as a class to be handed assignments like that and to see the brainstorming that went on. The different opinions gave me an appreciation that it wasn't so much men versus women, it was the different backgrounds that people had. Different training and thought processes that they had. It gave me a real appreciation that I ought to listen to some of these people because they're going to think of some things that I wouldn't think of. The 15 test pilots all usually came up with the same answer, and they were stunned when nobody got on board. They said, "Well no, we can do something differently." Oh, what do you know? So it was an education process and very enjoyable.

ROSS-NAZZAL: Why don't you tell us about those first few days in the Astronaut Corps once you finally arrived in Houston and showed up to the Center.

COATS: Al [Alan L.] Bean was our group monitor, shepherd if you will. He was responsible for making sure that they had a training plan for us, and they did, they had good training. The first year you're an astronaut candidate, and they have a lot of classroom work. We did a lot of traveling to the different NASA Centers as a class. Al was the guy that pulled all that together and made it happen, and it was really fun. We'd find all the time we could to talk to these guys. Several of them had walked on the Moon. We all had mentors assigned to us, and I got Ken [Thomas K.] Mattingly. I walked in to introduce myself, and he essentially kicked me out of his office.

ROSS-NAZZAL: Welcome to NASA.

COATS: Yes, downright rude. He apologized later, but literally 30 seconds before I walked in he had been told that he wasn't getting command of the first Shuttle flight, which he really wanted to command. John [W.] Young was going to take that to himself, so he was really disappointed and pretty upset about it. The timing couldn't have been worse. I walked in at exactly the wrong moment. I thought "boy, this isn't working out well at all. What did I say other than hello?"

We became good friends later and still are. He asked me to be his support crew for STS-4, and then of course on STS-4 Hank [Henry W.] Hartsfield was his pilot and then was my commander on my first Shuttle mission. So boy, that was my biggest memory, walking in to meet Ken Mattingly, who's been to the Moon, and he kicked me out of his office. Mentoring is going to go really well here. I wonder how this is going to work out.

They started us in classes, and they were fun classes. There really weren't any tests. They brought in some experts, different fields, things that you would expect if you have to look back at the Earth, oceanography and geology. Of course you also had celestial mechanics and astronomy, classes like that, which you would anticipate. They brought in all these experts to teach them, and it was fascinating, because they didn't give us any tests. They said your test will be when you fly. Nowadays there's a lot more testing, so I think we were spoiled back then. Nowadays they come in, and they're evaluated on everything they do and ranked. That really wasn't the case back then. The classes were fun because you could sit there and learn and soak it all in and ask dumb questions and not have to worry about a test. So we enjoyed that. Of course the traveling again as a group, going to the different Centers; I hadn't been to any other NASA Center. This was all new to most of us.

It was fun as a class going traveling together. I remember I missed the trip to Goddard [Space Flight Center, Greenbelt, Maryland] because my son was born, and it was a couple of years before I ever got to Goddard and got to see what that was about. We also had classes on the Shuttle, of course. Right off the bat, they started teaching us what the systems were on the Shuttle. Of course they gave us training materials by the piles and piles, and we pored over those. We all wanted to fly as soon as possible.

We thought the Shuttle would be flying within a year of when we got down here. As it turned out it was three years before the first Shuttle flew, but it was a really good time. In fact they told us that first year, during that astronaut candidacy period, if you had something else to do, like I did, finishing up a master's degree—I had to take some night classes to do that, because I'd been in graduate school—they said this is a good time to do it, because after the year is up you're going to get awfully busy. The hours will get very long. So the first year was actually fairly relaxing, even though it was fire hose treatment. It wasn't nearly as intense as later, when you got assigned to a crew and you're in the simulator all the time learning. That first year was enjoyable.

ROSS-NAZZAL: I understand that your class was so large that it was split into two groups, the red and blue group. Do you recall whose team you were on?

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COATS: Yes, as I remember it, and it's been 30 years, it was really for training. Instead of having a class of 35, they'd teach a class to the blue group, half of it, and the same class to the red group. They just wouldn't do it at the same moment. It really wasn't like there was the blue

folks and the red folks, it was just you went to different classes. You could mix and match when you needed to for whatever reason; at least that's the way I remember it.

ROSS-NAZZAL: Who were your officemates when you came down here?

COATS: Mike Mullane. Mike and I were in the same office, which was fun. Mike was Air Force, and I was Navy. He'd gone to [the United States Military Academy] West Point [New York], and I'd gone to Annapolis, so we had a lot of fun, the old Army-Navy rivalry. We ended up flying together on our first mission. It was fun because for two years it was just the two of us in an office, and then the class of '80 came in and Mary [L.] Cleave was going to be our officemate. She was selected in that class. We decided, before we'd ever met her, of course, to have a little bit of fun. They brought in a desk and file cabinets for her, and we shoved her desk in the corner and put file cabinets around it so she couldn't even see it really. Welcome mat. About five minutes before she walked in, Mullane turns to me and says, "If she doesn't have a sense of humor, we're in a lot of trouble here. This could be really miserable." I said, "Too late now." So she walked in. Fortunately Mary was just delightful. She walked in, and she said, "I'm going to fit right in here." She had a Ph.D. in—well, it was called sanitary engineering I think, and so we nicknamed her the "sanitary fairy" and "crap com" and had a lot of fun with her, and she was just a delightful officemate.

ROSS-NAZZAL: That's funny.

COATS: Mullane's got a good sense of humor. He was a terrific guy to train with when we got assigned, because when you're working long hours and everybody's tired, the sense of humor tends to go out the window, and nothing much is funny. Mullane would actually get funnier, and he kept everybody loose, because the more tired you were, the funnier he was, cracking up. It was really fun to be with the guy. Everybody else on that crew was a sports fanatic, including Judy [Judith A.] Resnik, except Mullane. He didn't have any interest in sports, and that became the joke on the crew too.

We'd tell sports trivia between runs in the simulator, and drive him nuts, just because he had nothing to talk about, he had no interest in it. But he was a good guy to train with; we had 56-hour sims [simulations] we called it, where you'd be in the simulator for two and a half days. They'd have cots set up that you'd sleep in, because they'd run around [the clock]. It was integrated sims, so the [Mission] Control Center was running too, because you have to simulate a flight for about two and a half days. Of course they'd wake you up in the middle of your sleep and horns are going off because a meteorite just poked a hole in the spacecraft, and you have to do an emergency deorbit and things like that. You didn't get a lot of rest, and you got pretty tired. It was good to have somebody like Mullane on the crew that just never seemed to get uptight, or tired for that matter, a good sense of humor.

ROSS-NAZZAL: Did you have a chance to read his most recent book, Riding Rockets: [The Outrageous Tales of a Space Shuttle Astronaut]?

COATS: He actually sent me the manuscript to review ahead of time, and I did. I was an instructor at test pilot school, used to grading flight reports and just bleeding all over them with

red ink, so I did the same thing on his book, his draft manuscript, and sent it back. A lot of it, I said, "Gosh, I don't remember it this way." He said, "Well you're older now, you wouldn't remember it." I said, "I think you're taking some literary license here." But I learned some things. He seemed to have a crush on Judy Resnik. At least he said so in the book. We didn't see that at the time. We trained together and flew together. I wish Judy was around so I could ask her if she happened to notice that he had a crush on her.

I did bleed all over the thing, and spell check doesn't catch words that are also other words, like hangar can be spelled two ways. I'd go through bleeding all over it. The editors didn't know any different, because they're not part of the aviation community. He sent me back a note saying, "Wow, you're the best editor we've ever had doing this." It was fun to read it, but he stepped on a few toes when he published that book, which was fun to see.

ROSS-NAZZAL: Amusing book.

COATS: Yes, yes, learned a lot.

ROSS-NAZZAL: That's a good way to put it. Your class called yourselves the Thirty-Five New Guys. Anyone in particular come up with that phrase? Or the patch?

COATS: Well, in the military the term for a new nugget pilot coming into a squadron, both Air Force and Navy, is the F-ing new guy, TFNG for short. So TFNG had a meaning in the military. You were the FNG when you came into a squadron. It just so happened that not only were we Thirty-Five New Guys, but we were the F-ing new guys too. So TFNG had a double meaning

for us; I don't remember who came up with the idea, but we latched on to it pretty quickly, and we'd say, "Oh yeah, it means Thirty-Five New Guys," snicker, snicker. All the military pilots, "Yes right, sure, we know what it means."

ROSS-NAZZAL: What sort of work did you do with Mattingly, once he came back to talk to you after he kicked you out of his office, for that first three-month on-the-job training?

COATS: Of course I was asking him an awful lot of questions. The first year, again, we were mostly going to classes to learn about all these sciences, plus learn about the Shuttle. The time I had with him I was asking about his flight. Of course he got kicked off Apollo 13 because of the measles exposure, and then eventually flew on Apollo 16, and of course Apollo 13 had all the problems. They almost didn't get back. It was fascinating to me to ask him about some of those stories, and also what he did here on the ground during Apollo 13. He was a real hero if you go back and read the books, and if you've seen the Apollo 13 movie that Tom Hanks made. TK just lived in the simulator trying to work out the procedures to get them back and did a heroic job.

He downplays that now, but everybody I talk to says, "Yes, he really did a heroic job." They had to get down to a certain power level or they just weren't going to make it back. He did an awful lot to figure out what they could turn off and still recover when they needed to, and completely reconfigured the Lunar Lander into a lifeboat for a period. He also said he's glad, in hindsight, that he didn't go, because they had to power down, make it very cold in there, because they couldn't afford the heaters. He said they were right at freezing, and TK is really thin. Small and thin and wiry. He said he can't stand cold. He said, "I don't think [I] would have survived that," according to his testament, so it actually worked out pretty well for him in hindsight. But

he said he was certainly bitter that he got taken off a week before the flight. I can imagine how hard that is. Every moment I had I'd ask him about his experiences, and he was very generous with his time.

After the year was up, they gave us assignments around here, and I got assigned to the SAIL facility, [Shuttle] Avionics Integration Laboratory. For two years I was over in Building 16 almost around the clock. They were working around the clock seven days a week, and they needed crew in there to execute the procedures they were testing out to make sure the software worked the way it was supposed to. I really didn't have a whole lot of interface with the Astronaut Office. We'd go to the Monday morning meetings, and then I'd be over at SAIL the rest of the week, including weekends. But whenever I could I'd go over and spend some time with TK.

Eventually he said, "We've got to get you out of SAIL and back over here to the Astronaut Office, because nobody ever sees you anymore." I said, "Well I'm working 80-hour weeks, what can I do?" So he asked for me to be on his support crew for STS-4, which was good, because then I got to be a CapCom [Capsule Communicator] and get really involved in the Shuttle training, watching him go through it, and it worked out really well for me. I learned a lot.

Back in those days the Apollo astronauts didn't care for the flight surgeons at all. It was very much an adversarial relationship. Their attitude was the flight surgeons are there to ground you. It's a feather in their cap if they can find a reason to ground you, so why would you ever talk to them? There was real animosity between them. I remember a flight surgeon walked in while I was in TK's office one time and wanted to talk to him about Hank [Henry W.] Hartsfield's [Jr.] heart rate when he was in the swimming pool in a suit, because he had to train

for spacewalks back then. TK just came unglued, just chewed him out like I haven't heard ever before, and I've seen Marine Corps drill instructors. I kept trying to leave and he said, "Don't leave, I need a witness." I thought, "I'm going to see a murder right here." This poor flight surgeon just kept trying to leave too, and TK wouldn't let him. Just chewing him up one side and down the other.

It was a surprise to us, because in the Navy—where we come from—the flight surgeons wanted to keep you flying. They didn't want to ground you if they possibly could, so there was a level of trust there that didn't exist here. Now it's turned around completely. Over the next several years it turned around dramatically. They got some young flight surgeons in who had a totally different attitude. Nowadays there's tremendous trust between the astronauts and the flight surgeons, and the astronauts know the flight surgeons will keep them flying if they possibly can. Got too much invested in them to not take advantage of that. It's really changed, but boy, that was an eye-opener for us back then.

We were briefed by Jack [R.] Lousma, the military astronauts; he sat us down and said, "Okay, now this is different, this isn't the military, this is a civilian space agency. First of all you have to get used to the fact that they won't make a decision before they have to, because they're going to continue to gather all the data they can." In a lot of meetings the first question is, do we need to make a decision now or how long can we put it off, and what more data can we get before we make a decision? Which is a different attitude than the military. Military is you make a decision based on what you know and change it later if you have to. He also said, "Don't trust the flight surgeons and don't trust the lawyers, they don't work for you, they work for NASA, and they're looking out for the agency and not for you." He had a lot of things to say, "Don't trust the

media, be careful what you say, never say anything negative," and so forth, and that was good advice. Again, it's a little bit different now fortunately. I hope it's a lot different.

I thought the older astronauts really welcomed us into the office. They appreciated the help, I think, and the fresh blood coming in, so it was good. We socialized together. The older groups and the younger groups, we went out to dinner a lot. We tried to have a touch football game, the old guys against the new guys, and that didn't work out real well. I think one guy broke his ankle, and another one broke his arm. They took it really seriously; these are very competitive people.

ROSS-NAZZAL: The old guys broke their arm and ankle?

COATS: I can't remember who broke what, but I remember we were playing touch [football]; remember the old guys were 29 guys, and of course we were 35, but six of them were women, so we had 29 against 29. We said, "Hey, let's have a football game." It got pretty rough, so we only had one football game and had to quit after that, too many injuries out there, a very competitive group of people.

ROSS-NAZZAL: You had mentioned working in SAIL. Who else were you working with at that point?

COATS: Steve [Steven A.] Hawley and I were over there. They had a couple more. Brewster [H.] Shaw, and I think Loren [J.] Shriver. They assigned several people to work because it was a round-the-clock activity. We'd work a different shift every week, which made us exhausted a lot

of the time, but back then we were young and we could do that. Steve and I seemed to be on the same shift a lot, and it was fun because Steve was a scientist. In the simulator there in the SAIL facility, which was a cockpit of the Shuttle, they have a technician in there all the time as well. We were supposed to be the crewmen.

The technician was Hispanic, and he'd be talking Spanish to other technicians that were on the headset listening in, and unbeknownst to them Steve spoke Spanish. He'd just come from Chile, where he'd been an astronomer down there observing, and he spoke good Spanish. We were in there probably a month, and this guy would be joking about us or saying things about us in Spanish, and Steve would tell me later what he was saying, and we were enjoying that. Then one day Steve lets out a sentence, a perfect sentence in perfect Spanish, and this guy's face just turned white, you could see all the blood drained out of his face, and he's trying to remember all the things he'd said about these two young astronauts. He never said another word on the simulator. Steve enjoyed that a lot.

ROSS-NAZZAL: You mentioned you were working 80-hour workweeks. Were you working eight hours a day or were you working longer hours than that?

COATS: No, you were supposed to work three shifts at SAIL, so you'd work a shift, but you'd have to get there an hour ahead of time for a brief and then a debrief afterwards. So it was 10 hours there, and then you'd go over to the office and try to get whatever work done there. You might have a class or something like that. Then you'd be working Saturdays and Sundays. It was about 12 hours a day, sometimes 7 days a week. You thought it was important because you were getting ready for that first Shuttle flight, but it was hard on the families.

In my case we had the five-year-old and a brand-new baby, and it was hard on my wife. We didn't realize we weren't home much, and we were enjoying the work, and time passed pretty quickly. But it turns out the time evaporated. Most of the guys that left the office finally, the reason they left the Astronaut Office and quit flying is because they just needed some family time, and that's one of the reasons I left after my third mission. My daughter went through high school, and we tried very hard to go to her marching band contests, but I still felt like I missed a lot. My son was about to start high school, and I didn't want to miss that as well. That was a big factor in deciding to leave. I know it was for a lot of folks. Astronauts work pretty long hours, they work pretty hard; a lot of traveling involved. It takes a very understanding wife to put up with that, because there are a lot of jobs that you work long hours, but I think in the Astronaut Office you don't realize it as much as other jobs. It can wear people down, families down; anyway, it's hard on families.

ROSS-NAZZAL: How do you think that your background in the Navy prepared you for the job that you accepted at NASA?

COATS: We were doing these 56-hour sims, and we ended up having to do quite a few because our flight got delayed. We had the first pad abort and two-month delay, so we ended up doing three or four of these things when usually you did one. We noticed the folks with the military background, who had frequently had to stay up long hours, seemed to put up with it a little bit better than the graduates right out of college with their Ph.D.s. When they got tired, they wanted to go to sleep, and you couldn't do that in the military. Mullane and Hank Hartsfield and I had all been military, and Steve and Judy and Payload Specialist Charlie [Charles D.] Walker were

all civilians. I don't know if it was easier or we just accepted the fact you just had to work while you were tired; sometimes fighting to stay awake, but you had to do it type of thing.

In the military they hand you an assignment and say, "Here you go, figure out how to get it done." They train you, but they want you to show initiative and go make things happen. In the civilian world it's not quite that way. You don't have the sense of urgency, I guess is the point I'm trying to make, that you do in the military. When you're assigned a task, it's almost like, "Here's your mission in life, you've got to carry it out whatever it takes." At the Naval Academy they taught us something they called "Message to Garcia." There's a story about a messenger in the Spanish-American War that had to get a message to Garcia, and everything he did to get it to him. The point was you do what it takes to accomplish the mission, you figure out a way, you don't say "I'm tired," you don't say, "Not today," you go get it done. You can see that it's a little bit different attitude.

Now after a while the civilians pick up on that, because you're working hand-in-hand and especially when you're assigned to a Space Shuttle mission. You become very focused on the mission and accomplishing everything you possibly can during that mission, all of the detailed test objectives, supplemental test objectives, everything you can, you want to get done, because after the flight you want to say, "Man, I was only there for seven days, but look at everything we did." You don't even want to go to sleep at night because you want to accomplish more, so you become very mission-oriented.

Everybody is that way, the whole crew. I see it when these crews come back. They just work their tails off when they're up there. We have to tell them to take a day off. We mandate it now after a certain number of days you will take a day off. Humans can't work every day forever, because it's pretty intense work up there. The military, I think, prepared you for that,

because it required you to work some pretty intense periods of time and made you mission-oriented, if you will.

The military learned a lot from the civilians too. First of all, "why." In the military you don't ask why, you just go accomplish the mission. Well, civilians were sitting there, "Now why would you want to do that," which is good. Every once in a while you have to step back and say, "Why are we doing what we're doing? Why is that the objective?" It's good to explain it to people. It was a good mixture, I thought.

ROSS-NAZZAL: One of the other assignments you had worked on was the landing rollout assignment. What was that?

COATS: First of all the wheels and tires and brakes on the Shuttle were designed for about a 150,000-pound vehicle. The weight grew to about 200,000 pounds. So you've got wheels and tires and brakes that are underdesigned for the size the vehicle had gotten, but you can't redesign them. You've only got so much room in the wheel well. Back then, especially in the early Shuttle missions, we were worried about blowing tires, and on one [flight] Bo [Karol J.] Bobko did blow a tire landing at the Cape [Canaveral, Florida]. I was assigned to work wheels and tires and brakes from the crew office. Carlisle [C.] Campbell, who still works here, was the expert in wheels and tires and brakes, and Carlisle and I spent a lot of time up at Wright-Patterson Air Force Base [Ohio] where they have a huge dynamometer testing wheels up there.

Remember, air pressure in your car tire is about 40, 42, something like that, psi [pounds per square inch]. In a Shuttle tire it's 300 and some psi, and we actually pumped it up to 900 psi during testing, seeing if it would blow. It turns out tires are as much a black magic as they are a

science. Finding what combination of chemicals makes a good tire and then how you heat-treat it to anneal it is more art and trial and error than science. So we really did learn.

Now they've come a long way since I left and came back there. Tires now are much stronger than they used to be, but we had tires that were relatively weak. We were doing a lot of tests, not only to figure out what happened if you blew a tire, did you have good control, can you maintain control of the vehicle, but what if you had a nose wheel steering hard-over? If the command went like that, do you have enough control to override it, and can you catch it in time? If you're landing in a crosswind, how much control authority, how strong a crosswind can you land in? So we did a lot of simulator work learning what our crosswind limits had to be.

We did a lot of work here. We did a lot of work out at Ames Research Center [Moffett Field, California] where they have what they call a vertical motion simulator, VMS, which is a huge room, about the size of this building. It has a cab on it that you can move forward and aft and up and down very quickly, so you can sense some of the Gs you feel, the forces you feel, when you land and have a blown tire or a nose wheel steering hard-over or whatever.

A lot of piloting techniques [were tested] to establish what kind of limits we could land the Orbiter in. I did that for a period of time. In fact, when Bo blew his tire, I had to oversee the study [to determine] the new constraints and what do we have to do to ease the constraints. Turns out when they'd built the long runway down at the Kennedy Space Center [Florida], the Shuttle landing strip, they'd put pretty deep grooves in the concrete, because when a rain shower would come through they wanted to drain off the water quickly. That's not a problem for most airplanes that have big tires, but with the Shuttle, which has a 200,000-pound airframe on a tire that's only built for 150, any kind of crosswind, when you turn the tire a little bit against those

grooves, it chews up the tire unmercifully. That meant we had to severely restrict the crosswinds that the Shuttle could land in.

I had to go brief the NASA Administrator at the time, James [M.] Beggs, and explain why we couldn't land at the Cape until we smoothed down the runway, and we were severely limited on crosswinds. I briefed him several times, and of course he wasn't terribly happy about spending several million dollars to go grind down a runway. But they did.

They had a big celebration in the [National] Air and Space Museum [Washington, D.C.], NASA did, and I forget the occasion, but I was there with my wife. I'm walking down the concourse at the Air and Space Museum, and James Beggs was talking to Vance [D.] Coffman, who was the CEO of Lockheed Martin. Just as I was telling my wife, "Oh, that's James Beggs over there, the NASA Administrator," he reaches out and grabs me and said, "Vance, I want you to meet the son-of-a-bitch who won't let me land at the Cape." So I got to meet Vance Coffman, who eventually became my boss at Lockheed. As we walked away my wife said, "Well, you certainly have impressed the NASA Administrator." That was my job, to figure out what we could land in in the way of crosswinds, and could we control the nose wheel steering hard-over, and that sort of thing. So I did that for a while. It was fun for me.

ROSS-NAZZAL: Yes, it sounds like an interesting project, it's something we hadn't heard of before.

COATS: Is that right?

ROSS-NAZZAL: Yes, no one's ever talked about that.

COATS: We learned, and of course eventually they put a drag chute on the Orbiter, so now when they land, they pop that chute to slow them down. We didn't have that back then.

ROSS-NAZZAL: Well, this might be a good place for us to stop today.

[End of interview]