

NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

ORAL HISTORY TRANSCRIPT

GEORGE D. "PINKY" NELSON
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is May 6, 2004. This oral history with "Pinky" Nelson is being conducted for the Johnson Space Center Oral History Project, in Bellingham, Washington. Jennifer Ross-Nazzal is the interviewer.

Thank you for taking the time to meet with me this morning. I really appreciate it. I know your schedule is quite busy. You just got back last night fairly late.

NELSON: Yes. Thank you.

ROSS-NAZZAL: I'd like to ask you about your interest in physics and astronomy as a child. Can you talk a little bit about that?

NELSON: Sure. I can't remember the time when I didn't want to be an astronomer, from the time I was [four at least]. I remember I've always been fascinated by things astronomical, by the sky and the planets. I grew up in the fifties, so I remember watching *Sputnik*, but even before that, I knew I wanted to be an astronomer. I wanted to be lots of other things, too, but that among them.

I grew up in rural Minnesota, so basically a Lake Wobegon kind of experience. I got a good education, and because of teachers, I thought I was interested in mathematics when I went

off to college, but soon discovered that I was a better physicist than I was a mathematician, and my real interest was in nature, not in mathematics. So I was able to continue pursuing that.

ROSS-NAZZAL: How closely did you follow any of the space programs, like the Mercury and Apollo Programs?

NELSON: I followed them closely, but not fanatically, not as a hobbyist or anything like that. My family always had a subscription to *Time* and *Life* magazine, so I read everything and knew everything, and during some of the programs, I used to save the pictures. I was fascinated with the pictures, mostly the pictures from the spacecraft, that were taken during the missions, during Gemini and Apollo especially.

ROSS-NAZZAL: Did you ever have any interest in becoming an astronaut yourself at that point?

NELSON: Yes, I thought it would be fun. It certainly was a fantasy, but it wasn't a career goal, really.

ROSS-NAZZAL: When did you find out that they were going to be selecting Space Shuttle astronauts?

NELSON: In 1977, I was finishing up my Ph.D., working on a fellowship in [West] Germany, at the University of Göttingen, and just saw a flyer on the bulletin board.

ROSS-NAZZAL: Why did you decide to apply at that point?

NELSON: Looked like fun. I had learned to fly while I was an undergraduate at Harvey Mudd [College, Claremont, California], and the job looked like it combined the three things I was really interested in, space, astronomy, and the intellectual challenge of it all, and then the flying aspect, which I liked, and also the physical aspect. I'd always been a jock, so I thought the physical challenge would be interesting, too. I didn't think I had much of a chance, actually, but I was just finishing my Ph.D. I met all the requirements, so thought it sounded like fun.

ROSS-NAZZAL: Can you tell me a little bit about the application and the interview process from your memories?

NELSON: Sure. I applied from [West] Germany. I typed my application on this old German typewriter, manual typewriter, and sent it in. This must have been in spring of '77. Then came back from [West] Germany in the summer of '77 and went to New Mexico, a roundabout way to Seattle [Washington], and spent, I guess, three or four months at Sacramento Peak Observatory in [Sunspot] New Mexico, and had really heard nothing during that time.

One of the people at Sacramento Peak was an Air Force officer, who has since had a distinguished career on the military side of space. He had also applied and so when he was there, I was able to catch up with—he was a good source of—all the rumors and all that, and I just kind of sent my application in and [had] forgotten about it.

And just as I was about to leave Sacramento Peak and drive back to Seattle with my family in November, I got a call from George [W. S. Abbey]—I think it was either George or

Duane [L.] Ross, saying they wanted to do an interview—this must have been on a Thursday or something. Could I come in on Monday? I said no, because I was driving my family back to Seattle, so I put it off for a week and drove back to Seattle and then flew out from Seattle. I guess I had known they were interested before that. The FBI [Federal Bureau of Investigation], or whoever does the background checks, had been on the observatory. The observatory had about fifty people who lived there, so it was fairly obvious what was going on.

So flew from Seattle down to Houston [Texas] for my interview. They had us in groups of twenty. I thought the interview process was really interesting. Again, my philosophy during this whole thing, here I was barely twenty-seven years old and I wasn't really expecting much. I knew I was qualified, and I just thought it would be a great experience, so had decided that I wasn't trying to be anything special; that I was going to play the game perfectly straight. If it was me they wanted to hire, then it probably would be fun, and if not, it would be an interesting experience.

The interview process, like I said, was really interesting. We were a mixed group of scientists and test pilots. Somewhere during this process, George Abbey had found out that I had also played baseball in college. I was a baseball player. The most unusual part of the interview was the interview with Terry McGuire, [who] was one of the two psychiatrists involved in the process. Halfway through the interview, he got up and walked across the room and packed up his briefcase and walked to the door and opened the door, and I said, "Well, I guess we're done?" And I thought, "Oh, boy, what have I said here?" [Laughs]

He said, "Yeah, we're done, because you've got a softball game in half an hour out at the field, so Mr. Abbey said you had to get out early."

So I went out and played softball with the—they had an astronaut team. At that point they're weren't that many astronauts; there were only, I forget, twenty-six or something like that, in the office. So a few of them were playing and a few ringers that George had recruited, Jay [F.] Honeycutt, and folks like that. So I went out and played and had a good time and went out and drank beer with them afterwards. I figured that was my real interview.

ROSS-NAZZAL: When George called, were you anticipating an offer?

NELSON: Oh no. I mean, the story gets even more amazing. When the interview was over, I went back to Seattle and I was in the midst of an absolute panic to write my Ph.D. dissertation. I guess it hadn't occurred, but as soon as I got back, I got a call from a well-known theorist at the University of Colorado in Boulder who said, "I have a postdoc position opening up. I want to offer it to you. Are you done with your degree yet?"

I said, "Well, no, I'm not. I'm just writing."

He said, "Well, can you be done by the end of the year?" And I hadn't really written anything yet.

I said, "Sure." [Laughs] And went in to my advisor and said, "Hey, I've got a postdoc job. Can I finish writing up what I've done so far? Will you take that?" She said yes.

So I basically went underground during November and December and did nothing but write all day and compute all night, so basically wasn't even thinking about the astronaut selection. I was trying to get my Ph.D.

I did finish my dissertation by the end of the year and defended in the second week of January or something like that, and the next day moved to Boulder. The day that I showed up at

the Joint Institute for Laboratory Astrophysics at the University of Boulder, I walked in the office at eight o'clock in the morning and the secretary said, "Are you Pinky Nelson or George Nelson? There's a George Abbey on the phone for you." So the very first thing I did at my postdoc job was quit. [Laughs]

So George offered me the job that day. So I spent the next six months there in Boulder kind of tidying up my astronomy career and getting ready to move down to Houston.

ROSS-NAZZAL: What was your family's reaction when they found out that you were going to be an astronaut?

NELSON: It was mixed, I think. My kids were very small. At that point my oldest daughter was five and the youngest was two, so they didn't have an image of what it was. My wife, I think, was apprehensive. I mean, she was pleased that it was something that I really wanted, and that was the typical spouse reaction, I think; it never changed. But it was very exciting at the time. There hadn't been that many astronaut selections up until that one. There hadn't been one in a long time. The press made a big deal of it.

It was interesting from our interview process, I have a picture from that week down in Houston that I had taken or somebody had taken, and it was a picture in the cafeteria, in what, Building Three? Is that the cafeteria?

ROSS-NAZZAL: Yes, that's one of them.

NELSON: Our group was sitting there having breakfast and everyone is kind of sitting at tables, and there are three of us who are sitting by ourselves at one table, eating breakfast. It turns out that those are the only three in our group that were selected. It was me and Jeff and Sally, Jeff [Jeffrey A.] Hoffman and Sally [K.] Ride, that just kind of self-selected ourselves, and we were the ones that ended up getting chosen out of that group.

ROSS-NAZZAL: What was the reception like, once you finally came down to Houston, by the rest of the Astronaut Office?

NELSON: I thought it was great. We were treated very well. For me it was just an eye-opening experience. I had never experienced anything like that before. We were treated, especially, I think, by the group of astronauts who were there, we were treated especially well, was my impression. Even though, here's this twenty-seven-year-old kid who's a scientist, not a test pilot. The same with the women, the six women who were in our group, who it became obvious pretty quickly that this was an exceptional group of people and they fit in right away. I just thought it was a ball from day one. I couldn't imagine being paid for having fun like that.

I think one of the reasons our reception was so good was that there was a tremendous amount of work to do, that the Space Shuttle was on the drawing boards and being built, but the challenge of pulling together everything that was needed to fly the Space Shuttle was awesome, and they needed the help.

ROSS-NAZZAL: Can you talk about the training that you underwent for that first year?

NELSON: The first year was kind of generic. We went to lots of interesting classes, science classes and things like that; two days of geology and two days of astronomy. Went on some neat field trips. Went around and visited all the Centers and then had training on the Shuttle systems and there were some history things about this agency, just to acculturate us; things like that.

The Shuttle training, we were developing the training as we were going through it at the time. There wasn't a Shuttle. They were just developing the systems and the single-system trainer and all those other pieces, and that was a great way to learn for all of us. I think our group probably knows more about the Shuttle. A few of the old guys who really dug in, Story [Musgrave] and Al [Alan L.] Bean and John [W.] Young and [Robert L.] Crippen, knew vastly more than any of us ever will, but our group really dug in and got to work on all those little details that it takes to pull a program together. So we know, I think, more about the Shuttle than anybody ever will, in terms of just how it's put together and how all the systems work, and why the displays and controls are the way they are, and why the checklists are the way they are, because we wrote them; we did all that work.

ROSS-NAZZAL: Our research indicates that you worked under the tutelage of Robert [F.] Overmyer for your first three months of on-the-job training. Can you talk about that mentorship process?

NELSON: Bob was a great guy. I don't think he was much of a mentor. I'm not sure what we did exactly. [Laughs] I don't remember exactly what we did. Now that you mention it, I remember that's true, but I'm not sure what we did together exactly.

ROSS-NAZZAL: Is there anything you think that he taught you about being an astronaut that was invaluable?

NELSON: Yes, Bob was one of those consummate pilot types, so we spent a lot of time flying together, flying the T-38s, so I learned a lot about flying, not just flying airplanes, but about just flying in general from everybody. Overmyer was one of them who really contributed to that.

ROSS-NAZZAL: One of your first assignments was working with the Space Shuttle EMU [Extravehicular Mobility Unit]. Can you talk about that assignment and what some of your basic job duties were?

NELSON: Yes, I sought that out, actually, because it really looked like fun to be able to work in the suit, go outside. Story Musgrave at the time was the EMU person, I think. So I started working with Story, and he helped check me out in the suit. There were three or four of us who were working EVA [Extravehicular Activity]-related issues. Anna [L.] Fisher and Jim [James F.] Buchli were working EVA issues, closing the payload bay doors and tools and things like that, and I was working the suit side of things, so we overlapped quite a bit. So we worked together as a team.

Story was a fabulous mentor in terms of just learning how to use the suit, physically learning how to use the suit. His depth of knowledge of the suit and the way he operated in terms of really digging in and getting to the bottom of every system, really knowing everything inside out, was a great example of how to work, so I learned a lot from just being around Story and watching him work, and then getting checked out in the—we started in the A7LBs, in the

Apollo suit. Had this little water tank in Houston and I did some work in the tank at Marshall [Space Flight Center], in Huntsville [Alabama].

I spent a lot of time going to design reviews and some trips up to Hamilton Standard [Inc.], where the suit was being designed, or to—I don't think I ever went to [International Latex Corp. in] Dover [Delaware] during that time. I might have once to see where the fabric part of the suit was being put together. But the suit was one of the long poles in getting the Shuttle ready to fly, the Shuttle EMU. The folks in Houston who were in charge of it were [Walter W.] Guy and his group were really working hard, and it was a difficult task to get it pulled together. The suit actually blew up shortly before STS-1.

ROSS-NAZZAL: Can you talk about that?

NELSON: Sure. I mean, from my own perspective.

ROSS-NAZZAL: Of course, yes.

NELSON: I was home working in my garden. I was playing hooky one afternoon, and I got a call from George Abbey. He said, "Where the hell are you?" [Laughs]

"Well, I'm home working in the garden."

He said, "Okay. Get in here. We just had an accident with the spacesuit." They were doing some testing in one of the vacuum chambers in Building 7, and one of the technicians—they had the suit unmanned, pressurized, in the vacuum chamber. They were going to do some

tests and they were going through the procedures of donning the suit and flipping all the switches in the right order and going through the checklist.

There's a point, when you get in the suit, that you move a valve. There's a slider valve on the front of the suit, and you move this slider valve over, and what it does is it pushes a lever inside a regulator, and opens up a line that brings the high-pressure emergency [oxygen] tanks on line. You do that just before you go outside. You don't need them when you're in the cabin, because you can always repressurize the airlock. When you're going to go outside, you need these high-pressure tanks. They're two little stainless-steel tanks about this big [gestures], about six inches in diameter, maybe seven.

And it turned out that when this tech [technician] did that, he threw that switch and the suit basically blew up. I mean not just pneumatically, but burst into flames, [and he] got severely burned. It was pure oxygen in there. The backpack is made basically out of a big block of aluminum, and aluminum is flammable in pure oxygen. So this thing just went "whooff," went up in smoke. And they reacted very well.

So then I was put on the Investigation Board for that, and spent I don't know how long, a couple months at least, just focusing on what had caused this and could we identify it and fix it and get it ready before—so that it wasn't the long pole for flying STS-1. So I learned even more about the design and manufacturing and materials and all of that in the suit during that process. It was fascinating. And the NASA system. The system for handling that kind of an incident really is very good. We've seen it with the big accidents we've had. They really can get to the bottom of a problem very well.

ROSS-NAZZAL: Besides the suit blowing up, were there any other major problems that you found with the suit that you helped resolve before the first spacewalk?

NELSON: I wouldn't say major problems. There were lots of little stuff. The displays and controls on the suit are a challenge, because, one, you have to see them from inside the suit, looking down, so a lot of these old guys in the office, who were, you know, the stage I am in my life now, where I have to wear reading glasses, couldn't read the displays because they were close to your face. So we worked on lenses and all kinds of ways to make the displays legible to people with old eyes.

One of the things I worked on fairly hard was the caution and warning system in the suit. It had a little computer, a very crude computer that monitored a number of different sensors and systems so that you could tell how much air you had left in your tanks and how much life left in your batteries, and how much carbon dioxide was in the air and things like that; which current you were using and whether your fan was on or not.

Then there was a caution warning system attached to that so if something went out of limits, it would ring the bell and then it would scroll through kind of a diagnostic program and offer some—all on this, I don't know how many, ten-letter, twelve-letter display or something like that. It would offer advice on what to do.

The caution warning system wasn't very useful, the logic in it wasn't very good, so one of the things I did was to rewrite the logic, the flow diagram for the caution warning system that they then programmed into the suit, that made it work in a logical way.

ROSS-NAZZAL: Our research also shows that you were a scientific operator for the WB 57-[F].

NELSON: Yes, that was fun.

ROSS-NAZZAL: Can you talk about that?

NELSON: Yes, my reasoning was, since I was working on the suit, I wanted to get as much experience in pressure suits, period, as I could. Plus, flying in the WB 57 sounded really cool. So Kathy and I, Kathy [Kathryn D.] Sullivan and I both got checked out in the WB 57, and my reason for doing it was to get experience working in a pressure suit. It's a different kind of suit, but similar kind of experience.

The price to pay for doing that was to learn about how the airplane worked and how the missions that the airplane did worked, and then to actually pull together and run a couple of missions. So I spent three weeks down in Miami at Homestead Air Force Base [Florida] doing microwave observations over the tops of thunderstorms for some scientist. I actually got a publication in *Science* magazine out of it.

Then Kathy and I both went to South America to do an air-sampling mission with the WB 57, and flew from Houston to Panama, to Lima [Peru], to wherever you go, Montevideo [Uruguay], down south over the Falkland Islands. It was neat. That was a fun trip.

ROSS-NAZZAL: Sounds like fun.

NELSON: Long flights. Seven hours in a cockpit in a pressure suit. This is the classic one that—people always think that the astronauts in the Shuttle have eating out of a toothpaste tube and

things like that. That's what you really did in those suits. You have your applesauce out of a tube. Water out of tube, sticking in the hole in your helmet.

ROSS-NAZZAL: Can you tell me how you performed the experiments? What was your job in the plane?

NELSON: Well, the main job was actually organizing the expedition, getting all the people together, the maintenance guys, the suit guys, the airplane, coordinating the ground operation, making sure you had fuel, and all that kind of stuff, just being in charge of the mission. NASA had all these people who knew how to do this stuff; you just had to pull them together.

Then flying the mission itself was pretty straightforward. You just had to program what was the equivalent of a GPS [Global Positioning System] back then. You had to program the little navigation device so the airplane would fly where you planned it to fly, and then when you were ready, just operate the instrument; basically, just be a technician and throw switches. Then the pilot in the front was doing all the real work; he was flying the airplane.

ROSS-NAZZAL: You were also a support crewmember and a CapCom [Capsule Communicator] for the last two orbital flight tests, STS-3 and STS-4. Can you talk a little bit those assignments?

NELSON: That's true. Sure. That was fun. We worked with Jack [R.] Lousma and [C.] Gordon Fullerton on STS-3. It was a fairly complicated mission, certainly the most complicated mission in terms of the payload at that point. Don't remember exactly what it was, but they had a bunch of little "sciencey" kind of stuff out in the bay, and some really weird interfaces to work with, to

operate them. So my main job on that mission was the on-orbit ops [operations] and then to work in mission control as the CapCom.

Jack and "Gordo" were black and white. I mean, they were the yin and yang of the space program, basically. Jack is your basic great pilot kind of "Let's go do this stuff," and Gordo is probably the most detail—well, the second-most detail-oriented person I've ever seen. Gordo at least knew he was that way and had had some perspective on it, but there were things he could not let go. So he knew everything, basically. He knew all the details and really worked hard at making sure that everything was in place, while Jack looked after the big-picture kind of stuff. So they were a good team.

Did that mission have the arm on it?

ROSS-NAZZAL: I know STS-2 did. I'm not sure about -3.

NELSON: I think it did. I don't remember. I think Sally Ride and I were the on-orbit CapComs for that. She had been on the support team for STS-2 and -3, so she and I did -3, and Mike [Michael L.] Coats was in there. I did -3 and -4, and Mike Coats did -4 and -5, I think, the on-orbit part. I may be wrong.

ROSS-NAZZAL: We can verify.

NELSON: So, preparing for the mission was fairly straightforward, as I remember. I mean, Jack and Gordo had their issues, and flying the Space Shuttle with two people was a nontrivial job. I mean, it was a full-time job to keep that thing going with just two people and carry out some

kind of a mission. I don't know how they did it, actually. I don't think I'd want to fly in the Shuttle with just one other person.

Working as a CapCom during that time, I thought was just a kick. I mean, it was an incredible challenge, because we didn't have the TDRSS [Tracking and Data Relay Satellite System] satellites, so we only had the ground sites. So the time that you could communicate was very limited. You'd get a three-minute pass over Hawaii and a two-minute pass over Botswana or something, so you had to plan. Unlike now, when you can talk pretty much anytime, you had to plan very carefully and prioritize what you were going to say, and the data came down in spurts, so the folks in the back rooms had to really plan for looking at their data and analyzing it and being able to make decisions based on spurts of data rather than continuous data. So it was kind of a different way to operate.

I really liked being a CapCom during that, having to organize what you were going to say and be able to say things in a really succinct and precise way and make sure that the language you used was just what they were expecting to hear so that you wouldn't have to repeat things, and to be able to listen. Just by the tone of their voice, when you went AOS, acquisition of signal, over a site, you would call up and say, "*Columbia*, Houston through Hawaii for two and a half," or something like that, and then you could just tell by the tone of their voice in the answer whether they were up to their ears or whether they were ready to listen. So there was a lot of judgment that had to be made, just in terms of, you always have a pile of stuff to get up. How much of this should I attempt to get up? What has to go up? Do I need to listen instead of talk?

I found that to be just an interesting experience, a challenging job, and I really liked it. I liked that idea that it's a really high-tech machine. Really the key communication was so subtle, the voice communication was really subtle and interesting, because there were times during those

missions where there are always little things going wrong, and with just two people, it's just incredibly taxed. There were times when you could just tell by the tone of their voice it was like, "Just knock it off for a while here. We're busy up here."

There were a few run-ins. I remember Neil [B.] Hutchinson, the Flight Director, was trying to get me to get a message up and I just wouldn't do it, because I knew that they just weren't ready to act on it, and it was important, but wasn't critical or anything. And Neil was ready to kill me, and I just kind of sat there and just said, "No. They're busy. They don't need to do this now." [Laughs] So that was fun.

The experience with STS-4 was a little different. T.K. [Thomas K.] Mattingly [III] is probably the most technically capable person who has ever been an astronaut, just in terms of his capacity to stuff things between his ears. He knew absolutely everything, and had to know everything, and was fanatical about tracking everything, and drove me nuts, because I don't work that way. I tend to work in a way where you take in a lot of information, but you have a filter. You say, okay, this is important, this might be important, this is probably not important, and you prioritize things, where T.K. works that everything is on the top line. He's able to work that way just because of his incredible capacity, and I wasn't, so he and I had kind of an odd relationship. If I didn't see the point of having to do something, I wouldn't do it, basically.

Henry [W.] Hartsfield [Jr.] was great. Again, George or whoever put those crews together did a very good job of getting the right mix of attitudes and skills and all that.

It was the first DOD [Department of Defense] mission, so it had some classified stuff to it, not very classified. They were just testing the system, basically. I thought it was funny that they had me as a CapCom on that, with no experience in that sort of thing at all.

Mike Coats was my counterpart, my partner on orbit, I think, during that mission. Because they were doing stuff that was supposed to be secret, we just didn't talk much, and T.K. didn't talk much anyway. That's one area where T.K. and I really got along. We were able to communicate fairly well because we had the same kind of style of no extra words kind of communication. But, boy, he was a hard taskmaster, I thought. He just didn't see the forest, but he saw every tree, and he expected everybody else to do that, and they just couldn't. He really wore some people down. That kind of thing doesn't bother me so much. I was able to just kind of ignore it and say, "Okay, I'm going to catch some flak for this, but I deserve it. I don't care. I'm not going to do it anyway."

That was another two-person mission. They were really busy. They did a nice job, though. That's where some newspaper article about the mission called me the "laconic and taciturn CapCom." [Laughs] That was great.

ROSS-NAZZAL: Let's talk about your first mission. When did you finally hear that you were going to be part of a crew?

NELSON: I don't remember. It was a year or so before the flight. People were getting assigned to missions and we were all restless. I was restless. I wanted to be on a mission, and this was the mission I wanted, because it had EVAs. I guess I remember going over to George Abbey's office with somebody else, Terry [J.] Hart, or maybe it was the whole crew, I don't remember, but being offered the flight. And George's style, "We thought we'd assign you to this mission if you think you want it still."

Then I remember meeting with Crippen shortly after that, in one of the little conference rooms over in Building 4, where he doled out the assignments, and assigned me the role of flying the MMU [Manned Maneuvering Unit], which kind of made my year, because here was a mission with four military pilots on it, and Terry Hart and "Ox" [James D. A.] van Hoften were both mission specialists, engineer types, but they had also both been fighter pilots, and [Francis R.] Scobee had flown everything that had wings, and Crip had flown—this was his third flight already on the Shuttle. And they decided to let me fly the maneuvering unit. I never asked why. I didn't want them to think about it.

Training for that mission was really fun. It was a very complex mission. We were involved quite a bit with Vance [D. Brand] and "Hoot" [Robert L.] Gibson. The mission before us, Vance and Hoot and Bruce McCandless [II] and Ron [Ronald E.] McNair and Bob [Robert L.] Stewart, because they were going to test out a lot of the equipment, so we worked closely with what they were doing and watched that flight pretty closely.

Lots and lots and lots of time under water, which was delightful. I got to be really good in the suit. I could sew. I could do embroidery in the spacesuit. [Laughs] Just from practice, you know. It's just a physical task, like anything else. So we got lots of practice. Ox and I were a great team. It was really the most complicated spacewalk that had ever been conceived, and a real precursor to the much more complicated work they've done on [the Hubble] Space Telescope.

So we worked with our trainers. We had lots and lots of good support. Terry [R.] Neal, I think, was our primary guy on the suit. We worked hard to choreograph this repair, and we had it down basically to a dance. We knew all the steps and who was where when, and what tools were needed, and how we moved things, and how you could just reach back. You didn't have to

say anything; you could just reach back and the tool would appear in your hand. So we had this thing all figured out. The training experience was terrific. Crip is a stupendous leader and commander, and the whole crew worked really hard, a very talented crew.

The mission itself was pretty exciting. We had the IMAX camera and all that stuff. We did the spacewalk on the third day of the mission, which was probably not a great day to do it, because people are still feeling kind of iffy. But I felt okay, actually. I ascribe that to having spent so much time under water. I think that was really good training for adapting to zero-G. I really didn't have too much of an adaptation problem on that mission.

But the first spacewalk didn't work out like we'd planned, and that was pretty strange. Everything worked perfectly until I got to the satellite and flew up to dock with it and then it didn't work. So I ended up making things worse rather than better, making the satellite tumble, and trying all kinds of stuff, actually just grabbing hold of the solar arrays. It was pretty exciting in retrospect, and the memories of the view from there are just amazing; the Shuttle against the Earth and jets firing and all this. What an extraordinary experience to be able to fly the MMU.

Then to actually have the ground bail us out, which was pretty neat, I think, because after the first spacewalk, when we had blown the capture, I thought, "Oh, god. This thing didn't work. I don't know why. I did everything I was supposed to do, but I know I'm going to get the blame for this, the credit for not having it work. Now what do we do?" So luckily, the ground bailed us out and T.J. [Terry Hart] was able to grab the satellite, so we were able to actually complete the mission, which would have been a very different experience if they hadn't done that. The guys at Goddard [Space Flight Center, Greenbelt, Maryland] were really good.

The repair itself was a kick. It was so much easier to work in space than it is on the ground. Ox and I and T.J. running the arm just kind of did this repair. I mean, it was a piece of

cake. It was so much fun riding on the end of the arm, and just being out there was tons of fun, and much easier than working under water.

Then the mission after that, we were low on gas. The mission after that was a lot of fun. We didn't have anything to do, basically, run a bunch of rinky-dink experiments on board. We had these silly bees. NASA does such goofy little science things. I'm afraid the Space Station's full of that kind of stuff, too.

ROSS-NAZZAL: Let me ask you a couple questions about your first mission before we talk about the second one. Your crew was called the Ace Satellite Repair Company. Do you remember who coined that phrase?

NELSON: Actually, it came from one of the earlier crews, maybe STS-[5], I don't know. Joe. How embarrassing.

ROSS-NAZZAL: We can fill that in. Joe [Joseph P.] Allen?

NELSON: Joe Allen. They had launched a couple of satellites. I think that was the first time we'd used the PAMs [Payload Assist Modules] and launched communications satellites, and they called themselves the Ace Satellite Delivery Company, and I think it just kind of carried. So I think Joe Allen gets the credit for that.

ROSS-NAZZAL: Did you have the opportunity at all to work with the IMAX camera? You had mentioned the IMAX was on board.

NELSON: Oh, sure. We all did. Yes, we all did.

ROSS-NAZZAL: Can you talk a little bit about the training for that and the difficulties or the ease with which you used it in space?

NELSON: Terry Hart did most of the mechanical work on it. We were all trained to load film and do all that, but Terry ended up doing the most of the real work. The training for it was stupendous. The guy who invented the camera was there basically training us. This was their first time. They really wanted to make sure it worked, so Graeme Ferguson and Phyllis Wilson, now Phyllis Ferguson, and Dave [Douglas]—he lives up on Vancouver Island. The camera guy. They spent lots and lots of time with us. We gave them lots of time to work on the IMAX and we took lots of footage on the ground. The camera itself is just a monstrous big blivet, you know, lots of moving parts. But we didn't have any trouble with it. It worked fine for us. The footage was spectacular. Yes, that was a lot of fun. The IMAX camera was a lot of fun.

The other thing we had fun on that mission was just being STS-13. Was [Robert A.] Frosch the Administrator at that time? Whoever it was, was afraid of the number thirteen and so we were originally STS-13, and then just as our flight came up, they changed the numbering system to make us 41-C. So we started saying on the air-to-ground, whenever the number thirteen came up, we'd say 41-C. [Laughs] Yes, that was fun.

We had a great ground crew on that, too. Jay [H.] Greene, who was the lead on-orbit Flight Director, was fabulous at pulling the ground crew together. It was a very complicated mission from the ground's perspective, too, having to work with Goddard, and there were a lot of

things that we hadn't done before, so the folks on the ground on that flight were terrific. The EVA guys and all the problems we had and all that were really helpful to me.

It turned out that it was good that I knew a lot about the suits. I had a serious failure on the suit that basically didn't even talk about until we got back, because there was nothing anybody could have done then. The cooler on the suit failed, so I had two options. I guess I did talk about it when I was out there. I had two options. I could either have ice water running through my liquid-cooling garment or I could have that off, so I just cycled back and forth. I would leave the cooler off until my visor started to fog up, and then I would take a deep breath and turn on the ice water until I started to shiver, and then turn it back off again. So I had to cycle back and forth between those. I knew the suit so well that I knew exactly what was happening, and it wasn't a big deal, and I knew it wasn't dangerous. It was just a minor inconvenience.

ROSS-NAZZAL: I have read that this was really a model crew for the Space Shuttle Program. You had one of the best commanders; you had two of the best EVA people; an expert arm operator; and one of the best pilots. What do you think about that? I asked Terry Hart that question, and he sort of laughed.

NELSON: Yes, Terry has limited experience; I mean that was his crew. We had a very complex mission, and in terms of getting our arms around the mission and getting ready to fly, it was a tremendous crew for that. In terms of the coherence of the crew, I think my second crew was better, and even though we had a fairly trivial mission, I think technically my second crew was actually better. Just the mission was so dumb that nobody paid any attention to it. Our main

cargo was [Congressman] Bill Nelson, which to say nothing bad about Bill Nelson. He did very well.

Ox and I were a terrific team on that in terms of the coordination we were able to do on the EVA. Ox and I, even though we rarely see each other or talk to each other, whenever we do, we have this kind of Vulcan mind-meld thing. We are on the same wavelength. We just know how to do that, and that wasn't something that was natural. It developed over the year. We spent the whole year together, basically, just really intensive training time and personal time and all that. That was part of the mission was pretty neat.

ROSS-NAZZAL: What did the crew do when it had free time?

NELSON: Looked out the window. What everybody does.

ROSS-NAZZAL: And what did you do in between this flight and your next flight?

NELSON: What did I do? Went to meetings, probably. I don't remember what my assignments—oh, yes. This must have been the time that I was the head of—took over from Bill [William B.] Lenoir the Mission Operations Branch or whatever it was. I was in charge of all the missions that didn't have crews assigned, all the payloads. So I had to organize a team to go to safety reviews and work on the displays and controls for new experiments or new satellites or whatever, and just make sure that when a crew was assigned to a mission, that the mission was in reasonable shape from the crew's perspective, from the Astronaut Office perspective, to hand over to them to start to train to fly. So there was a whole group called Mission Operations. So I

think that's what I did, ran the Missions Operations Group. Plus, there's always lots of other ancillary stuff. Flying around. There was lots of PR [Public Relations] after STS-13.

ROSS-NAZZAL: Can you talk about some of those PR tours?

NELSON: Oh, those trips are just—some of them are great and some of them are just absolutely ludicrous. Ox and I went on a lot together, some really bad ones. Those are the ones you remember. As soon as you walk in the room, you just know, "Oh, no. I don't want to be here." [Laughs] And it's not that it's not good for the space program and you're not talking to nice people and all that; it's just that you know it's a waste of time for you, that the government is paying lots of money for you to talk to thirty-five Kiwanians or something, who just needed a speaker this month. [Laughs]

So I tended to try and go to schools. I had this interest in education, so I went to lots of schools during that time. I enjoy talking to kids, so I did a lot of that. I tend not to be more corporate oriented, so I wasn't trying to find a good job out in the corporate world or anything like that. I was just wanting to get assigned to another mission.

ROSS-NAZZAL: You were reassigned to another mission, and Congressman Bill Nelson, as you pointed out, was on that flight. What did the crew think when he was assigned to the mission?

NELSON: Well, it was a strange situation. I can't remember whether we had payload specialists from the very start on that flight or not; it seems like we did. Our original payload specialists were Bob [Robert J.] Cenker and Greg [Gregory] Jarvis, so they were training with us. I forget

what happened. It was after [Senator] Jake Garn flew, and then they decided they had to offer a flight to his counterpart in the house. Don Fuqua couldn't fly for some reason, and so it filtered down to the chair of the subcommittee, Bill Nelson, and he jumped at the chance. Who could blame him?

This was just months before the flight, in the fall or late fall, even. The flight was scheduled in December. So they bumped Greg and his little payload off the mission over on to Dick Scobee's crew and added Bill to our crew. I think our attitude generally at that point was, "Well, that's just the way the program's going. We're flying payload specialists. We'll make the best of it."

ROSS-NAZZAL: Did you train differently because he was a politician and his schedule was different?

NELSON: Oh no. No, not at all. No. Actually, Bill was a model payload specialist. He worked very hard. I mean, he was engaged. Physically, he was in better shape than we were. Oh, that was hard to say. That crew was in great shape, actually. He had no experience either in aviation or anything technical. He was a lawyer, so he had a huge learning curve, but that didn't stop him from trying, and I think he knew where his limitations were. He wanted to jump in and help a lot of times, but just didn't have the wherewithal to do it, but worked very hard and was incredibly enthusiastic.

ROSS-NAZZAL: In his book he says that you went out of your way often to help him. Do you remember any of the ways that you would help him?

NELSON: Oh, I'm just a nice guy, you know. [Laughs] This is one you may want to edit later, but a lot of the ways I'd helped him was just holding Steve [Steven A.] Hawley back. [Laughs] I'd say, "It's not worth it, Steve." Franklin [R. Chang-Diaz], too. That was Franklin's line actually, to say, "It's not worth it, Steve." [Laughs] Because every once in a while, you know, when you're inexperienced and you—he would just kind of get in the way, and being the personality that Bill had, wasn't very good at getting himself out of being in the way, so there were times when you just had to kind of get him out of the way, and you had to be a little careful about how you did that.

ROSS-NAZZAL: This flight was actually delayed seven times.

NELSON: Oh god, I don't know. Forever.

ROSS-NAZZAL: What was your reaction and the crew's reaction to these various postponements?

NELSON: It was funny. My first flight went off right on time, so I had no experience with that. One of my other jobs that I seemed to be on ever third or fourth flight was family escort, so I'd had experience on flights that were delayed with the families, so I'd seen it from that end. My response was different from the inside than from the outside, and I think it was the same as the rest of the crew when you have an abort. Steve Hawley was a good person to have around on that, because he had been through the abort on 41-D. Is that it? Anyway, the first flight of *Discovery*, where they had the abort on the pad at two seconds or something like that. A

hydrogen fire and all that. So he had been through it, and that was good experience for us. And Hoot Gibson is just the best in terms of being able to technically fly the Space Shuttle. Probably John Young and Hoot Gibson are the best I've ever seen. It's like the *Apollo 13* line; Hoot could fly a refrigerator.

Anyway, so having them up there, and Charlie [Charles F. Bolden, Jr.] really worked hard and knew his stuff.

ROSS-NAZZAL: Can we stop?

NELSON: Sure.

[Tape change]

ROSS-NAZZAL: Maybe we should go back just a little bit to the launch delays. You were talking about Steve Hawley being a good person to have along, and Hoot Gibson.

NELSON: Right. It was obvious during that time that the system was getting pretty ragged. The launch control center was not really smooth. Our mission control wasn't—there was a lot of new people, and that particular crew, we were just really good. I mean, we knew our stuff. We trained very hard to be perfect, and that was kind of our goal. We never did anything alone. We worked in teams. We always read checklists together. Our goal was to never make a mistake, and as result, we rarely did and we were often ahead of the ground. Even during the mission, we were ahead of the ground. We knew what was happening before they did and what to do before they did, and the launches were kind of the same way.

The main thing you have to do when you get a launch abort close in is turn off the BFS [Backup Flight Software], the backup computer, because it counts to two minutes or something and then drops you off the tank. [Laughs] So it's kind of important to turn off the BFS. Other than that, there's not much going on. So it's a little disconcerting when the clock stops, but it happens in simulations all the time. Once you determine that you're in a safe configuration, there isn't a fire or there isn't something going on, then from the crew's perspective, it's more, "Well, I hope we didn't damage anything. I'm glad we're still alive. Let's just crawl out and we'll go back to crew quarters and we'll go to bed and we'll get up tomorrow and we'll do it again." It's not as disappointing as it is from the outside, where you've gotten up at o-dark-thirty, mainly because it's a neat experience to go out to the launch pad in a fully fueled rocket and climb in. It's something not everybody gets to do, so to get to do it again is okay, as long as it's safe.

We were a little worried about both the vehicle and the ground. There were a couple of times that we didn't launch, but there were other reasons that we shouldn't have launched, too. There was the time somebody in the launch control center opened a valve and drained a bunch of our oxygen out of the external tank. We lost a sensor that actually had broken off and migrated down into the engine screen. So there were some real indications there were problems. Actually, the first launch date on that was a very cold morning, too, like the morning the *Challenger* was launched. I'm not sure what the actual temperature was, but it could have been a bad day if the cold O-rings was really a problem that was going to get you every time.

But we were such a good crew. It was a little disconcerting. One of the things, Bill had brought his ghostwriter, [Jamie Buckingham], into crew quarters a lot. He was this evangelist preacher guy. We called him the Holy Ghost. [Laughs] That was kind of a pain. Bill tried so

hard to be part of the crew. He was just always "up," and this politician's voice, and he sang songs. He was just always glad to see you and happy to be there. [Laughs] And I think it was honest. I think he honestly felt that way, but it got a little old after a while.

We spent a long time in crew quarters. Cost me a fortune, actually. This was back in the days before there was a family support plan. My biggest contribution to NASA, I think, was the family support plan.

ROSS-NAZZAL: What is the family support plan?

NELSON: It's a document, formal signed document, that describes how NASA will look after the families of the astronauts during a mission and if there are any contingencies. We wrote it after 51-L. Before that, there was no written plan, and basically we were on our own to get our families down to the launch. We had to pay their way, find a room for them, put them up. NASA took good care of them once we were there, pretty much. I think Susie spent twenty-one days in a condo at the Cape [Canaveral, Florida] during the launch of 61-C, and the kids didn't get to see the launch, because they were missing too much school, so they were back at Houston and Susie was in Florida.

Had the accident occurred on that flight instead of the flight afterwards, the *Challenger* accident, it would have been just a nightmare scene, because the families were scattered all over the place. I don't think anybody knew where anybody was exactly. [Daniel C.] Brandenstein was our family escort. He probably was on top of things, but Dale [A.] Gardner, just as a personal favor, had agreed to go over to my house to be with my kids during the launch. I mean, it wasn't arranged or anything like that.

So anyway, after 51-L, I instigated, and then Dan Brandenstein, who was the chief of the office by then, really helped write and push through, along with the secretary, Sylvia [S. Stottlemeyer]—anyway, she made a great contribution to that, too. We outlined it and she did a lot of the writing, and we pushed this document through. It actually had to go up to [NASA] Headquarters [Washington, D.C.] to be signed, but now there is a formal plan for how the families are transported to the Cape and taken care of and what happens in a contingency. It's still being used. It's expensive. It costs NASA money, but it seems like if you're going to spend half a billion dollars launching the Space Shuttle, you ought to do something for the crew's family.

ROSS-NAZZAL: Let's talk a little bit about some of your memories of the mission. Nelson, of course, in his book talked about some of his most memorable moments in space. What were some of your most memorable?

NELSON: On that particular mission?

ROSS-NAZZAL: On this mission, yes.

NELSON: Sixty-one-C, from start to finish, the mission itself was kind of a frustration because it was so trivial. We launched two satellites, and we did this silly material science experiment out in the payload bay which didn't work. I knew it wasn't going to work when we launched. Halley's comet was up at the time and we had this little astronomy thing to look at Halley's comet, and it was launched broken, so it never worked. So the mission itself, to say what we did,

I don't know. I deployed a satellite. Steve deployed a satellite. [Laughs] We threw a bunch of switches, took a bunch of pictures.

But that said, we were such a good crew that it was just a delight to be on board with those guys. The whole crew, Hoot and Charlie and Franklin and then me and Steve, were just incredibly tight, and [Bob] and Bill just kind of did their thing. What was our payload specialist's name? Bob, Bob Cenker. Greg [Jarvis] was waiting to fly in 51-L. Bob Cenker did his little things, and Bill did his. Bill worked really hard. He ran the treadmill twice, because he forgot to turn on the tape recorder the first time, but he sucked it up and did it.

But we [had] just a great time on the flight, and we really knew our Earth obs [observations]. We did a lot of looking out the window and taking good pictures, and we kept the Shuttle in just perfect shape, dealt with the ground. Our landing got delayed two days in a row. It was a mission of delays.

Anyway, we finally landed in [Edwards Air Force Base] California instead of [Kennedy Space Center] Florida, and Bill Nelson was just so bummed out. Brandenstein was so great. He showed up in the trailer and handed Bill a bag of oranges from the California Growers Association. [Laughs] He had gone to Burger King and gotten us some food. Brandenstein is such a jewel.

Poor Bill had a really hard time after the landing, for some reason. Most people don't feel very good their first day or two in space, but don't have too much trouble when they get back on the ground. Bill had a really hard time for a few hours after we landed, but, boy, he was a trooper. He was suffering, but he, you know good politician, put on a good face, and we had to do our little thing out at Edwards and all that and get back on the plane. He really sucked it up

and hung in there, even though he was barely standing. And the rest of us, of course, cut him no slack at all.

That was a great flight for Franklin, too, I think. It was Charlie's first flight, but Charlie was an experienced pilot. Franklin was more out of the mold [of] me and Steve, kind of a scientist type, and this was his first mission. Having Steve and I as mentors, I think, was a good experience for Franklin. He really integrated into the crew really well. Franklin's smarter than both me and Steve put together. I think he learned a lot. He was a great crewman on that and went on to do wonderful things. He's the one who's going to take us to Mars, I think, in his rocket.

ROSS-NAZZAL: Yes, in his plasma rocket.

NELSON: I hope so.

ROSS-NAZZAL: Let's talk a little bit about the *Challenger* accident. Where were you when the accident occurred?

NELSON: That was during the time they were premiering *The Dream is Alive*, the IMAX film that they made from 41-D and 41-C, and it's still a great movie, I think. We had just landed ten days prior, so I was on my way to Minneapolis [Minnesota] for the premier of *The Dream is Alive* at the science museum in St. Paul [Minnesota]. We had worked closely with the crew, because they were the ones after us and they had the same rinky-dink little camera to try and look at Halley's comet, so I'd spent a bunch of time trying to teach Ellison [S. Onizuka] how to

find Halley's comet in the sky. Scobee and I were really close friends because of 41-C, so "Scobe" and I had talked a lot about his kind of a "zoo crew," about his crew and all their trials and tribulations. He really wanted to get this mission flown and over with.

So I talked to them the night before, actually, from down at the Cape and wished them good luck and all that, and then the accident happened while I was on the airplane to Minneapolis. I found out about it at the airport and spent the day, until they could get me a flight back, at the museum with Graeme Ferguson and Phyllis, the IMAX folks, and people from the Science Museum of Minnesota, then flew back that afternoon.

Got back about the same time that the families got back from the Cape. Went into the Center and found out what was going on. We pretty much knew what had happened, what caused the accident, even by then, by the afternoon of the first day.

Then teamed up with Ox and Val, Jim van Hoften's wife, and my wife, Susie, and we went over to Scobee's to do what we could, over at Scobee's house. We spent basically, I don't know, at least a few days, basically, staying over there. Scobe's daughter had just had a baby, and, oh, it was a nightmare.

The national press was just god-awful. I've never forgiven some of those folks, Sam Donaldson and people like that, for their just—I mean, it's their job, but still, for their just callous, nasty behavior.

So we just spent a lot of time just kind of over at Scobee's, trying to just be there and help out. I still can't drink flavored coffee. That's the only kind of coffee June [Scobee] had, vanilla bean brew or something. So whenever I smell that stuff, that's always my memory of that, is having bad coffee at Scobe's house, trying to just get their family through the time, just

making time pass. We had to unplug the phones. The press was parked out in front of the house. It was a pretty bad time for all that.

We went over and tried to do what we could with some of the other families. My kids had been good friends with Onizuka's kids; they're the same age. Lorna [Onizuka] was having just a really hard time. Everyone was trying to help out where we could, where our roles were. I spent most of my time with Scobee's and Onizuka's. Cheryl McNair also had a hard time.

Then in terms of the technical work that was going on there, things were just being pulled together and teams were being made to work on various aspects of this and that, and we all got little assignments and went off and got back to work, which was good therapy for the folks in the office, to dig in and try and really find out what happened and see if we can get back flying again.

It became obvious after, I don't know, a few months anyway, that not much was happening. I'm not very good at sitting around, so I actually asked to take a leave and come up here. I spent six months up here in Seattle, working at the University of Washington, in the Astronomy Department, just thinking about astronomy, because I didn't feel like I had much of a contribution to make down there.

Then after being here for six months, George Abbey must have figured out that I was having too good of a time, so he assigned me to the STS-26 crew and made me come back.

ROSS-NAZZAL: Let me ask you a question before we talk about this final mission. I understand you were a member of the band Max Q.

NELSON: Yes.

ROSS-NAZZAL: Can you talk about that a little bit?

NELSON: I was the founding member of the band Max Q, actually. Brewster [H.] Shaw [Jr.] and I are the founding members of Max Q. Max Q was a result of a party that we had after the *Challenger* accident, just kind of a morale-booster party that "Sonny" [Manley Lanier Carter, Jr.] was a big organizer of. So we rented the pavilion down at Galveston Park and we had a fifties party, basically. Everybody dressed up in hoop skirts and jeans and t-shirts.

Brewster and I had played together a few times, just over at our houses, just sit around and drink beer and play our electric guitars or play our guitars, so we decided that we would get a band together. We knew Hoot could play, so we got Hoot involved, and then we found out Jim [James D.] Wetherbee was a drummer, so we invited Wetherbee to join us, and we got together and learned two or three three-chord songs for this party.

It turned out to be so much fun that we kept playing. Then Steve Hawley joined the band for a while. That was really fun. That was a good pastime. We'd practice once in a while and we'd play at roadhouses or various parties or whatever. I guess they're pretty good now.

ROSS-NAZZAL: I've heard them, yes.

NELSON: We weren't very good. [Laughs] But it was a lot of fun. I mean, it was just kind of something to do, recreation, to have fun. We started playing softball again and all kinds of stuff like that.

[Interruption]

ROSS-NAZZAL: Let's talk about STS-26. You had already mentioned that George Abbey had called you while you were in Seattle. What was your reaction, and what was your family's reaction to the news?

NELSON: I was thrilled, of course. Everybody wanted to be on that mission. We were living on Whidbey Island [Washington] at the time. I came home at dinnertime and told my wife and daughters, who were getting older by that time, that George had called me and assigned me this flight, and they all broke out in tears. So it was a hard one. This was a difficult mission for the families. For one, they loved being up here, and the prospect of going back to Houston wasn't great then. So that was hard, but Susie's a real trooper. She said, "Okay. This is probably going to be the last one, though." [Laughs]

So I was thrilled. Having been on the flight before, I didn't think they were going to assign me to this mission. I think what happened was that they had a four-person crew that was assigned to the next flight, and because they had the *Galileo* mission, which they just didn't have the weight to carry more than that. But they didn't have anybody on this flight who had EVA experience or expertise, so, at least my feeling—I've never talked to George about it, but my rationalization to myself was, well, they thought they would find somebody who was already trained up and experienced and who had the EVA experience, and since I had just flown and had the EVA background, and was very expendable, that they'd put me on this mission.

ROSS-NAZZAL: Can you talk about training for this mission? Did training change at all from the last mission that you were on?

NELSON: Well, training had different aspects on this mission, because not only were we training for the mission, but we were also going through all this analysis and all these fixes. They looked at the whole system, hardware and software procedures, end to end, operations, and the whole office was involved in that and the crew was naturally involved in all those different pieces, too. So not only were we training for the mission, but we were also involved in the design of the escape system and rewrite of the software and all the different things, the redesign of the solid rockets, and all the other stuff that was going on. So it was really kind of double role. Usually when you're assigned to a mission, you gave up all your other ancillary roles and you just focused on your mission, and then everybody else in the office was following all that kind of stuff for you and fed that information in. So we were spread a little more thinly, but we were all experienced and the mission was very trivial. We launched a TDRS [Tracking and Data Relay Satellite].

So the training for the actual mission was just to make sure that we had all the procedures nailed, and having [John M.] Lounge and [David C.] Hilmers as mission specialists, I basically—I just got to sit back and watch. Those two guys are just both incredibly capable.

That was an amazing crew, too, just in terms of their capacities. Rick [Frederick H. Hauck] is the mold of Crip, kind of, as a commander. He's just a terrific commander. The crew was great. They had been a four-person crew. When you build a crew, it's really a psychological process of building a crew, and they welcomed me into their midst and made me

feel like I was part of the crew right away. There was plenty of work to do, so I got my share of the work.

The training part was pretty straightforward, actually. The biggest part of it was just watching all this flailing going on on the outside, which is really NASA at its best, you know, responding to a situation and doing engineering and rewriting procedures and testing. They really rose to the occasion, I thought. So I felt very good by the time we finally got into launch for STS-26, that we were really ready, that everybody had done what they could do.

ROSS-NAZZAL: What was the mood like at the Center as you were preparing for this mission?

NELSON: It had its ups and downs. Once we got closer to the mission, the mood started to get good. Right after the *Challenger* accident and then for maybe a year following that, things were pretty bad at the Center. Morale was bad. There wasn't a heck of a lot happening. There were a lot of these little investigations going on, but nobody had made the decision, "Okay, these are the fixes we're going to do. Now let's get back to work." Once we turned the corner and set a launch date and had identified all the changes we were going to make and gotten into the engineering and into the actually planning the flight, then morale, I think, came up pretty well.

ROSS-NAZZAL: Can you talk to me about that day at launch? What was the crew talking about in the crew cabin? I know you were sitting down on the middeck.

NELSON: [Laughs] Yes.

ROSS-NAZZAL: What are your memories of that day?

NELSON: Yes, I was down there. It was kind of lonely down there. My sole instrument is this little button altimeter that's just bolted to the face of a locker, so that if you blow a hole in the cabin, you're aware that you've got a hole in the cabin, basically. Actually, it was so that you could deploy the escape system at 10,000 feet.

So you're just there. I mean, you're in constant communication with the crew. I had launched on the flight deck before, so I knew what was going on, but basically I had nothing to do but just kind of take it all in, so I just decided I was just going to relax and just go along for the ride and sense the experience. I kept track of my watch so I could note the time when the *Challenger* was lost, to know just what was going on at that point.

The launch went incredibly smoothly. I mean, I didn't think we'd launch that day. We all came out to the pad thinking, you know, this will be a good run-through, and then we launched, and absolutely flawless. We had less problems on this mission than on either of my other two.

ROSS-NAZZAL: Did you have any concerns during liftoff that something might go wrong, given what happened last time on the *Challenger*?

NELSON: Well, not given what happened last time, but just given the nature of the beast, of the Space Shuttle. It's just an incredibly complex, complicated conglomeration of parts and pieces. I always had concerns that something was going to go wrong, and I always figured that it was

something that they hadn't told me about. So, yes, launch is a very exciting, dynamic time and you are worried.

ROSS-NAZZAL: I understand there was a problem on the flight. The flash evaporator system froze up. Did that have any impact on the flight or the crew?

NELSON: No, there are procedures for all that. That was the other thing. Now, this was all a crew of—three of us, anyway—Hauck and [Richard O.] Covey and I had been in TFNG [Thirty-Five New Guys], in the first group of astronauts, so we knew, and Hilmers and Lounge being Hilmers and Lounge, knew everything. We knew everything, basically, about the Shuttle.

So when the flash evaporator goes out, you know, it has the potential to cause problems. It's your cooling, but the doors were open and the freon was working fine, and we had no payload, basically, so we didn't have a big heat load. You need it during entry, but we had another one. So, no, we just did the procedures.

One of the things that I did early on in the program was, I was the representative for the malfunction book, this big book of all the procedures when you have an alert or an alarm. So I knew all the malfunctions, I knew all the procedures. You just live with those kinds of things; you expect those kinds of things to happen on a mission. You don't expect them to, but you know how to live with them when they do, and you know what the potential problems are and all that kind of stuff, so you just kind of work with it.

We had a bigger problem on 61-C. We had a fuel cell alert shortly after launch that, once again, we psyched out before the ground and figured out it was a sensor and changed systems.

We actually called the ground and told them what it was, and said we were going to change sensors, and they said, "Okay, go ahead." Charlie was just right on top of that.

So, as I recall, on STS-26 we may have gotten a master alarm sometime during launch. Maybe that was the flash evap, but no big deals.

ROSS-NAZZAL: The crew actually wore Hawaiian shirts on board.

NELSON: One day.

ROSS-NAZZAL: What are your memories of that day?

NELSON: Well, we had been given those shirts by the ground crew, because they wear them on Fridays. It was one of those days, you know, "We've got to take some pictures. Let's wear our Hawaiian shirts and act stupid for a while and take some movies. Then we'll have something for our post-flight stuff." Basically, you know, that's it. We have these things, "Okay, let's put them on and take some pictures."

ROSS-NAZZAL: Your crew also paid tribute to the *Challenger* crew on board.

NELSON: Yes, that's an interesting story, actually. That's another one of these things that tells something about NASA. We knew we needed to do something and wanted to do something to honor the *Challenger* crew. We kept asking for help from PAO, the Public Affairs Office, from

our bosses, just, "Hey, what should we do?" and got nothing. So we talked about it a lot of times, "Well, what are we going to do?" and didn't have anything.

Finally, Dave Hilmers actually wrote a draft and said, "I think we ought to read something like this. We can divide it up and each read a piece." So Hilmers was the one who really came up with the idea and the draft of what we were going to do. Then we brought it to the Flight Directors, to the folks on the ground, and said, "This is what we'd like to do. We'll get some footage."

We worked it all out and we found a good pass over Hawaii where we could downlink it, and worked with [Charles] Lacy Veach, our CapCom, to coordinate it all. But Hilmers gets the credit for thinking of it.

ROSS-NAZZAL: What impact do you think that that tribute had on the agency itself?

NELSON: The tribute?

ROSS-NAZZAL: Yes.

NELSON: Oh, none. Why do you say that?

ROSS-NAZZAL: I'm just curious.

NELSON: Oh, no, I don't think—the tribute itself I don't think had any—I mean, I think it was important for the—well, I take that back. I think it was important for the people, for the folks in

mission control and for the engineers and the technicians who worked on the spacecraft, to have the crew acknowledged, because we tried to speak for everybody. I mean, that was the intent. Hilmers is a very, very clever, sensitive guy. And it was important for the families, I think, who needed that kind of closure. It was one more piece of closure for them to have somebody in orbit, on a successful flight, recognizing what their family had done.

ROSS-NAZZAL: How did you and your crewmates deal with all of the press? Obviously, this was a high-profile mission.

NELSON: Oh, like the geeks that we are, I think, you just kind of deal with it. I mean, the nice thing is, we had no agenda. You know, we're not trying to self-promote. We're not selling anything. So basically, we can just react to the press and try and represent the agency in the best light. I think that's our main goal.

There was a lot of press on that. It was kind of interesting coverage. Actually, 41-C had a lot of press, too, because it was such an interesting mission, so I had been through a mission with lots of press before, and Rick had been through STS-7, with Sally on it, so he had been through a mission with lots of press. It's kind of fun, because, again, it's a unique experience that you don't get every day, and it's not every day that Dan Rather comes down to interview you for *48 Hours*, or that you get to talk to *Good Morning, America* or something like that or *The New York Times* does a cover story for their Sunday magazine. It's just kind of fun.

But basically, Sonny Carter had the best perspective on that, I think. He used to say that when he was giving a talk or something out on a PR trip for the public, he knew that when the people looked up on the stage, they didn't see Sonny Carter, astronaut; they saw astronaut. They

saw John [H.] Glenn [Jr.] and Al [Alan B.] Shepard [Jr.], and they saw the icon of the astronaut, who happened to be Sonny Carter, standing there at this time. So I always thought that was a really good perspective, to try and keep your own ego out of the situation, that you really were representing the icon of the astronaut rather than being so special yourself, and I think the rest of the crew kind of shared that. Rick and Dick and Dave and Mike just weren't real publicity hounds, either. I was the team goofball, kind of.

ROSS-NAZZAL: Why don't you tell me about landing day at Edwards. There was quite a big crowd there. The Vice President [George H. W. Bush] was there. The Administrator [James C. Fletcher] was there. What are your memories of that day?

NELSON: We didn't know the Vice President was going to be there. That was the interesting thing. The last teletype message didn't come up for us, so we suspected something was going on, because we'd gotten some hints.

It was a beautiful day. Rick did a stupendous job of landing, which is the important part. We were down; we were alive. That felt really good, that part of it. So after we had landed, we were down doing all the things you do after you land, turning things off and cleaning up and changing clothes and all that kind of stuff. And when they opened the hatch, the first thing that happens is the medical guy sticks his head in and just says, "Is everybody okay?" And he checks us out and he says, "And, by the way, the Vice President's waiting out here. You guys might want to hurry." [Laughs] So we changed clothes and went out.

That was really a neat thing. We had taken this flag on board to have to wave and to come down the stairs with. The Administrator was there and [Richard H.] Truly was there and

Bush was there and, more important, our families were there, finally had gotten to see a landing. I was supposed to land at the Cape my first two flights and ended up in California, and Susie had never seen one of my landings. So that part was nice.

Then a little reception afterward was fun. It was neat for my family got to eat lunch with George and "Bar" [Barbara Bush]. They thought that was pretty cool. They had this little reception. The best thing that happened at this little ceremony that they had afterwards was that Harvey Mudd College, my alma mater, was just across the mountains from Edwards, had brought about half the student body, about two hundred people, up to watch the landing, and they were out in the audience during the reception, and they were yelling and screaming. When Bush got up to talk, before he could talk, they broke into the Harvey Mudd fight song, which they had used as one of our wakeup calls on this flight, to the tune of the Mickey Mouse Club march, H-A-R-V-E-Y M-U-double-D. So they sang through the fight song and Bush had to stand there and wait for them while they sang that. I thought that was just great.

ROSS-NAZZAL: Those are great memories.

NELSON: Yes. So that was a good mission. Then just ending up back home. My dad had gotten to see the launch, so they were back at Houston. Then when we got back to Houston, the neighbors had a—we lived in this great neighborhood and we had a big neighborhood street party, kind of.

ROSS-NAZZAL: Can you talk about some of the PR tours that you took after this mission?

NELSON: I don't remember too many of them, actually. The neat one, I remember we went to Washington, D.C. I remember we got to be on the balcony while Congress was in session. We got applause, a standing ovation from Congress, which I guess hadn't been done more than once or twice before. That was neat. I liked that.

What else do I remember about PR tours? I remember going around to the Centers, lots of Centers, handing out lots of Snoopy Awards, which seemed like an appropriate thing to do, to thank the people who do the real work. But if I remember right, I don't think we got an exceptional amount of extra PR after this flight. It was just nice to be back in business and working again.

At that point I was probably already thinking downstream. Susie had already convinced me that it was time to go do something else. There were other things. There was a lot going on in the program, but I was probably mentally disengaging at that point.

ROSS-NAZZAL: So you had made plans at the end of the launch or before the launch to retire from NASA?

NELSON: Well, I hadn't made any real decisions, but I was thinking about it, yes. Rick and I had talked about that. Actually, Rick and I had just a wonderful time during the mission, because I think he was thinking the same thing. This was going to be our last flight, and we spent a fair amount of time, just the two of us, up on the flight deck, just kind of being up there and looking out the window and taking it all in. He and I, we have similar kinds of personalities, I think. We're very compatible personalities, so it was really a pleasant time, just being on the flight deck with Hauck during that mission, just kind of being in space.

ROSS-NAZZAL: Do you have any other memories of that mission that you want to share, or any of your other missions?

NELSON: Really not of a mission. One thing that maybe we could talk about is before STS-1, one of the things that I got to do as an unflown astronaut that I just thought was just an amazing experience, was being on the chase team. We did a lot of training. I got a tremendous amount of terrific flying experience, airplane-flying experience, going out to the range at Edwards and practicing rendezvousing with the Shuttle and chasing it down. Jon [A.] McBride and I were Chase 1, so it was our job to rendezvous with *Columbia* on reentry and then follow it down to the runway. My job was to photograph the tiles and to make the calls as it came down, in case the radar altimeter didn't work and things like that, be able to call air speed and altitude.

The training for that was amazing. Jon McBride and Dave [David M.] Walker and then a couple of the staff pilots, Dick [Richard E.] Gray, especially, built this kind of empire around the chase program. There were just a ton of us, and every once in a while we'd be out at El Paso [Texas] and there'd be eleven T-38s lined up on the ramp. [Laughs] A lot of flying. So that experience was just great.

So I got to see the launch of STS-1 from above the launch pad in a T-38. Jon and I were up orbiting the launch pad, basically, orbiting south of the launch pad and got to see the first launch, see it come off and go right by us. That was just really cool. [Laughs] I remember my response at that, as it went by, was, "I'll be damned! It worked." [Laughs] We had so many problems getting STS-1 ready to go in the first place.

So that was a really interesting experience. The chase team was terrific. McBride and the whole team did a good job. We almost blew it. I mean, we'd been practicing with the radar folks from both Edwards and the radar organization in L.A. [Los Angeles, California], and the Shuttle was coming in and it was approaching and we were getting ready to go intercept it. We took off at Edwards and the first thing we did, we called the radar folks and they said, "You're not going to believe this. We just lost all our power." They were sitting in a dark room. They lost everything. They couldn't guide us. So then the folks at Edwards took over, and so the rendezvous was really kind of grab-ass, but we saw the Shuttle and Jon is a great pilot, got us up to it, a little bit late, so I had this camera in the back and Jon's flying around and I'm taking pictures. [Laughs]

But we got the whole surface of the Orbiter photographed and Jon called out the landing and all that. There's this great picture. *Time* magazine is the only one who has given me a picture credit for some picture that's been published, but inside the *Time* that came out the week after the landing—

ROSS-NAZZAL: Can we stop?

NELSON: Sure.

[Tape change]

ROSS-NAZZAL: You were talking about *Time* magazine.

NELSON: *Time* magazine printed a double-wide, a full-spread picture that I had taken of the Shuttle just as it was touching down, and gave me a picture credit, so now I can say I am a published photographer. Usually they just give the credit to NASA, but *Time* went to the effort to actually find out who had actually taken the picture.

ROSS-NAZZAL: That's great.

NELSON: So that was fun. So, being an integral part of STS-1 like that was fun, both trying to get the spacesuit ready to go and working on the malfunction book and being on the chase team. We really felt like we had become a real part, like a real astronaut by then, a part of the program, ready to go out and fly.

ROSS-NAZZAL: Let me just ask you a couple of general questions before I close out today. Looking back over your career with NASA, what do you think was your most challenging milestone?

NELSON: Getting selected was certainly the most challenging thing. Contrary to popular belief, I think the job of being an astronaut is not all that hard. You're in an incredible support system. You're extremely well trained and provided with resources that you need to get trained, so if you're a motivated person who has basic, good motor control and fairly smart, you can learn how to do all the procedures. It's a little different for the pilots, I think, who have to have special skills and who are just really terrific at flying the machine.

I can't think of anything I had to do that was really hard. I found it all just very enjoyable. It took a lot of effort to learn how to work in the spacesuit really well, but it was an interesting challenge and fun. The people part of it is always a challenge, but my experience is that the people at NASA, not just the astronauts, but the support team and the folks in mission control and the hardware folks—

[Interruption]

ROSS-NAZZAL: We are back, and you were talking about your biggest challenge, before the phone rang. You said your biggest challenge was getting selected.

NELSON: That's for sure. The rest of it just came naturally. Being a person with a fairly short attention span, working within the system of going to endless meetings, working within the NASA system, which is really the one that Chris [Christopher C.] Kraft [Jr.], Al Shepard, Deke [Donald K.] Slayton, and those guys made up on how to run a space program, really functions well in terms of checks and balances and procedures. Learning to work in that system has its challenges, because you have to really carefully document and account for everything you do. So just working in that system was a bit of a challenge for somebody like me.

ROSS-NAZZAL: What do you think was your biggest accomplishment while working at NASA, if you had to pick one?

NELSON: I would rank the family support plan as one. I think that's had a big impact on the quality of life of the astronaut program. Then just technically, I think the work that I did on the spacesuit made it a useful tool.

ROSS-NAZZAL: Is there anything that you think we've skipped over today that we should talk about before we end?

NELSON: Oh, there are a zillion stories. I mean, you could get hours and hours from everybody. This is probably okay for now.

ROSS-NAZZAL: I thank you very much for taking time today.

NELSON: You bet.

[End of interview]