NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT

LOREN J. SHRIVER
INTERVIEWED BY REBECCA WRIGHT
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WRIGHT: Today is December 16th, 2002. This oral history is being conducted with Loren Shriver in Houston, Texas, for the NASA Johnson Space Center Oral History Project. Interviewer is Rebecca Wright, assisted by Sandra Johnson and Jennifer Ross-Nazzal.

Thank you for taking time from your schedule to meet with us today for this project. We'd like to start by talking with you about how your interest in the space program first began and then your involvement with the astronaut candidate application and interview processes.

SHRIVER: Well, it's an interesting question. When I was a young boy, we lived on a farm in Iowa, and not too much associated with anything in NASA or space-related or even the military. So I often wonder myself how I got started in wanting to become a pilot. That was probably the first thing I can point to that really actually started to guide my career in the direction that it took. But one should remember that there wasn't even basically a space program when I was a young boy, and it wasn't until I was in high school in the late fifties and early sixties—I graduated from high school in 1962, so we were just starting to have a viable human space program back in those days.

So I guess I was aware of the space program, human space program. I was aware that rockets and things had been launched by others and that there seemed to be a lot of activity for us trying to catch up, but that process did not really drive my thoughts going through high school and even early college, because, well, it was just too early in the program to have much effect, and it's like, well, gee, those guys are now starting to do that. It looks like it's neat, it's challenging, it would be a lot of fun, but the chances of me ever doing that, again, living on a small farm in small-town Iowa, just seemed like the remotest thing possible that you would ever

become involved in that.

However, I did have an intense interest in engineering and in flying airplanes, and, as I mentioned, I have no idea where the idea that I would want to fly airplanes came from. I had no relatives that ever flew, no relatives in the military. My dad was not involved in anything like that. I just knew that some day—and this is at a fairly early age, like intermediate school level—that I was going to be a pilot some day and fly, and tried to set about doing things that would help make all of that come true. So it kind of went from there.

WRIGHT: Well, you joined the service. Tell us how that occurred.

SHRIVER: Okay. Well, after I graduated from high school, there was, of course, the problem of how I was going to pay for college, because, basically, my family didn't have a lot of money left over after the basics. I had applied to Iowa State University [Ames, Iowa], and had been accepted there. But in the meantime I had also learned about the [United States] Air Force Academy [Colorado Springs, Colorado], which, again, in those days—the Air Force Academy today is well known and just an outstanding institution, as it was then, but it was a very young institution back in those days.

I entered the academy basically when it was five or six years old, and I was in the ninth graduating class of the Air Force Academy. So it had not been around very long, and I'd just learned that it existed. Of course, within my mind, Air Force and Air Force Academy and flying, and it all seemed to fit together. Why wouldn't you want to go there? But I knew very little about the school or the institution.

But I went ahead and applied through my congressman, and got a letter back in the spring of that year, saying, "You're qualified. You have good academic marks. You've done all the right things. But your congressman has already appointed somebody to the Air Force Academy for this year."

You know, congressmen have the ability to either appoint someone outright or appoint a

number of candidates and then let the academy select. So they offered me a chance to go to the Air Force Academy Prep School, which is located right on the same site as the Air Force Academy is. So I had to think about that for a while. As I said, I had been accepted at Iowa State.

But probably, as much as anything, still had an intense interest in flying and viewing that, well, this might be the shortest way to get there. Also, of course, was the economics of the situation. So I elected to go ahead and accept the opportunity to go to the prep school, and I did that. I was in the second class that the Air Force Academy Prep School ever had. So again, that was a brand-new institution, and they were still kind of feeling their way on what to teach.

So that whole year, about eleven months' worth, right after graduating from high school, I spent at the Air Force Academy Prep School, started off down at Lackland Air Force Base [San Antonio, Texas] in basically Air Force basic training, because they didn't know what else to do with us at that point. We went through a shortened version of basic training at Lackland and then went up to the academy and finished out a couple more weeks up there before we started the academic portion of the prep school.

It was heavy concentration on math and English and literature, and we took the—in those days it was the College Entrance Examination Board tests—at least five or six times during the year. When you take a test that many times, you begin to come out pretty well on the scores, so that's the way it ended up. I had good scores on that test, and being at the prep school opened up many, many more avenues of application of potential appointment to the academy. I ended up getting one from my senator from Iowa, but there were other avenues as well.

So after that, basically a year out for going to the prep school, I finally was accepted to the Air Force Academy, then the next year, the next summer, and started in [19]'63, then, into the Air Force Academy.

Turns out it was a really neat thing to do, to have gone to the prep school, besides getting a hugely important preview on what you might expect when you got to the academy. Unlike some of the other people who showed up right out of high school, I basically knew what military

and military training was all about by that time. And I ended up kind of being a helper, if you will, to a lot of other guys who just showed up right out of high school and just were totally culture-shocked by arriving at the Air Force Academy without having any idea of what to expect.

It also, of course, allowed me to get into the accelerated courses in math and English in the first two years at the academy, and what that did was leave room then in the last two years for several electives. The Air Force Academy can't grant a master's degree. It's only authorized to give bachelor's-level degrees, but I was among a group of several guys that took advanced courses, and they were credited by Purdue University [West Lafayette, Indiana] after I graduated from the Air Force Academy toward a master's in aeronautics and astronautics.

So, anyway, after the four years at the academy and graduation, all my classmates were looking forward to two or three months' worth of vacation before they went to pilot training. Me and about twelve other guys went to Purdue, had one week to show up, and we started that summer session just right after graduating from the Air Force Academy. So I have never quite forgiven them for having to give up that much leave, but it happened.

That summer session was very intense. I took nine hours of graduate-level courses, three different courses, and it was probably the worst—the most work academically that I had ever put in, even though I'd had several semesters at the academy with twenty and twenty-one hours' worth of credit. Three courses at graduate level in the summer just is not my recommendation as to how to do a master's degree, but we got through it all right.

Took an interim course between the summer session and the fall semester, and then fall semester at Purdue. That was probably the easiest academic situation that I'd ever had in my professional academic career, helped along by the fact that Purdue had an outstanding football team that year. Of course, back in those days, my four years at the Air Force Academy, where it was not a coed institution at that time, and when I got to Purdue, they not only had a good football team, which we didn't have when I was a cadet, they also had women attending the college, which was a totally new experience for me. So, lots of distractions there.

Anyway, that all worked out fine, and in January finished all the requirements for the

master's degree, and left Purdue then with that degree, and went back through Iowa; had gotten engaged, of course, in the meantime, and got married. And then finally, after all that academic stuff, got down to pilot training in Enid, Oklahoma, and went through Air Force pilot training.

Again, just an outstanding course of instruction, a lot of work, a lot of study, very, very intense, and after a year, graduated from Air Force pilot training. And finally, after those many years, I had been flying through pilot training, but finally was a rated pilot in the Air Force, my major goal at the time. So it worked out great.

WRIGHT: You spent a number of years in training and as an instructor before you became an astronaut. At what point did you decide to put your name in for the selection process?

SHRIVER: Well, again, it's an interesting situation. I never in my early Air Force career, proceeded as if becoming an astronaut were the major goal in my life, again, mainly because I had certain things that I wanted to do as a pilot, and becoming an astronaut, again, was kind of, I thought, well, it'd be a lot of fun, but there's hardly any chance that it would ever happen to me.

I spent some time, about, well, almost four years, I guess, at Vance Air Force Base in Enid, Oklahoma, as an instructor pilot for other student pilots in the Air Force, and what that did was give me a tremendous amount of experience in, well, teaching and flying, a lot of flying experience. And then I went on to check out in the F-4 [Phantom II] down in Homestead, Florida, before Hurricane Andrew. Homestead was still there. And right after that, then went to Southeast Asia to Thailand for about a year. So I got the operational experience there in F-4 fighter airplanes.

Somewhere along the line there, I decided that I wanted to become a test pilot, too. I think again because of the academic background I had, I thought I would be suitable at that. I really wanted to be involved more in things that were more at the leading edge, more exploratory in nature than maybe just the normal being an instructor pilot or a fighter pilot. I really did want to become a test pilot.

So when I was in Thailand, I had put in all the paperwork to be considered for that and was accepted at the Air Force test pilot school then while I was over there. So when I came back from Southeast Asia from Thailand, I had been accepted to test pilot school, and I came back to go through that school.

So if it's beginning to sound like my life is a series of schools and training, that's largely true. It's quite a process to get all the background. And, again, I was not doing this because I thought I was ever going to become an astronaut. These were things that I thought I wanted to do—well, I knew I wanted to do because of my interests and the background that I already had and the educational background that I had. It just made sense to me to become a test pilot, because that's the kind of flying that I was more interested in.

Well, it turns out, then, that after I finished test pilot school in [19]'75, and spent a couple, three years as a test pilot at Edwards [Air Force Base, Edwards, California], first on a T-38 lead-in fighter project, and then on the F-15 [Eagle] joint test force, NASA puts out the notification or the advertisement, if you will, that they are going to be looking for new Space Shuttle pilots and astronauts and mission specialists, and they laid out the criteria. And, of course, being in the military, the Air Force had its own screening system that it used before it even sent the names on to NASA.

So there I am, sitting at Edwards Air Force Base as an F-15 test pilot, just having a ball, basically just doing some of the things I'd always wanted to do, and now I had a big choice to make. At first my wife was not at all excited about me thinking about sending in an application. It was not a high thing on her list to have me go do. But we talked about it for a while, and then finally decided, well, why not? I do have all the right background. I have exactly the kind of training and experience that they seem to be looking for, so why not put an application in?

So I, along with about 60 percent of Edwards Air Force Base, submitted our applications to the—we submitted ours to the Air Force system, personnel system, and they went through a screening process based on, of course, the NASA screening, that criteria, and then they passed a whole set of names on to NASA, and NASA did their own screening. And it was, of course,

with NASA then that I eventually had the interview back in—well, late 1977 at that point.

So it was just a series of things that I had done, to do the things that I really wanted to do or the things that I was interested in, all those things I had done because I wanted to, not because I thought I was ever going to be an astronaut some day. It was really not until being at Edwards and seeing that some former military people had been selected to be astronauts, that you even thought that there was a remote chance that you would be considered. And then when NASA put out the call for names, why, you say, "Hmm, okay. If there ever is going to be a chance, I guess this might be it." So in went the application and that started the screening and interview process, first in the Air Force and then with NASA just after that.

WRIGHT: How much were you aware of the Shuttle development while you were still part of the Air Force?

SHRIVER: Well, when I was at Edwards, of course, NASA had been conducting the ALT [Approach and Landing Test] program, the approach and landing tests off the back of the 747 with *Enterprise*. Of course, those happened out at Edwards Air Force base, so I knew that they were working on it. And I guess that probably made me as much aware as anything that the Shuttle Program was coming along and it looked like it was going to be viable. Of course, there was a lot of literature and claims out by NASA on what the Shuttle was going to do in terms of the capability, of course, was recognizable and just looking at the vehicle itself. But the flight rate, I remember when we came down for our interviews and just prior to coming down for the interviews, the flight rate was advertised to be about, I think it was, sixty flights a year that Shuttle Program was going to fly. So it seemed like the right thing to do at that time, and I put my name in the ring.

WRIGHT: Now, as well trained and very many years of service in the Air Force, what did you think of the Shuttle when you saw the *Enterprise* as an aircraft?

SHRIVER: Well, the *Enterprise*, I guess folks should remember now, I probably didn't know it in detail at the time. *Enterprise* was basically just a shell of a Shuttle. It had the right shape on the outside. It had the right volume. The center of gravity and aerodynamics, of course, were what they needed to be. But, of course, it could never have, without a lot of just completely rebuilding the whole thing, would never have been able to fly into space. But it did, of course, the job it was designed to do, and that was to figure out if the concept of the Shuttle and the shape and the aerodynamics and everything were even flyable—if they had all the numbers right on all the right coefficients in the right place. So it did precisely what it was designed to do, and, of course, it also proved the concept of being able to be ferried on top of the 747 and released from there to conduct these tests.

So I think while it was not a space-rated vehicle, I think in terms of piquing my interest on being part of the program, it helped a lot. And the fact that it was conducted at Edwards while I was there really made it all kind of come together, I guess, at that point.

WRIGHT: Definitely a reality happening right then.

SHRIVER: Right.

WRIGHT: Tell us how you were notified and what your reaction was when you learned you were going to be part of the 1978 class.

SHRIVER: After the interview process, which in itself was—well, it had some interesting points to it, of course. I don't know whether it followed a standard format from previous classes or previous groups of astronauts that had been selected. I suppose some of it was similar. It was the weeklong process down here at the Johnson Space Center. A large part of it was medical and medical screening, of course, but there was also psychological screening, and that was interesting

to me. We had the good guy and we had the bad guy. [Laughs] I hope they don't get too upset for me describing it like that, but that's basically what it was.

Then there were some interesting tests, medical tests that I had never had before on the screening part. One of the other kind of related things was to—I think it was part of the psychological test more than anything, but they were talking about it in terms of this little round inflatable ball that was described as a crew transfer device between a Shuttle that may have been disabled on orbit and had no way of getting back, and another Shuttle that would come up and rendezvous with it. And then the guys on the good Shuttle would carry this thing over, and you would put crew members in it, and they had enough air supply, and it blew it up, and maintained enough pressure just long enough to get them over to the new Shuttle.

Well, what it was, was a little fabric enclosure. It was completely dark on the inside, and they had to crawl inside of that and sit there for a half hour, forty-five minutes, and I think the whole objective was to figure out if you were claustrophobic or anything like that. It would not have worked as a crew transfer vehicle at all, I'm pretty sure, now that I look back on it, but I was pretty naïve back then on space-related things, so it was a nice test.

But after we got through all that, I just went home to Edwards and was doing my normal job. One morning I get a call early in the morning. The time differential made it fairly early for me. I had just gotten up and started to get ready to go to work, and I got a call from George [W. S.] Abbey, and he just basically came right to the point. He said, "Well, are you still interested to coming to work as an astronaut pilot?"

I said, "Well, yes, I am." I didn't think much about a smart reply or anything. I said, "Well, yeah, I'd like that a lot."

He said, "We've screened everybody, and we've accepted you, and we'd like to have you come down."

So that's the way that happened. It was a nice, short phone call with good confirmation. I learned later that the guys who had not been selected that particular class had gotten a call from somebody else. So it didn't take but a few minutes after we all got to work to figure out if you

got a call from George Abbey, you had been accepted. If you got a call from either Jay [F.] Honeycutt or Duane [L.] Ross, it meant that you had not been accepted. So it was one of those little interesting sidelights of the selection process.

WRIGHT: Your wife had mentioned that she wasn't quite sure when you first put your application in. How was your family's reaction to find out that they'd be moving to Houston?

SHRIVER: Well, before I put the application in, that's when she was the most skittish about it. She was not sure that was the right thing. But as I went through the process, I think just finding out a little bit more about the program, seeing the relative excitement of me and everyone else at Edwards who had applied, when I was notified, then I think she was ready to have it happen also. And she's been fully supportive. We had a great time down here.

She, back then, was a nurse, and she'd been following me around every place we went, we ended up. I mean, she'd hit the place, set up home, go to the hospital. They always hired her immediately, so she had no problem finding work and keeping busy, and I think that certainly helped her know and feel like, "Well, I can go anywhere, and as long as I'm busy, why, I'll be okay." Of course, by the time we were ready to move, we had four kids, too, so that was going to keep her busy as well.

WRIGHT: Well, you were one of thirty-five new guys to come into NASA's astronaut corps. Tell us what the reception was like for you with some of the long-term astronauts that had already been in place.

SHRIVER: Well, I think there's various ways you could describe the reception that our group had. We were the first group in a long time, nine or ten years, I guess. I think the folks who were still in the Astronaut Office, which, of course, had been between programs for several years of that period, were glad to see us there, on the one hand, because they were all really busy doing the

technical things that astronauts do while they're waiting to go fly—various inputs to boards and panels and safety inputs and crew displays and all that kind of thing. They were all really busy, and I think they were happy to see us show up so that we would be able to help them and take some of the load.

At the same time, I think there was a bit of the "Oh, no, all these new guys. How are we ever going to get them trained and up to speed? Will they ever be ready to go fly in space?" Well that's kind of a natural reaction to the group of people who has been there and done that a lot. That's a bit of a different aspect of "We're happy to have them here, but I don't know, it's maybe just a little more work for a while until we get them all checked out.

The other thing was, since we were the first in a long time, and since the Shuttle, of course, was a new program, basically they were inventing our training as we went along. Now, that sounds worse than it really was. They didn't really know. I think the folks who had been around for a while, of course, a good part of Johnson Space Center is devoted to training and training astronauts, but the Shuttle was such a new vehicle, with a lot of totally new systems that they were learning, first of all, and then trying to decide what a new group of astronauts needed to know what was important. And, again, they were kind of putting this all together as we went through the training.

They had a course laid out for us, but there was, I think, a lot of real-time adjustments. And, of course, each time we finished a phase or a course, then they would take the lessons learned from our experience, and I think by the time three or four more classes came through, they had it pretty well ironed out the way they wanted it. But it was a fairly new process.

But we had a lot of great training. We had some visiting folks who came in from the fields of geology and space physics and astronomy, and gave us all kinds of lectures and information that had it not been for that, I never would have been exposed to them. And it was just all so interesting. That was an aspect of our AsCan [Astronaut Candidate] training that was completely different than my technical background as a test pilot in the aero-astro engineering field that I went through school in. This was completely different, and I just really enjoyed that.

I really liked that a lot.

To get a little bit of exposure you might have to try to use some of that training in the future on looking down at Earth and seeing the various geology that was represented there, but I would never be proficient at that, but at least I was exposed to some of the terms and some of the thought process that they were going to be using, so it was great.

WRIGHT: What were some of your first responsibilities that they gave to you?

SHRIVER: Well, toward the end of that first year, after we had done most of the classroom work that they had laid out for us to do, my first real assignment, so to speak, was as a Cape Crusader. That was a small group of people, there were just three of us in the beginning, who began to spend a considerable amount of time TDY [Temporary Duty] down at [NASA] Kennedy Space Center [KSC, Florida], where they eventually had moved *Columbia* down to KSC, and really it wasn't even close to being finished yet when they moved it.

But they moved it down there and finished the manufacturing process and finished, I guess, as important as anything, the tile system as a system that had to work, of course, correctly. There had been all kinds of problems previous to that with being able to bond these things to the external part of the places of the Shuttle where they needed it and have them stay there. Eventually they got that all worked out.

But we spent really a couple of years prior to STS-1 in that mode. [Karol J.] Bo Bobko, myself, and [Francis R.] Dick Scobee were the primary ones in the beginning. And then [Ellison S.] El Onizuka and [Frederick D.] Fred Gregory spent some time doing that, and a couple of other guys as well.

But during that process, of course, we learned a lot about the Shuttle, because we had a huge amount of exposure to the real vehicle by actually going into it, inside of it, sitting there and looking at things. I remember coming back several times, and people would ask you, "Well, what does this look like? What does that look like? Where is that switch?" And it all became

second nature over the course of the couple years that we spent doing that.

We'd crawl in that vehicle and help conduct tests and listen on the net as they went through the process. So the knowledge of the hardware and what it looked like was right there. I mean, you were exposed to it. So it was good for learning that part. For some of the other details, like the ascent profile and some of the detailed systems knowledge, it might not have been so good as some of the people back here who had other kinds of jobs, and specifically the functioning of the software of the guys that went over to SAIL to help check out the software in the early days, I think came away from that with intimate knowledge of what the software did at various points. I had more knowledge of the hardware in the actual vehicle.

Was assigned also then about, I guess, halfway through that process as the first—we'll call them ASP—I guess I got to dream up the name for it—astronaut support pilot. We developed all the procedures and the checklists and everything for helping to strap the crewmembers into the Orbiter and perform that function. And for John [W.] Young and [Robert L.] Bob Crippen as the first crew, every time they would come down, why, we'd talk over what the procedure should be, what they should look like, and who was doing what to whom and when, and all that sort of thing. So it was just a tremendous experience. The only, I guess, bad part about it was that it involved so much TDY away from home in Florida.

WRIGHT: Must have been an exciting time then for you when STS-1 launched. Were you able to be down at the Cape [Canaveral, Florida]?

SHRIVER: Oh, yes. I was required to be at the Cape because as the astronaut support pilot, I was in the white room. I helped strap them in. We helped cinch down the belts and hook up all the tubes. As a matter of fact, after they scrubbed the first time for the BFS [Backup Flight Software] issue, they got it back out a couple days later, came back, and when Crippen got into the seat, put his helmet on, and put the visor down, he couldn't get any air flow out of his helmet. Turns out that the quick disconnect for the oxygen hose that they had at the time, you had to play

with it just right to make sure it was rotated all fully and fully seated, otherwise, it wouldn't flow anything. And I had seen that happen several different times in tests, so I kind of thought, "Well, that's probably it."

So I reached down there. I had to get a pair of pliers out to rotate it, but eventually, after I heard it click into place, and I said, "Try it now." Sure enough, it worked. But I'm not sure the guys back here in mission control were ready to—it kind of magically corrected itself. But I don't know whether they ever even knew that happened or not.

Anyway, I was there and strapped them in for the first mission, and we fell back then to the—well, it's the roadblock that's about the closest point that anybody gets to. It's where the fire trucks all hang out. Of course, we had a huge group of people there. The guys said—the ones that had been there a long time, said, "Well let's get up on top of these big fire trucks. Let's get up on top of there and watch the launch from there." So we did.

I remember when the thing lifted off, I was just—there were a number of things about that first liftoff that truly amazed me. One was just the magnitude of steam and clouds, vapor that was being produced by the main engines, the exhaust hitting the sound suppression water, and then the solid rocket boosters were just something else, of course. And then when the sound finally hits you from three miles away, it's just mind-boggling. Even for an experienced fighter pilot, test pilot, it was just amazing to stand through that, because being that close and being on top of the fire truck, I guess after it got up a ways, of course, the pressure waves are basically unattenuated except by that three miles of distance, but when it hits your chest and it was, I think, flapping the flight suit against my leg, and it was vibrating, you could feel your legs and your knees buckling a little bit, could feel it in your chest, and I said, "Hmm, this is pretty powerful stuff here."

So it was really an amazing thing to experience, quite a—well the culmination of several years' worth of AsCan training and then a couple more years as a Cape Crusader.

I came to NASA and was assigned to NASA in 1978, and that was [19]'81, so we were doing a lot of things in between there, and I didn't fly my first mission until the seven-year point

in [19]‘85, so we had a lot of time to think about what was going on.

WRIGHT: Did you have the same duties continue for the next couple of flights?

SHRIVER: No, because it had been such a lengthy process and because of all the TDY, I had told the guys back here, I said, “Hey this is a lot of fun. I’m learning a lot, but is there something else I can do?” So right away they assigned me to be one of the chase pilots for STS-2, which again is a lot of TDY. And one of the other things I did in that time period was, because of the experience of being in Florida and watching a lot of construction finished on *Columbia*, 099 *Challenger* was being built at Palmdale [California] at that time, and they said, “Well, why don’t you, as one of your duties, why don’t you monitor the assembly of *Challenger* in Palmdale.” Well, that’s just more TDY, just going to the opposite coast.

So I spent a good part of that next year or so TDY, doing the same type of—watching the same kind of tests, helping them run the same kind of tests as they were building *Challenger* out at Palmdale. So it was interesting. A slight change, but still a lot of TDY.

But there was more opportunity, I think, in there to spend some time around here and begin to get a little more of the simulator time that the guys that were assigned and stayed more here had gotten to do, that I had not been able to do in this first couple of years.

WRIGHT: When did you learn that you were being selected for STS-10, as it was called originally?

SHRIVER: Let’s see. I don’t remember the exact date that we learned about that crew selection. It would have been, oh, more than a year ahead of when we actually flew STS-51-C. Crewmembers were basically the same on both of those flights. Everything kind of runs together back in those days.

WRIGHT: Did you learn right away that this was going to be a DoD [Department of Defense] flight?

SHRIVER: We knew that STS-10 was going to be DoD, and when the crew was formed, it was all military guys that formed the crew. So I think NASA believed that it didn't have to do that, but I think it also believed that things would probably go a lot smoother if they did. So they named an all active-duty military crew.

Of course, as we started to do some of the background work, the early training work, learning about what was going to be required, then it became apparent during that process that STS-10 wasn't going to go in sequence or on time. And that's when we started to learn that the numerical sequence of the numbers of the missions, that didn't mean a lot in those early days. And, as a matter of fact, of course, eventually that whole nomenclature went away, and by the time we resurfaced as a crew, NASA had gone to the 51-C, the numbers and letters for the fiscal year, and the sequence in that fiscal year.

But it was an interesting process. I thought, "Well, maybe I never will fly." It was the kind of situation where once you were identified as the crew for that mission, then especially this one being a DoD mission, you were kind of linked to it, as long as there was some thought that it was going to happen. And it never did completely go away. It just went kind of inactive for a while and then came back as 51-C.

WRIGHT: How did security conditions associated with the mission affect your training and your preparation?

SHRIVER: Well, as with most things like that, if you're the first one of a dedicated—this mission was dedicated to DoD. It was all DoD. And so since it was the first one like that—now, there had been a couple of other missions that had particular portions of the mission that were DoD-related, and there would be some classification surrounding that, but this, the entire mission was

classified.

We were really worried about that, as a crew, because, of course, in the NASA system, everything is completely open. That's one of the strong technical parts of NASA programs like the Shuttle, is that it is so open, everybody just keeps data and information on everybody else so that when that process was all through, everybody is pretty well assured of having the information that they know they need. We were concerned that just the opposite was going to happen, that because of the classification surrounding the mission, that people were going to start keeping secrets from each other and that there was a potential that some important product or piece of information might not get circulated as it should.

I think that was overcome, though, by basically the way things operated. The mission, yes, was classified. Certain descriptive details about what was going on were always classified, but within that classification shell, so to speak, the system was able to find a way to operate and operate very efficiently, I thought. There were still some hiccoughs here and there about how data got passed back and forth, and who could be around for training and who couldn't, and that sort of thing. But eventually all that got worked through fairly well, and I think the pathfinding we did on that mission helped some of the subsequent DoD-focused missions to be able to go a little bit smoother.

But I remember back—the Air Force did not even want the launch date released. They didn't want the crewmember names released. We weren't going to be able to invite guests for the launch in the beginning. This is your lifetime dream and ambition. You're finally an astronaut, and you're going to go fly the Space Shuttle, and you can't invite anybody to come watch. It was pretty—it was an interesting process. We finally got them talked into letting us invite—I think each one of us could invite thirty people, and then maybe some other car-pass guests who could drive out on the causeway. But trying to decide who, among all of your relatives and your wife's relatives are going to be among the thirty who get to come see the launch, well, it's a career-limiting kind of decision if you make the wrong decision. [Laughs]

WRIGHT: Pretty touchy subject.

SHRIVER: You know, you have part of the family mad at you for the rest of your life. Turns out that I think we got some rationality into the system, and both my wife and my family are from Iowa, anyway, so it's far enough away that other than fairly close relatives weren't really going to be able to make the trip anyway. So it all worked out, and I don't think anybody felt left out, and besides that, we made up for it on the next launch.

WRIGHT: What type of restrictions were imposed on you and the crew because of the security in classified missions? Anything somewhat unique that you can share with us that other crews did not have to—

SHRIVER: Well, sure. I mean, everything about our mission was classified. I couldn't go home and tell my wife what we were doing, anything about the mission. Everybody else's mission, everybody in the world knew exactly what was going on. That's what I'm talking about. NASA's system is so wide open. They could tell their wives about it, their family knew, everybody else in the world knew what was on those missions. We couldn't talk about anything. We couldn't say what we were doing, what we had, what we were not doing, anything that would imply the launch date, the launch time, the trajectory, the inclination, the altitude, anything about what we were doing in training. All that was classified. Couldn't talk about anything.

WRIGHT: Did you have specific trainers assigned to you the whole time so that you didn't have a variety?

SHRIVER: Yes, you had the same crew assigned. But it was so much counter to the normal culture within NASA, that that's why we were so worried in the beginning that would they even

be able to pull this off and get us trained properly, and would we know enough about the systems and everything. But it turns out that all ended up fine. It's just that nobody outside knew much about the mission. Whenever I go, still do it, when I go out to the public and talk to the public I mention the fact that I flew a DoD mission, and the fact that I wasn't sure my wife ever believed I went on a Space Shuttle flight because I couldn't tell her when I was going or when I was coming back. It only lasted three days anyway. She actually obviously knew that the Shuttle lunched and I was in it, but it made for some interesting situations.

WRIGHT: According to our research, the Air Force insisted on adding payload specialist Gary [E.] Payton to the crew to possibly prevent the astronauts from gaining any more knowledge of the payload. Can you tell us anything about that statement?

SHRIVER: Well, I guess I didn't ever see Gary's role as that. It's just a little bit different than your impression or your research, apparently. But, yes, and payload specialists, I think, were always a kind of a part of the thinking of those organizations that the Shuttle wanted to come fly or entice a customer, so to speak, to come use the Shuttle for whatever. I think there was always an implication that in a lot of cases they would be able to send a payload specialist along with the mission.

Certainly [Charles D.] Charlie Walker flew three Shuttle flights, and that was his status on each one of them. He was a guy that operated the separation device, the protein crystal growth stuff, and he had a specific purpose. Well, Gary had a specific purpose, but I don't think it was to make sure that we didn't learn about what the details of the mission were. As a matter of fact, we all got briefed into the mission, and we knew exactly what was going on.

So, as a pilot on the Shuttle, I have certain duties that I'm supposed to do, and that was where my training focused, and the payload specialist and our mission specialist focused more on the mission itself. But that's the way our system is designed anyway. So I never viewed Gary as being there to try to prevent me from learning something about what was going on.

WRIGHT: Did the change of orbiters from the *Challenger* to *Discovery* cause any impact to the crew or to the mission?

SHRIVER: No. We were—I mean, all that was transparent. I guess it may have happened that way, but as far as our training and what we did for our training, it didn't change anything.

WRIGHT: Just one last question about the mission. Were you ever in a situation where you felt somewhat compromised, and did people ask you questions or did people avoid asking you questions about the mission because of its classification?

SHRIVER: Well, people ask questions all the time, and they ask more questions when they know that the answer is prohibited from their knowledge. Then they just get even more adamant that you should tell them, and try to dream up of more tricky ways to get you to say something. The media, of course, being number one in that game.

There was rampant speculation throughout our entire training period as to what might be on that mission. Everybody had an opinion as to what it was, and you'd just say "Cannot confirm or deny," and that's all that was necessary. It got to be kind of a chuckling situation. It was humorous, I guess, to listen to people out there trying to guess as to what it might be. You'd say, "Okay. Well, just let that churn around out there. I'm going to go do my training and not worry about it." And eventually you don't think much about it.

But it does require you, then, when you do go meet the press or you do go do public presentation that you have to, of course, think a little bit harder about what you can say and not say.

WRIGHT: And you had a seasoned commander there to help with that mission as well, working under [Thomas K."T. K."] Mattingly [II].

SHRIVER: Yes. T. K. he helped invent the Shuttle, I think, in certain respects, the avionics and flight control system. He just knew a huge amount about that. And so it was a very educational experience to be part of one of his crews for my first flight. I learned a lot about the stuff that I needed to know about, being a pilot and then the commander. He was an excellent mentor and teacher on the first mission.

WRIGHT: Well, after you returned, 1985 proved to be a very busy time for NASA and for you. You provided mission support for STS-51-G, F, and J, as well as STS-61-A and B. Share with us what the working atmosphere was like due to this aggressive flight schedule.

SHRIVER: Well, you're correct, right after you fly a mission, of course, there's a flurry of debriefing activity that you go through to pass along your experiences and lessons learned, and then you go right back in, at least in those days, went right back into the support mode, doing CapCom [Capsule Communicator], training, going to boards and panels. There's a myriad of activities that happen, most of which the average Joe is probably not aware of, but it occupies a tremendous amount of time, and I did a number of those, I guess, while we were waiting.

We flew in [19]'85, and it wasn't too long to where we began to learn that, well, there's probably another mission on the horizon. As a matter of fact, we were sort of headed in that direction with a few folks on one mission specifically. Turns out, of course, then the events of *Challenger* [STS-51-L accident, January 28, 1986], of course, altered that plan greatly, and all of those missions kind of went away while the Shuttle got reinvented and the boosters got reworked.

So it was a busy period, that early part. Things were beginning to click along. The flights were more frequent. Things were going along. I think everybody had the sense that, "Boy, this is really going to pick up," and I don't know whether we ever thought we were going to get to sixty missions a year. That would have been pretty amazing, but I think people could

see more frequency and more flights coming. Of course, not really aware of this issue with the booster joint seal that was kind of lurking in the shadows. But, yes, it was a very busy period, and everybody, I think, having good feelings about programs getting going. It was really moving along.

WRIGHT: The common thread for most of those missions was deployment of communication satellites.

SHRIVER: Right.

WRIGHT: Did you have specific duties with any of those satellites, or can you remember or can share with us some of the specific things that you did for these missions? Was it a common thread for you, or did you have something for each one?

SHRIVER: You're right. We did a lot of satellite deployments, and we were working Spacelab quite a bit back in those days. One of the missions—I did not have too much to do with so much any of the satellites, although being in a very basic familiarity with the launch mechanism and the basic support stuff that went with it, the individual satellites I didn't deal much with, again because that was more of our mission specialists were directly doing that sort of thing.

I mentioned that after 51-C, then we were beginning to look at another mission which involved a high degree of Japanese participation in Spacelab, so we were beginning to look at that. It turns out that didn't get very far into maturity before *Challenger* happened, but had *Challenger* not happened, I think that mission probably would have blossomed into more of a mission than it ever did. But when *Challenger* happened, of course, that put everything on hold for quite a while and kind of reshuffled things after that.

WRIGHT: If we can, let's take a few minutes and talk about *Challenger*. It certainly was a

tragedy for the nation and for the space agency. Can you tell us where you were when you learned of the accident?

SHRIVER: I was spending most of my time here in the Houston area. After that first mission, 51-C, we were doing more training and sticking closer to home. I was in one of the small conference rooms that had a TV in it and had voice loops piped in from mission control as well up on our floor. So I was in that conference room watching the *Challenger* 51-L launch and could pretty well tell, just pretty much immediately that something was definitely not right on that launch. And then after that, of course, the voice loops confirmed all of that. And remembering not quite what to think about everything. But I think everybody has a natural tendency to start off with what can be right or what can positively happen, and maybe not fully realizing the extent of what had happened and what might be the result.

But pretty soon, of course, you start thinking about the reality of things and the fact that nothing was found immediately, you pretty much have to know that things are not going to turn out very well, and that was the case.

WRIGHT: What were your duties during that time period immediately after the *Challenger*?

SHRIVER: I guess the most immediate thing was that—I don't know whether you're familiar with the term "casualty assistance officer." In the military, anytime there's a human fatality, they always assign a member, casualty assistance officer, CACO [Casualty Assistance Call Officer], we call it, to help the family of whoever has been killed or injured or whatever. And since Ellison Onizuka and I flew as crew members on the first flight, I guess it was probably equal parts volunteering to do it and equal parts of George Abbey and John Young realizing that maybe it was a good thing, since I knew Ellison probably as good as or better than a lot of guys, that I do that job.

So some of the first things I did right after that had to do with the casually assistance role

with Lorna Onizuka and her two girls, and then all, of course, the relatives that were immediately here from Hawaii. There was a huge, huge amount of activity that went on there, and took a long time. Took—well, it went on for two or three years, as a matter of fact, in various forms. And then for several years after that, still had some things happening that I kind of stayed involved in because I'd been involved early on. Certainly got to know Lorna and her family and Ellison's family very well in that year or two right after the accident.

That really occupied most of the time for several months, actually, but interspersed with all of that, there was a role in the reworking of the hazards analyses and the FEMA [Federal Emergency Management Agency] Silva [phonetic], the documents that document what can happen if a certain thing breaks, what does that mean to the total system. And a lot of that work got redone, and I was a safety representative to the space flight safety panel for the Astronaut Office for a while. Filled some other safety functions for a while in the office.

Again, went to a lot of technical forums and boards, and quite a bit of the casualty assistance role for several months right after that, interspersed with some of this other activity, especially as it got laid out better as to how much detail they were going to go into redoing all of that and the redesign of the booster and all that. But it was more located here rather than somewhere else, because of the casualty assistance role.

WRIGHT: Just a year before, with your flight on 51-C, it was your mission at that time that had launched at the coldest recorded temperatures.

SHRIVER: Right.

WRIGHT: And after it was determined there had been a problem with the O-rings. Were there any thoughts you would like to share with us on that?

SHRIVER: Well, I've talked a lot here this morning about how open NASA's system is, and how

the safety of human space flight depends on people not hiding things from each other, not keeping them in the dark. Well, it turns out the *Challenger* accident was the classic case of basically that having happened. There was an issue on the booster seal, the joints, and how they came together and how they sealed against each other, and it had been manifesting itself for some time, it turns out. There were several missions that had some erosion of the O-rings even prior to ours on 51-C.

We launched 51-C, of course, in January. It was a very cold morning. Well, the day before we didn't even launch because it was so cold in Florida that day that they were afraid that the water in the fire ex [extinguish] system would freeze, and if they needed to use it, it wouldn't work properly. There's water pipes throughout the thick surface structure that spray water on a lot of stuff if it's needed. So the first day we were supposed to launch, they didn't even try, and then the second day was still cold, but a little bit better.

Turns out, I was told, after *Challenger* came to light, that 51-C was the next worse erosion of any other mission. And so you kind of wonder, well, it's maybe a good thing it wasn't quite so cold or whatever. But that sort of information—I'm not sure one could have a problem like that today and have it not be called to the awareness of everybody else in the Shuttle Program, as opposed to what happened there.

There were a few folks who knew what was happening, but the information didn't get out. So it's a classic communication problem, complicated, in the final analysis, by a stroke of bad luck with cold weather, of all things. Of course, it wasn't going to manifest itself without the cold weather being there, but what a way to have it happen.

WRIGHT: Unfortunate for all that it happened that way.

SHRIVER: Yes.

WRIGHT: We are approaching not necessarily the time that we're going to be closing, but a time

to release you for your appointment. Before I do that, I was going to ask Sandra and Jennifer if they have some questions for you, and when they're finished I have another one before. Then hopefully we can come back and meet with you again and start with your missions—the next ones that you actually got to fly and got to tell people about.

SHRIVER: I've been too wordy, huh?

WRIGHT: Absolutely not, but it probably is a good place to break. I don't really want to start on STS-31 and then have you lose all of that momentum and good thoughts and we have to start all over again.

So let me ask Jennifer, do you have any questions for today?

ROSS-NAZZAL: I don't have any questions.

JOHNSON: Not today.

WRIGHT: I've got one that when we were talking about support crews, I know that you also supported STS-8, which was the first mission to launch at night and the first one to—

SHRIVER: Oh, yes.

WRIGHT: Could you tell us about your role and the preparation for the night landing? I understand you helped developed and test them and those methods that were used for that.

SHRIVER: Yes. Well, of course, the Shuttle is a hypersonic vehicle. At reentry everything's pretty much got to be behind the tile and inside the mold line. When the gear comes down, there's no landing lights on the Shuttle. A normal airplane has several lights that come down

when the gear are extended or other lights that the crew can deploy and turn on.

So here we are, not wanting to not be able to land at night because some of the missions, of course, are going to require—I mean, to be a fully operational program, you're going to eventually land at night somewhere. And without landing lights, you need some kind of illumination on the runway in addition to just the normal runway lights. In a normal airplane, as it comes in to land, it's supplying its own landing environment light for the situation, and the pilot has the cues that he needs.

We were worried that the Shuttle coming in—the runway itself has lights along the edge. It has threshold lights, or approach lights. There are a lot of cues, but there is nothing that's illuminating the touchdown zone like the landing lights of an airplane does. So we had to figure out a way to supply some of that lighting onto the touchdown zone and are far enough ahead that the commander then could get the visual cues that he would normally have to fly in and land.

So we experimented with a number of things, a number of methods. There were methods to fly the glide slope on, and then after the pre-flare to fly the shallow glide slope, the inner glide slope, we developed a ball bar system that did that, after looking at several different methods for the inner glide slope. And then we used various combinations of other fairly high-powered lighting systems to try to supply this light up on the touchdown zone.

We ended up zeroing in on xenon lights. These are very bright searchlights that the Army hadn't been using for some time. We found that certain arrangements of these lights in groups of four or groups of two, and angled across the touchdown zone, not only sort of headed you in the right direction, but supplied the light. But we used a number of different—we tested quite a bit out at Edwards at night out on the lakebed and on the hard surface runway, and we eventually got a system that we thought would work, involved lights and reflectors and various things.

Then it became apparent that once you come in, if the light sources are behind you and you're trying to land on a lakebed, the wing-tip vortexes and everything that are generated and Shuttle touching down or rolling out produces a huge amount of dust on the lakebed. So if the

lighting sources are behind you and the dust billows up behind you, it starts to cut out the light in the rest of the touchdown zone. So it's maybe not a good thing to try to land on a lakebed at night, because the dust is soon going to block out all the light.

So very soon after that, of course, we put all that stuff on the hard surface runways, and we basically said, "Well, if we're going to land at night, we want to land on a hard surface runway." But most of our experimental work was done out on the lakebeds at Edwards.

WRIGHT: Was this a time-consuming process?

SHRIVER: Well, yes, there were so many iterations that we tried. We tried various configurations. I think, first, we had to decide what that inner glide slope device was going to look like, and we kind of narrowed in on that after several different experiments and tries, and then the overall area lighting, that took a little tweaking as well. And then there were various combinations of reflectors added. We did some, and then the guys that were kind of doing it after I left that project to go train again, they added some other stuff, too. So it was kind of an evolving process there for a while.

WRIGHT: And one other question about your other duties. At some point early in your assignments, you were assigned to be the interface with the Vandenberg Air Force Base [California], because at one point they were believed they were going to do launches—

SHRIVER: Yes, there was a short period of time, and I did go out there a few times to kind of get the setup for the launch pad, which was different than Florida. But we actually never ended up doing—coming very close, because of budget reasons and various other reasons, but mostly budget, I think.

But I made some trips out there and did some work trying to—well, the design of the crew quarters, for example, we worked at for a while and sort of got that laid out, and we looked

at the launch pad and the various things. But before it got—they had a huge amount of stuff built, and there was a lot money involved in what they did, but we never really got that close to actually pulling off a launch out there.

WRIGHT: Was that assignment a reason—part of you being a part of the Air Force, or was it just luck of the draw?

SHRIVER: Oh, I suppose some of it was, but it was just kind of a natural thing, too, since I had been involved in a lot of the early days, I think at the Cape, getting ready to fly that, that it might think that it was kind of a natural thing to say, "Okay, here we are in the beginning part of a potential Vandenberg launch. What are some of the things that they're going to need out there?" And looking at the runway and the lights and flying a few approaches and then just some of the basic things that went in to support the Cape, then you'd want to think about having that same capability at Vandenberg.

WRIGHT: Okay. Is there anything else that you would like to add about this part of your career before we start again on your next segment where we pick up where you become commander of your flight?

SHRIVER: Oh, I don't know. I think one of the questions you had written was what was some of the more difficult things, and as I look back on it, this business of being a casualty assistance officer is not easy to do. Totally different than the technical background that I have, and the duration of it was another factor. It was very, very long and very tedious work, very satisfying in some respects, very difficult to do though in some respects. But I would say that was probably more difficult to do than many of the technical things I've been involved in so far in my career.

WRIGHT: And I would imagine that some of those duties just never felt like they stopped.

SHRIVER: Oh, yes. I mean, today it's very remote in the past, but they did go on for a long time. And there are still linkages that I have, because of that work, to Ellison's family in Hawaii that every once in a while get renewed in some way or another. But, yes, it was a pretty traumatic time for everybody involved and a different aspect of anything I'd ever done before.

WRIGHT: All the training you've had, I'm sure it was very hard to be able to be trained in that position.

SHRIVER: Yes, well, all the training I went through was to do a job that I already knew quite a bit about, and that was flying an airplane/space vehicle. This kind of training is something you just don't get.

WRIGHT: After all those early effects of *Challenger*, and, of course, being in that position you were in, did you ever have any doubts that maybe this isn't what you wanted to pursue?

SHRIVER: No, I don't know as that entered my mind. I could see the huge amount of rebuilding, redoing, reinventing that was going on in the overall program. Of course, the joint was redesigned—the solid rocket booster joint was redesigned. You get the feeling, then, that with all that effort that has gone into it, that actually things may be more safe now or right after that than they were just prior to that. And that's probably the case in most situations like that. But, of course, it'll only stay that way as long as everybody stays alert and vigilant and pays attention to detail. And from what I see these days, we certainly haven't let up on that at all.

WRIGHT: Did it almost seem, those preparations for return to flight, was it almost like being those first days back when you first started with the Shuttle Program, everything being reviewed?

SHRIVER: Yes, or even worse. I say "worse." Even more so. Everybody is familiar with the terminology, the pendulum swings back and forth. Well, maybe the pendulum had gone too far in one direction, but when it swung back the other way, it probably went a little too far in the other direction as well. And when it does that, the amount of expense and cost in the program gets pretty huge, and the last little bit of that, it's arguable as whether it has actually done that much to increase safety or not.

I think the basic things that we did were what I think actually ends up improving the safety of the program, and we probably went a little further than necessary and encumbered the program for many years with a lot of practices or paperwork or whatever procedures that added a lot of time and cost and people, but actually didn't improve the overall safety of the vehicle all that much, if at all. But I think since that time we have filtered out some of that, and I think we're back more toward a rational approach.

WRIGHT: Were you involved with the STS-26, of any of the preparations?

SHRIVER: Not really too much there, no, not direct support to what they were doing. Again, a lot of this casualty assistance stuff was still going on, even that late.

WRIGHT: Well, I'm sure that those duties will long be remembered by all of those involved.

SHRIVER: I suppose.

WRIGHT: Well, we're going to close for today so that when we begin again we can start on a very exciting note of you being named as commander of your next mission and talk about those missions, and then move to the administrative part of your job as well.

SHRIVER: Okay.

[End of interview]