NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT
ORAL HISTORY TRANSCRIPT

JOHN O. CREIGHTON
INTERVIEWED BY JENNIFER ROSS-NAZZAL
SEATTLE, WASHINGTON – 3 MAY 2004

ROSS-NAZZAL: Today is May 3rd, 2004. This oral history with John Creighton is being conducted for the Johnson Space Center Oral History Project in Seattle, Washington. Jennifer Ross-Nazzal is the interviewer.

Thank you for joining me this morning. I really appreciate it.

CREIGHTON: My pleasure.

ROSS-NAZZAL: I'd like to begin by asking you about your interest in aviation and aerospace as a child.

CREIGHTON: Well, I think I've been interested in flying since I can remember. I don't remember exactly what sparked that interest, but I can remember going and watching the Blue Angels fly here in the summertime during the hydroplane races, and it was just something that I've always wanted to do, is fly. I was fortunate enough to get an opportunity to do that, and, fact is, I'm still flying for [the] Boeing [Company].

ROSS-NAZZAL: That's great. Why don't you tell me briefly about your career with the Navy.

CREIGHTON: Well, I graduated here in Seattle from Ballard High School and I went a year to the University of Washington [Seattle, Washington]. At that time, ROTC [Reserve Officer's Training Corps] was compulsory, so I joined the Naval ROTC there with the intent of going on into naval aviation.

Then about midway through my freshman year at the University of Washington, why, my ROTC prof [professor] there asked whether there was anybody interested in trying for an appointment to the [U.S.] Naval Academy [Annapolis, Maryland]. Interestingly, my ROTC prof was Richard [M.] Nixon's younger brother, who was a lieutenant in the Navy at that time.

So I talked to him, and he put my name in, and I took the physical and I took some exams, and didn't hear much about it until I was just finishing up finals at the University of Washington. I got a packet in the mail, with about a million forms to fill out, saying that I'd been accepted to the Naval Academy and I was to report in three weeks. So that's the first time I ever took it serious.

Well, four years later, I graduated from the Naval Academy with a couple of degrees, one in management, one in aerospace engineering, and went right from there into flight training, and flew F-4s in Vietnam for a couple of years.

Then I went to the Navy Test Pilot School in Patuxent River, Maryland. During that period of time, I get in on the ground floor of the F-14 program, was the Propulsion Project Manager for the F-14, and got an opportunity to be one of the first Navy pilots to fly the F-14. I spent several months up at the factory in Grumman [Aircraft Engineering Corporation], up on Long Island [New York]. Lived out in the Hamptons in the summer, so that was kind of nice, and it was really a fun opportunity.

Then I went from there to the First Operational F-14 Squadron, VF-2, and spent about four years flying the F-14. Again, made a couple of carrier deployments of about a year each, and ended up going to the Western Pacific again, flying the F-14.

My third cruise—the first two were combat cruises in Vietnam, and then we were back over the Far East, but by that time we had pretty well pulled out of Vietnam, so it was a peacetime cruise. We'd gotten done with the cruise, just pulled into Manila [Philippines], when all of a sudden, we got orders—we had dropped anchor. The anchor was down for about thirty minutes. They pulled it up, turned around, and we went back and sat off of the coast of South Vietnam for about thirty days, and I ended up flying fighter cover in an F-14 over the top of the U.S. Embassy the night that Saigon fell and they evacuated the U.S. Embassy. So I saw that first-hand from about 10,000 feet up. We were just there to make sure that no MiGs or anything came down and tried to harass our helicopters that were evacuating the personnel out of there.

Then I went back for a second tour. Just after I got out of VF-2, I went back to Patuxent River, Maryland, for another tour back there as the Program Manager for all fighter testing in the Navy and also as the ops [operations] officer for Strike Test Directorate back in the Navy. In fact, I hadn't even checked in yet for my first day of work, when I got a phone call, I think it was on a Thursday or a Friday afternoon, and I got a phone call from NASA saying that are you available to come down the next Sunday, you know, a couple days later, for an interview for the astronaut interview process.

I had applied to the astronaut program. They hadn't selected any astronauts for, I think, the better part of ten years, not since the Apollo era. So I said, "You bet." So I checked in on Friday—I hadn't planned to check in until the following Monday, and I checked in on Friday and

said, "I'm here. How about cutting me orders to go down to Houston [Texas] for a week to go through this interview process."

So they said okay and filled out the paperwork, and I ended up flying down to Houston. I met several people that I knew in the Navy and had met in the Marine Corps, along with a bunch of Air Force people. It was all pilots that first week. There were, I think, twenty of us down there.

I went through the selection process, and just through dumb luck—most of the selection process there is physical. You go through and they check your eyes and your heart and take x-rays until you glow in the dark, and look in every orifice. It's typically a two-hour here with one specialist and maybe give you a couple hours off, and they encourage you to meet the astronauts that were there at the time, left over from the Apollo Program, the ones that were still there, and meet as many people as you could. Then you go back and see another doctor in some other specialty.

Well, it turns out that none of us appreciated it at the time, but the real key to that, because most pilots, if you can pass a Navy or an Air Force flight physical, you can probably pass a NASA selection physical. Occasionally they find a few things and they might have weeded out a few of the pilots, but generally, most of the pilots were able to pass the physical. So the real key thing to the astronaut selection was the interview board, and it just so happened through the luck of the draw that I was in the first group to go down and go through this selection process, and I was the first one in the first group to sit at the long green table with all of these people sitting behind it. I had no idea who any of these people were, had no preparation, so I walked in there stone cold. I must have gotten through it okay, because I got selected a few

months later, but I like to tell people I set a standard by which nobody else could fail. So that was an interesting aspect of the selection process.

Got done with that, and, of course, then as soon as I walked out the door, I was surrounded by other people, "What did they ask you? What did they want to know?" It's really not anything that you can prepare for. They don't ask you to derive any differential equations or anything. They just want to talk to you and, I think, get a sense of the kind of person you are, what your feelings are like. They'll throw you some oddball questions just to see how you think on your feet. Public speaking is a part of the job, so they'll get a sense of how they think you would do standing up in front of the public, and I've never had a problem doing that. I was a commencement speaker at my high school graduation, so I'd had some practice at getting up in front of groups and talking.

So, got through that week and went back and, as I said, I was in the first group of twenty to go down for the selection, so then we had to wait until all the other people that went through. I was in the first selection process where we were picked specifically for the Shuttle Program. There were about—don't hold me to these numbers, but I think there were around 200 people interviewed, about 40 percent pilots and about 60 percent mission specialists, which are the nonpilot scientist, engineers-type people. So that took, I think, pretty well through the beginning of December, and I was in sometime in August when I went through the selection, so I had to wait quite a while.

Then right after the first of the year, I think it was in late January, I was going through some training to learn—because I was going to do some testing for the F-14 program back at Pax River on photo reconnaissance, so I went through some training down in [Naval Air Station]

Sanford, Florida, which was the home of the RA-5C, which was the Navy's reconnaissance airplane that was in the process of being phased out at the time.

Then I had a weekend off and I flew out to San Diego [California] to be with some friends of mine, and then I was going up to [Marine Corps Air Station] El Toro [California] to fly the RF-4, which was a reconnaissance version of the F-4 at the time. Well, it was over this weekend they were notifying everybody who had gotten selected, and nobody knew how to get a hold of me.

So the next morning, Monday morning, when I reported to El Toro, I was in the middle of a brief, and they were telling me about the camera systems on the F-4 in preparation for going out flying that afternoon, and I got a phone call from my secretary in Pax River saying that "NASA's been trying to get a hold of you, and don't get too excited, because they're notifying the people that didn't get selected as well as the people that did." But they gave me a number to call back and then they said, "Be sure and call us and let us know what the results were."

So I called George [W. S.] Abbey, who was the head of the selection process at the time, and he got on the phone and asked me whether I was still interested in coming to work for him, and I said, "You bet," and that's how I found out that I had gotten selected for the astronaut program.

So I called my office back and let them know that I'd been selected, then I sat down for the brief and didn't hear a word that the guy said for the rest of the morning and, in fact, went up to fly and couldn't remember how to turn the cameras on in the airplane. That was kind of embarrassing.

But it was interesting. I found out that they were going to have a big press conference the following—I think it was about two or two and a half weeks later, and I had already made

arrangements after this training that I was going to stop—I'm an avid snow skier, so I was going to stop in Aspen [Colorado] and go skiing for about a week before coming back to Pax River. Well, it turned out that about three days later, I was supposed to be in Houston for the interview. All I had brought with me was casual clothes, so I went with a friend shopping for some appropriate attire in Houston. I had made arrangements just to spend three more days in Aspen, so I spent ten days in Aspen skiing, then I ended up going directly from there to Houston for the press conference, where they introduced the thirty-five of us that had been selected. So that was a unique couple of weeks, living on cloud nine the whole time. That's how I got introduced to the astronaut program. It was great.

ROSS-NAZZAL: What did you family think when they heard that you had been selected to be an astronaut?

CREIGHTON: Well, I think they were happy for me, although I think my mom in particular was a little concerned. I'm happy that my father was alive to see it, because he died unexpectedly a short time after—I think about two months after I actually reported to Houston, why, he passed away of a heart attack. But they were excited for me, because they knew it was something that I'd wanted to do from the time there were such things as astronauts.

I mentioned earlier that I'd wanted to fly since I could remember, and I can remember when they launched *Sputnik*, that my dad and I climbed up on the roof of our house and watched, because back then, they'd report in the paper when the *Sputnik* was due over and you could look up there and see this little faint light as it passed overhead occasionally in the evening. I can remember being up there with him then. And then not too long after that, when Yuri Gagarin,

followed shortly thereafter by Alan [B.] Shepard, went into space, why, I decided that not only did I want to fly, but I wanted to be an astronaut. That was, I think, about my—I was either in the eighth or ninth grade, in that time frame. So I got a chance to fulfill, eventually, a lifelong dream.

ROSS-NAZZAL: That's great. Can you tell me about the astronaut training that you underwent during the following year?

CREIGHTON: Well, we ended up reporting to Houston. I ended up coming down just because it was convenient. I sold my house in Pax River, so I came down about a month early and got settled in, and then took a couple weeks' vacation and went up and saw my parents up here in Seattle for a couple weeks and then came down. We reported, I think, just after the 4th of July, if I remember correctly, the 7th of July.

Most of that first year, at least initially, was spent in the classroom. We'd spend about three hours in the morning, break for lunch, and come back for two or three hours in the afternoon. They brought in a number of speakers to talk to us in general about spacecraft design and how NASA was organized and a little bit about all of the different Centers. Then we got progressively in more and more detail on how the Space Shuttle was designed at that time. This turned out to be about two years before the first Shuttle, actually almost three years, before the Shuttle flew. We reported in July of '78, and the Shuttle flew in April of '81, on the first flight.

But at the time that we reported here, the Shuttle was supposed to fly fairly soon after we got there, then it turned out that they ran into some problems with the tiles and it got delayed a couple of years. So we ended up spending time there. The pilots, we got checked out on the T-

38, because that was the airplane that we would fly there, that we would maintain our proficiency in. I had flown it at Patuxent River, and most all of the Air Force pilots had flown that as a part of their initial training, but the Navy, unless you went through Pax River, you probably hadn't every flown a T-38 before.

Then the mission specialists, some of them had private pilot's licenses, but most of them had never flown in a high-performance airplane before. So they got checked out, and we flew as a team. They would fly in the backseat and the pilots would fly in the front, and they would learn to operate it as a crew in kind of a stressful environment.

We went through various survival training: land survival, water survival. Took a number of tours around the country to visit the various NASA Centers, and that was fun as well as educational. Back then, we didn't get much simulator time. They do nowadays. When they get in, as a part of that, they'll start getting you in the simulator fairly soon, but back then, all the simulator time was being taken up by the first couple of crews that were getting ready to fly the Space Shuttle, John [W.] Young and [Robert L.] Crippen and [Richard H.] Truly and [Joe H.] Engle.

So we learned a lot about NASA. Originally, they were talking about it being an eighteen-month to two-year training program, but they cut it shorter to about fourteen months, and then the subsequent classes were limited to a year. We had a lot of social activities together. In a lot of ways it was like a Navy squadron. You socialized together on the weekends and do a lot of things together, travel as a group to go to visit these things, so you built sort of a close-knit group and a camaraderie amongst the crews. That lasted throughout the initial year or fourteen months of training, and up until the selection of the first crews out of our group, and then the

group tended to fragment a little bit. Then you started socializing more within the crews, once you got assigned to a crew to go fly.

ROSS-NAZZAL: Speaking of your class, your class called themselves the Thirty-Five New Guys.

CREIGHTON: Yes.

ROSS-NAZZAL: Can you tell me about that nickname, and what you thought of it?

CREIGHTON: Well, that came from a Navy term. There were thirty-five of us in the group. I don't know whether you've seen a picture of it, but I can't remember who the artist was that drew it. I think it was somebody in our group that drew a picture of the Shuttle with all these little astronauts clinging all over it, the patch that we put together. The Thirty-Five New Guys, the "the" was for "the" and the NG was for the new guys, and I'll let you guess what the "F" stood for, but that was where the original expression came from, and the letters worked out for the thirty-five instead of some other words that had been used historically. So that was sort of how the name evolved.

ROSS-NAZZAL: Our research indicates that you had actually worked underneath an astronaut, Joe Engle, for about a three-month period. Can you talk to me about that mentorship period?

CREIGHTON: Well, as I recall, Joe had responsibility for procedures early on, so I worked with him to develop some of the ascent procedures and really just sort of followed him around. It was

more of a learning who the people were to talk to, because we'd met some of them in our initial year of training, but then once you got assigned to a specific task, why, then you met a different group of people, specialists in a particular field. So it was more of a learning experience, if you will, in that respect. I don't think I probably contributed much in those early days, because I was still getting up to speed, too.

Really, the first significant training or what we call technical assignment or job that I had, I paired up with another astronaut named Brewster [H.] Shaw [Jr.], and we ended up working on an electronics device called SAIL, which stood for the Shuttle Avionics Integration Laboratory. This was, again, before the first flight of the Shuttle, and so Brewster and I were the two astronauts and we worked twelve on, twelve off. One week I'd be days and he'd be nights, and then we'd reverse it, and it was oftentimes six days and occasionally seven days a week.

What this was, was a mockup, just like the Shuttle, from an avionics point of view, in the flight deck, other than it wasn't on a motion base, it didn't move and there was no visual, but all of the actual hardware was located there, the wires were run exact lengths that they are in the real Shuttle, the black boxes were located in the same positions they would be on the Shuttle, in case there was any electromagnetic interference or anything. So this was a dress rehearsal from an avionics and a software point of view for the ascent or the liftoff portion of the first flight, getting ready for the first flight of the Shuttle. So we had to do all of the test and verification of both the hardware and the software for the launch of the Shuttle.

Early on, on that testing, why, a lot of things would go wrong and we'd sit around for hours and there'd be nothing going on, because they'd have problems. Then we'd come in at eight o'clock in the morning and you wait around and you might get the first run off, or you'd try to get a run off and something wouldn't work, so you'd sit around for another three or four

hours. Eventually, you might get something done in late afternoon, but it seemed like most of the runs actually get done in the middle of the night instead of during the daytime.

So we had that job for about a year and a half, so in some respects it was kind of a long year, working six, seven days a week, twelve hours a day, but we got through it, verified the software, and the Shuttle launched right on schedule.

ROSS-NAZZAL: Why don't you tell me about the flight of STS-1. What are your memories of that flight.

CREIGHTON: I was assigned to the recovery team at Edwards Air Force Base [California]. I was hoping to get to go to the Cape [Canaveral, Florida] to watch the launch, but I was designated in case—there's a number of abort scenarios in case something goes wrong. One of them is, that you will recall, return to launch site, which you would come right back and land at the Cape. Another abort is called abort once around, where you would essentially arc all the way around the world, come back in, and land at Edwards Air Force Base, so we had to have somebody there on launch day to take care of that.

So I was in one of the Army helicopters—there were about four or five of them—as a rescue team in case the Shuttle came in and didn't land on the runway or something landed off site or something. I was there to identify the various structural components in case something broke up, you know, they would need to know is that hazardous, can we go in, because the Shuttle has a lot of propellants on it that if they leak, are potentially fatal, and you can't see them and by the time you smell them, it's too late. So that's the reason I was in the helicopter. Nothing happened on launch, fortunately.

Then on landing, when they came back in about—I can't even remember now how long the first flight was. It was about forty-eight hours as I remember, a couple days. We were there airborne when the Shuttle came in. Then as it landed and rolled to a stop, way off at the far end of the dry lakebed, where the Shuttle landed on its first landing, they had this fenced-off area with all kinds of people that had camped out there for several days, some of them. A bunch of RVs and motorcycles and cars and campers and things. There was a fence there and there'd been a patrol to keep people back there. Well, as soon as the Shuttle rolled to a stop, these people charged forward. This fence came down, and they got motorcycles and cars that went out racing. This was about four to five miles away from where the Shuttle actually landed, and the only way you could see the Shuttle was with binoculars, but, boy, they wanted to get an up-front view.

The security folks didn't know what to do, so they told the helicopters to try and get this crowd under control. So these helicopters would swoop down in front of these on-charging group of cars. I don't know if you ever saw the movie *Independence Day*.

ROSS-NAZZAL: Yes.

CREIGHTON: Well, they're charging towards the gate, that's exactly what it looked like, only we were above it, so we would drop down in the helicopters and blow dust up to try—we were trying to herd these cars like cattle. The helicopter pilots loved it. They were having a great time trying to head off all of these people. Then they finally did bring them to a stop, and by that time they got a bunch of security people out on the ground. I don't think they ever probably got closer than about a mile to the Shuttle. But, I mean, it was for their own protection. They didn't

appreciate that. In case any of these fluids that were leaking, why, it could have been potentially fatal. But that was kind of an interesting sidelight that most people probably had never heard of.

ROSS-NAZZAL: No, I had not heard that before.

Your bio sheet also indicates that you held a variety of technical assignments supporting the Space Shuttle for about a period of four years, and you've already talked about SAIL. Can you tell me about some of the other positions that you held?

CREIGHTON: Well, the next job I had after SAIL was I was designated as the computer expert or software guy in the Astronaut Office, not because I had any background in computers, because it was just my turn to take the job and that was the key to really understanding how the Shuttle flew, was because it was done through software. By the time I got that job, the Shuttle had flown the first time, so a lot of it had been done. So what we were looking at is improvements to the Shuttle, things that we could add capability to it.

So I would sit down the Software Control Board and get involved in the requirements as to what we were really trying to achieve, and then we would turn it over to the programmers to actually do the programming. We would work with IBM [International Business Machines Corporation], which were doing the programming for the primary software system, and then we had a backup computer system with backup software, programmed by a different group of people, and that was Rockwell [International Corporation]. So I worked with both of them, both the primary and the backup software. I had that job for about a year, maybe a little over a year, as I recall.

It was interesting. I can remember one time I went on a speaking engagement. I was on a panel with a famous aviator, Scott Crossfield, who flew the X-15, and he was telling a story that they were doing the final test—they'd flown the X-15 early on, and now they were putting a bigger motor in it so that it could go higher and faster, and the last ground test before they were going to go fly, it had to be manned for some reason, so this rocket was chained to the ground and he was sitting in the cockpit, running the engine up to full power, when it exploded and blew the cockpit, and I don't remember how far he said, but a hundred feet or so and it tumbled across the desert. Fortunately, he wasn't hurt or—you know, shook up a little bit, but he opened the hatch and climbed out, and within six months they had figured out what was wrong, rebuilt the engine, tested it, and he was flying.

And after he told that story, I was sitting next to him on the podium, and afterward, we were taking a break. I said, "You know, you did all that in six months and I can't get a software change in the Shuttle in six months." So it was kind of frustrating in that respect. Because of all of the checks and balances and all of the testing that's required to be done before they were to make a software change, why, it was kind of slow going to get some of the improvements that we all thought we should have. But it just took forever to get them approved.

So I had that job. Then after that, I was in the ascent and entry procedures group again. That's what I did with Joe Engle early on, and then I worked for Ken [Thomas K.] Mattingly [II] for about another year, working on a number of different things that we were looking at for ascent and entry. I don't remember any of the specifics off the top of my head. I'd have to go back and look at some of my old notebooks, but we were busy.

I can remember that Ken was a workaholic. He put in more hours than any other man I've ever seen, in any place I've ever been and worked. I mean, he would be there when I came

in in the morning at six-thirty or seven, and he'd be there sometimes at seven-thirty or eight at night, every day. So you couldn't outwork Ken. And it was kind of funny, because every time you'd go in with the answer to one question, why, he'd ask you two more that you didn't have the answers for, so you'd have to go back off. So the group grew exponentially. And I wasn't the only one; he had about six or seven astronauts that were working for him at the time. So we used to try and find an opportunity when he wasn't around, we could sneak in and lay the answer on his desk so that you wouldn't get two more questions while you were in there, and as I mentioned earlier, he was always there, so that was tough. [Laughs] He was a tough guy to work for. A nice man, but, boy, he was a workaholic.

Then after that, I think the next technical assignment I had was to go the Cape. We called them the Cape Crusaders for short, and that was to go down and do the actual test and checkout of the actual hardware at the Cape. Sometimes it was payload testing, sometimes it was the actual Shuttle testing. You would typically jump in a T-38 on Sunday night or Monday morning and fly down to the Cape and spend the week down there, and then fly back on Friday night or Saturday and do a load of laundry when you got back, and then turn around on the following Sunday or Monday and do it again. So you were basically commuting from Houston to Florida to work and coming home most weekends.

It was fun to actually set foot on the Cape and touch the hardware and get in the actual cockpit of the Space Shuttles, whichever one was slated to go next. They would typically roll out to the pad. You'd do a lot of the test and checkout in the Orbiter processing facility, where they're being refurbished between flights, where they sit horizontally. Then when they get raised to the vertical, then moved out to the pad, then typically you'll go out there about thirty days prior to launch. Then you actually get in the actual vehicle on the test, typically for payload

checkout testing. So that was kind of fun. I did that for about, I guess, approximately six months or seven months, maybe.

Then I got a phone call from George again, Abbey, and called into his office and then I was told that I had been selected for a crew and now I was going to go into training full time, again. So those were my major technical assignments leading up to my first flight.

ROSS-NAZZAL: Why don't you talk a little bit about the training that you participated in for this flight.

CREIGHTON: It turned out to be longer. Typically, most crews get named to a crew about a year prior to launch. Some of the Spacelab flights, the payload mission specialists got named maybe as much as two years in advance, but the pilots typically about a year. Well, it turned out that for a couple of different reasons, this stretched out to almost two years for us on this particular flight. But we were supposed to carry an IUS, inertial upper stage, and that was a booster. I can't even remember what the satellite was now that we were going to carry, and we were going to rendezvous and pick up—we had a long-duration exposure satellite that had been put up on a previous flight and we were going to go up and pick it up, so we'd done a lot of training for rendezvous.

On all three of my flights, the first thing that happens to you when you get selected for a flight, you go in and they give you a briefing on the specifics of the flight, what's the inclination, how high, how long. By this time you know who the other crew's going to be. Anything unique about the payload, just an overview, that's probably the better part of a week of briefings on what's going on.

Then you start getting into the simulator probably one, maybe one and a half times a week, initially, and for the ascent and the reentry simulations, you typically work as a three- or four-man team. You work with a pilot, a commander, and then a mission specialist, MS-2, that we call them, designated them, sort of works as a flight engineer, and some crews work with a fourth person, some don't. We did part time. We used a fourth person on that first flight, mostly for ascent, not much for entry. You spend, as I said, one and a half days a week maybe for the first three months and then it gradually picks up. As you get closer, you get higher priority on the simulators, and you spend more and more days in the simulator.

We went to the various principal investigators for any experiments that we were going to do. Went to the factory where they were making the IUS up here at Boeing, and also to the payload that we were going to carry.

Then we met our payload specialist, a man named Greg [Gregory B.] Jarvis, who trained with us for about four or five months. We got to within about three weeks of our flight, but the flight right in front of us was having problems with their payload and it was slipping and slipping, so at the last second, they swapped payloads. That crew took our payload, we got slid about four or five months and picked up a totally different suite of payloads, and Greg Jarvis got bumped off of our flight and, unfortunately, got put on the *Challenger* and died in the *Challenger*, which flew about six months after we ultimately ended up flying.

But when we picked up this new flight, new suite of payloads, there were three communication satellites that we were going to launch, and they were one from AT&T [American Telephone and Telegraph Company], one called Morelos, which was for the government of Mexico, and then Arabsat, which was a satellite for a consortium of Arab countries. The State Department made the offer for the Arab countries, if they wanted to, we

would fly the first Arab to go into space and it turned out to be Prince Sultan [Salman Abdulaziz Al-Saud] from the Saudi royal family. They put up most of the money, so I guess they got to pick who got to fly. So, Sultan joined us, oh, probably three or four months before we were ready to go, shortly after we got named.

Then we also had a French payload specialist, a fellow named Patrick Baudry, on that flight, too, so we got to know him. He had been in training, I think—I don't remember now whether he had previously been assigned to another flight or whether he had just come in about the time that we got named, because we trained with him a little bit longer than Sultan. He was a former French test pilot, so he was highly qualified.

We went back into the simulator training, and then the other thing that we carried was a small autonomous satellite called Spartan, which we deployed. It was an x-ray telescope. It dropped off, backed away from for a couple of hundred miles for a couple of days and then went back and picked it up again, so we did get a chance to use our rendezvous training that we had done, although we didn't pick up the LDEF, the long-duration exposure facility. That was left to another crew later on.

Then finally launch week came, and you go into quarantine and end up going into crew quarters there at the Johnson Space Center for about three days. The dietitians do their best to fatten you up before you go, great meals, probably about 4,000 calories a day. You don't have a whole lot to do that last week. Go into quarantine for a couple of different reasons. One is to sort of get away from some of the outside distractions. You're not home working on the broken washing machine or the car that didn't work; you're concentrating on the flight at hand. Also it minimizes the people you come into contact with. In case somebody has the measles or something, you don't get exposed to it.

First day you go into quarantine, you do an orbit sim [simulation], which is typically about eight or ten or twelve hours. Practice the deployment for one of the communication satellites is what we did. Then the next day you do an entry, your last reentry sim, with a bunch of malfunctions. Then the last morning that you spend at JSC, you do an ascent sim, with all of the various abort scenarios. Then the final sim is generally not nearly as bad as some of the other disaster drills that you've been going through for the previous year. And then you go have lunch, jump in a T-38, and fly to the Cape.

Then you get into crew quarters there, and there really isn't much to do there. You get there typically about three days before flight, and lots of videotapes there so you can sit there and watch movies, if you want, in the crew quarters. There's a couple of briefings, one on the payload and one on the vehicle, in case there's any last-second glitches that you might have to work around once you get into orbit. You learn about those, and then there's not a whole lot for the crew to do other than just sort of relax and eat another 4,000 calories a day and fatten you up. You have an opportunity to meet a few people to come in and see you. I don't remember—I think they changed the policy between my first and second flight, because I don't remember—you can see spouses, but I don't think they let you, on my first flight, see anybody else. That changed later on, and we can get to that later.

Then probably you've been told about this, but it's tradition that you go out to the beach house the night before launch. We were launching at, I think, around seven in the morning, as I recall, so we were going to get into the vehicle. You have to get up around two-thirty in the morning and then get dressed and suited and go out to the vehicle about three hours ahead of time.

Anyway, back to the night before. We ended up going to the beach house and having a barbecue dinner. There's some NASA management there, and then they leave, and you have an opportunity to be with your spouses and go for a walk. My wife and I, although she wasn't my wife at the time, we were engaged, walked up toward the launch pad. This cabin is located—I'm guessing—maybe a mile away from the launch pad. Most of the time, when the vehicle sits on the launch pad, for those thirty days or so it's covered by—wrapped around by the payload change-out room, sort of in a cocoon to protect it from the weather, and it allows you to load the payload while you're there.

Well, that night before launch, when they rolled that back, and they were in the process of refueling the vehicle, plus it's illuminated by these bright searchlights and it's brilliant, and you walk up the beach for maybe a half mile toward the vehicle, you can get a pretty good view of it, and then it's time to turn around and walk back to the beach house.

After all the crews and their spouses got back there, we ended up opening up a bottle of wine and having a toast to the upcoming success of the flight, and all signed the wine bottle and stuck it on the mantle there. There was a number of dusty old wine bottles there in the beach house that previous crews had signed before they launched off. Sort of a mini museum of wine bottles there.

We went back to the crew quarters, and the spouses head on back to Cocoa Beach [Florida] to entertain friends and family that have come down for the launch, and the crew goes back there and goes to bed. I know I'd asked a couple of crews that had gone before me, "How'd you sleep the night before launch?"

They all said, "Fine," and I didn't believe them, and people asked me how I slept the night before launch, and I say, "Fine, and nobody believes me, but it's really true. By the time

you finally get there, I mean, it's almost relief. You've done this practicing so many times that now you finally get a chance to, you know, go do it for real.

So you end up going to bed, and NASA has everything scripted right down to the minute and they wake you up about four hours and forty-five minutes before launch, and you end up going into the breakfast room—well, you take a quick shower and get dressed and go in, still half asleep, into breakfast, and a bunch of photographers run in and take your picture and they bring out a big fancy cake with your patch on it. Nobody feels like eating cake at four o'clock in the morning, and it's kept and eventually you get a chance to eat it when you celebrate after you get back.

Then after a quick breakfast, why, the mission specialists go down the hall to begin to suit up, and the pilot and commander go into the briefing room, which is right across the hall from the eating quarters, and you get a final briefing on the weather sites around the world, in case you have to do an abort, so you have some feeling for what the weather's going to be like.

Then it's time to go down there and get suited up and you climb into your pressure suit. Well, actually, on my first flight, we weren't in pressure suits. We were just in helmets and then normal Nomex flight suits. That came after the *Challenger*.

They allow a little bit of extra time in case you have a communications problem with your helmets, and then you're sitting in these comfortable couches and there's a table there with a deck of cards if anybody wants to play a quick hand or two of poker.

Then it's time to go down the elevator from the crew quarters and out into this van that's waiting for you, and there's a bunch of KSC [Kennedy Space Center, Florida] people there waving at you and cheering you on, and a television camera there to record the event. You climb into the vehicle, and it's just the crew on board, plus the head of the Astronaut Office, who in

this case was John Young, and drive down. It's about a seven-mile drive to the launch pad from the crew quarters, but about halfway down there, you'll pass adjacent the Launch Control Center, which is a hold-short point, and then the head of the Astronaut Office, John, wished us all well, got off, and he went on into the Launch Control Center to be our representative during the final stages of countdown, and then we proceeded on down to the launch pad.

There's nobody allowed past the hold-short point except for the crew and the driver of the van. Then there is the closeout crew. There's about four people that are there on the launch pad, waiting for us to come. You drive up there and get out of the van and climb into this gated open-meshed elevator that takes you up to the 192nd-foot level, which is the level of the access arm out to the vehicle.

Again, it was still dark when we got out there. Everybody's been out to the launch pad a number of times. There's people climbing all over the place, and it's a lot of banging and clanging—typical industrial site. Well, on launch morning, it's totally different. Now there's nobody else there. There's no noise except for the external tank is venting and you can hear the LOX of the liquid oxygen that's boiled off in the form of gaseous hydrogen, you can see that coming out from the tip of the external tank, underneath the beanie cap, and it's sort of creaking and groaning a little bit, and it's like this inanimate object is come alive. Plus, it's a brilliant white. All these searchlights, each one of them is about 800 million candlepower illuminating this white Shuttle, and it's almost hard on your eyes when you look at it.

Then you don't have much time, though, to sit there and enjoy the view. Typically, the crew gets out of the elevator and all lines up at the rail to look at the Shuttle there, looking out to the east. Then it's time—the commander's the first one to crawl in—walk across the access arm and crawl into the Shuttle, climb up, and get suited in. The pilot's the second one, and I was the

pilot on my first flight. Then the rest of the crew gets strapped in. It takes the better part of an hour to strap the crews in. You've got to sort of hoist yourself up, and you're lying on your back with your legs are elevated above you into the well area where the rudders are for the Shuttle.

Then you climb in there and they close everybody out, and then off to the left, out the commander's window, you can see the closeout crew, because that's right where the elevator is. They close the hatch and they wave to you, and they get in the elevator and disappear down and go back to the hold-short point, and then the crew's left alone out there.

There's really not a lot for the crew to do. You do a couple of communications checks and maybe throw one or two switches, but that's about it. Most all of it is controlled via computer from the Launch Control Center, so you try and alleviate the boredom and the uncomfortableness of laying on your back on this couch, or seat, and try and tell jokes and entertain one another, and the time goes kind of slow, but before you know it, why, you're getting down to the last throes of the countdown.

When you get down to five minutes before launch, they give you the go. If everything's okay, they'll give you the go to start the APUs [Auxiliary Power Unit]. We've only got about five minutes of extra fuel on board, so they don't give you the go to start the APUs unless they're pretty sure. I mean, the weather's good, there's no technical problems they've been working, so when you get the go to do the APUs, you're pretty sure you're going to go.

Then it gets very quiet on the flight deck. It's the pilot's job to start the APUs. A typical airplane here, that I'm testing here at Boeing, you've got one switch to start the APUs. Well, on the Shuttle you've got eighteen switches. You have three APUs instead of one, but you've got six switches to pressurize the fuel tanks and power up the controllers and whatnot, and each of these switches has got an abbreviation of the word *control* or *controller* in it, and it's hard to see.

Later on, on the subsequent flights, with a pressure suit, but it's hard enough on your own helmet, even without the pressure suit, to get a good look at those switches, and you sure don't want to throw the same one. So what you've been doing cavalierly in the simulators for at least a year, and in my case, almost two years, you just "boom, boom, boom," go through those. On launch morning, you look at every switch and you look at your checklist, you look at the switch, make sure that you're not doing those—because they're not straight in order. If you were just starting in the back and worked your way forward, that would be easy, but you jump around a little bit. So you want to make sure you don't mess that up.

So then you get that done and then before you know it, why, you hear "Close the visors on the helmet," and you activate your visors and now you're on hot mike [microphone]. Then you hear somebody saying, "Ten, nine, eight," and that's about all you hear, because the engines start to sequence to come alive at about six and a half seconds, and the whole vehicle starts rumbling and shaking and you can't believe that these big bolts are still holding you to the ground. It feels like it's trying to rip itself off the ground.

Then before you know it, the continuation of the count goes—although you can't hear it—down to zero and they blow the bolts, ignite the SRBs [Solid Rocket Boosters], and it's a giant kick in the rear as this vehicle leaps off the ground. I mean, it's not like previous vehicles that had to actually burn down fuel, Gemini, Apollo, and Mercury, where it had to get light enough so it could lift off. At the point of ignition of the solid rockets, you're going. You're on your way.

I can remember we cleared the tower very rapidly. You could see a little bit of the gantry from your seats as you're sitting there before launch, but that quickly disappears out of sight, and the vehicle whips around, does a roll. In our particular case, in this first flight, it was a twenty-

eight-and-a-half-degree inclination launch, which means that you just do a ninety-degree roll off the launch pad and head due east from the launch site.

The whole world swings around, and then I looked out my window to the side and I could see all the way up the Florida coastline, past Jacksonville, a quick glance back, because the pilot's primary duties are to make sure that the engines are working properly, so I'm scanning the engine instruments to make sure they all look good.

Then another thing that we were worried about was any ice being shed off the external tank to come down and bang into the tile. So we looked up to see if we could see any ice coming down, and looked back at the engines, looked back up and it was dark. I couldn't believe how fast it got dark. You need to get up to about 100,000 feet or so before there's not enough air there to reflect the light, so that it looks light, but above about 100,000 feet, it's starting to get dark outside. You can still look at the bright sun out there, but there's no surrounding air to diffuse the light. That was kind of a surprise to me.

A lot of vibration. We'd had a number of discussions when other crews had come back after their flight and debrief, and everybody would talk about the solid rocket boosters and the vibration and whatnot going on, but until you experience it for the first time, you don't really appreciate the tremendous brute force pinning you in the seat, with all the vibration on top of it. That lasts for about two minutes and eleven seconds, and then the solid rocket boosters shut down and you're sort of thrown forward in the straps. I mean, you're not in zero gravity; you just drop off from 3-Gs of acceleration to about a G and a half.

Then, shortly after that, why, they blow the bolts that are holding the solid rocket boosters and then they ignite some rockets that are about a thousand-pound thrust each, four of them in the nose and four of them in the tail of each SRB, and it totally engulfs the windscreen in

flame. It sounds like World War III is going on right outside the windows out there as these things are firing to push the solids away from the Shuttle.

I was sort of prepared for the solid rocket booster, but I wasn't prepared for—although people had talked about it, nobody had adequately described the noise of those separation rockets going off outside the window, plus totally engulfing the windscreen in flame. It probably lasted a half a second, but it seemed like an eternity at the time. Then it pushed off, and all of that vibration is gone. Now it's just a sustained quiet push as these main engines continue to build the acceleration back up.

I mentioned that you're limited, by the design of the Shuttle, is limited to about 3-Gs of longitudinal acceleration. Well, that's during the solid rocket boosters and then it drops off to about a G and a half, and then gradually builds back up over the next several minutes, until eventually you get back up to about 3-Gs in about seven minutes.

Then we begin to throttle the engines back as we burned all of our fuel, so that at the point of shutdown, which, in round numbers, occurs in about eight minutes and thirty seconds, about eight and a half minutes. Then you're still at 3-Gs, but the engines are almost back to idle by the time they actually shut down and you're thrown forward in the straps, and now you are weightless.

On all three of my flights, there was a spontaneous cheer from the crew, because—I think you don't often get agreement amongst the astronauts. In fact, there's a common expression, you get five astronauts in a room and you'll get six opinions. But one thing that most people, at least up until *Columbia*, would agree on was that probably the most hazardous part of a spaceflight was the ascent, and you just survived the most hazardous part of it, which is the first eight and a half minutes. So I think we all felt a collective sigh of relief.

You don't have much time, because the external tank separation comes shortly after that, then you have to prepare for an orbital maneuvering system burn that kicks you into a higher orbit, and then about thirty minutes later, you have another burn that circularizes your orbit. So that whole ascent sequence takes a little over an hour, although the most violent part of it is the first just eight and a half minutes.

Then right after ET [External Tank] sep [separation], why, some of the payload specialists start getting out of their seat and start doing some of the early reconfiguring or getting out of their suits and that sort of thing. Meanwhile, the pilot and commander are still strapped in until you get the circularized burn down, typically about forty or forty-five minutes into the flight.

Then you get out of your seat. I can remember on my first flight I had some switches on the back deck area that I had to get out of my seat and reconfigure, so I unstrapped and came floating out of my seat and pushed off the overhead—there was a little area off the ceiling that sort of hung down—and pushed off myself to propel myself to the back of the vehicle to get to the switches, and I quickly realized that was the wrong thing to do, because I went rocketing across the cabin. I didn't smack into the opposite wall, but had to put my hands out to prevent hitting it a little faster than I'd intended. You learn to do things slowly and just hand over hand, pull yourself across the ceiling. But I felt, within probably fifteen or twenty minutes, that I had adapted to the way to maneuver around in zero gravity.

That first day is a long one, because you've been up early, waiting for the launch. And you get up there and then you have to do the reconfiguration and get set up for on orbit and get changed. Because of that, and there's not really much time to have lunch, by this time it's been maybe six or seven hours since you've had anything to eat, why, we carry basically a sack lunch

with us. It's in a netted bag so it doesn't go floating off, but whenever you get hungry, you can reach down and grab a ham and cheese sandwich or whatever you ordered, and something to drink, and that we take out with us when we go onto the flight. So I grabbed a bite to eat that first day.

Statistically, about 70 percent of the astronauts, you have problems adjusting to weightlessness. I was one of the fortunate ones that didn't. So a couple of times—I don't know that I did it on my first flight, but I think on subsequent flights, if somebody looked a little green, you might ask him, "Are you going to eat your sandwich for lunch?" [Laughs] So most people lose weight. I think I gained a pound on each of my three spaceflights, because I ate pretty well up there.

Anyway, you get through the first day, and then on my first flight, on day two, we had to do—actually, on the next three days, why, we had to do a satellite deployment, so each of those three days was sort of a repeat of one another, because they were all similar-type satellites, spin-stabilized.

Then the next day we deployed our Spartan spacecraft and backed way from it, and I got a chance to fly the Shuttle as a part of backing away from the vehicle. Normally, the commander does most of the flying. The pilot's only along in case the commander drops dead or something, but Dan [Daniel C. Brandenstein] let me do that, and the separation went out, and then I backed him up on the rendezvous a couple of days later, when we went back to pick it up, grab it with the arm and put it back in the payload bay. The last time I saw that Spartan was in the Smithsonian Institution, [National] Air & Space Museum [Washington, D.C.].

What I think most of the astronauts enjoy the most, what little spare time you have while you're on orbit, is just finding a window, with a camera, and watching the world go by, taking

pictures. We always had some kind of a camera in our hands. Sometimes you'd have a spot, or most of the time you actually fly the Shuttle upside down and oftentimes sideways. I mean, there's no air up there, so you don't have to keep the pointy end forward. It's a more benign environment if you're upside down with the payload bays open. It isn't exposed to the extremes, quite as extreme, as if it was pointed into deep space, where it can get brutally cold at night, and with the sun beating into the payload bay area, it can get very hot in the summer. Where it's pointed toward the Earth, it doesn't get quite as cold at night, because you do have some of the radiation reflected back from the Earth and then you don't have the sun directly shining into the payload bay. So unless there's a unique mission requirements to the contrary, that's normally the way the Shuttle flies.

So you perch in the windows. And I know that I slept in my seat. The commander slept in his and I slept in mine; not actually in, but hovering in the vicinity. You've got the back of the seat to keep you from drifting back, and the overhead from going up, and your legs are down in the well area where the rudder pedals are located, and with the center console on one side and a side console on the other, it sort of keeps you confined in that area. And it gets kind of cool in there, so I'd wear a jacket at night, because we power-down most of the avionics, so it gets cooler at night. Then I just put on a mask to block out all of the bright sunlight there, and then I just sort of hovered.

I can remember halfway feeling my hair brushing up against some of the switch guards and things in the overhead, where there are a bunch of circuit breakers and switches up there. Then if I'd wake up, I'd just peel my mask off, and here's the window right in front of me and you'd watch the world go by. Typically, when you're in a sleep period, a different part of the

world's in daylight as opposed to when you're awake, so you'll see a different part of the world than you do when you're awake. So I took advantage of that.

I was always tired at night. I'd fall right to sleep. Each of us was supplied with a Sony Walkman tape, and you could bring about five or six tapes with you, of your own choice of music, and I would put one of those tapes on. I don't think I ever heard more than about the second song before I was sound asleep. But I think on my first flight maybe I averaged two and a half hours of sleep and then I'd wake up, take my mask off, and watch the world go by for a rev [revolution] or two, and then I'd put my mask on and sleep for another thirty minutes to an hour, and then I was essentially, not up, but I was awake, and I'd take my mask off and just watch the world go by, because I wasn't sure I was ever going to get another opportunity to go, so I wasn't going to waste any of it sleeping.

So I ended up watching and sleeping. It's not physical exertion so much as just mental, because there's always something doing, so you're tired at the end of the day, but refreshed the next morning and you're ready to go and you have to sort of sequence through the facilities down there to brush your teeth and go to the bathroom and that sort of thing. We did have a woman on my first flight, Shannon [W.] Lucid, who I had shared an office with. Actually, I think I shared an office with her for the first ten years I was in the space program.

So there's a little bit of privacy, a privacy curtain that you can close. When it's an all-male crew, typically you don't worry about that, but if there's a female on board, there's some privacy involved, and you cycle through and get cleaned up in the morning and grab a quick bite to eat. Generally, everybody's on their own for breakfast and then up and about doing the work of the day.

Lunch and dinner, we tended to rotate around as to who was to do it, but somebody would go down and rehydrate. Most of the food that we ate was rehydratable. Some of the stuff was stabilized in foil packages, but most of it you had to add water to and then you would stick it in the convection oven and let it heat up, and then about an hour later, why, the crew would come down and grab a tray that you'd strap to your leg, and it had cutouts in it that you could stick these pouches in. Then go off and some people would be on the ceiling and some people on the walls and the floor and the heads would all meet in the middle and you'd take a few minutes out of the day to grab a bite to eat.

Sometimes lunch, you'd still be on your own, because there'd be a lot of stuff going on, but other times, particularly at dinner, most of the work was done by then, so everybody would spend about an hour eating together, and that was a good time. You'd play games and float peanuts and M&Ms across to one another and play catch and the space version of Pac Man. That was fun.

ROSS-NAZZAL: Why don't you tell me about the high-precision tracking experiment. I understand that there were some problems performing that on board.

CREIGHTON: One of the things that we were supposed to do, we had a reflector in the side window and we were supposed to pass over, and we had it programmed into the computer, pass over or do a knife-edge pass, for those aviators, the wing down, because of the side window on there, we would pass over this tracking station in Hawaii and they were going to try and track this particular object that we'd mounted in the window.

The first time we tried it, why, it didn't seem to work. We figured it out, actually, about the same time that the ground did, but it turned out that when you put the units into the computer, we used the wrong units. We had put in miles and we should have put in feet, or vice versa, so it turned out that what the Shuttle was actually tracking was about—I think that's what it was, because the point that we were trying to point this window at was the tip of a mountain on Hawaii and that was, I forget, like 11,000 feet, but the units on there were 11,000 miles, so the point that we'd actually put in was way up above us instead of below us on the top of the mountain. So as we passed over, we were actually tracking a point that was above us instead of below us. So we figured it out, updated the computer coordinates, and then we weren't passing over Hawaii, so we had to wait about twenty-four hours and do it the next day. So that was an error on everybody's part that we never caught that ahead of time that it was the wrong units.

It happened again a number of years later, apparently, when the Martian—they used the wrong units. They used kilometers versus miles or miles versus kilometers, and they lost a couple of satellites that they sent to Mars here about, what, four years ago or so, as a result of the wrong units. So it happens every now and then. Fortunately, in our case, it was only an embarrassment. We didn't lose any significant hardware.

ROSS-NAZZAL: Can you tell me about the crew relationship? You mentioned that you were telling jokes during the launch and that you ate lunch and dinner together and sort of entertained each other. What was the crew relationship like?

CREIGHTON: I was fortunate—well, I don't know if I was fortunate. I would like to think that NASA picked people that could get along. I've heard stories that there are some egos that have

had problems in the past. But I was fortunate on all three of my crews. We all got along really well together. As I said, my hat's off to NASA in the selection process that they do.

Socially, I knew the commander of my flight, Dan Brandenstein, previously in the Navy and Pax River, so I knew him. And Steve [Steven R.] Nagle was an Air Force pilot and we got along, so we did a lot of things socially ahead of time.

Shannon Lucid and I shared an office together. She was a biochemist, Ph.D., from Oklahoma, and she had three kids. I remember one time prior to the first flight, why, my brother came down to visit me in Houston and brought his kids with him, so the four adults were going to go out to dinner, so Shannon agreed to babysit his youngest. She was probably about two at the time and doesn't remember it, but she's been grown up, she's impressed she had an astronaut babysitting her. [Laughs] Shannon took care of my niece for me.

So let's see. Who am I forgetting here? John [M.] Fabian was on the crew, and John, again, an Air Force guy, a nice guy. He and Dan had flown previously, so it was their second flight. It was Steve, mine, and Shannon's first flight. Then I mentioned previously we had a French payload specialist and a Saudi prince on board.

Nobody knew quite what to expect of the Saudi prince when he arrived, so they were worried for a while about somebody making a statement for Allah or something, and doing something dumb up there, so they gave him a psychological profile. They did the same thing to all of us, too. It's a part of the astronaut selection process. The psychiatrist came back and said, "He's saner than most of the rest of the astronauts." [Laughs] He had been educated in the United States. He was a communications major. I think he started out at UCLA [University of California, Los Angeles, Los Angeles, California] or USC [University of Southern California, Los Angeles, California], I don't remember which. Then he ended up transferring to the

University of Colorado [Boulder, Colorado] or the University of Denver [Denver, Colorado], and graduated in the United States, and was relatively young. He was the youngest member of the crew. I got along well with him. Had him over to my house for dinner one night just shortly after he got there.

His backup was an Air Force major, the first time he'd ever met anybody from the royal family and so he was impressed with the entourage that was surrounding Prince Sultan when he came there. It was obvious to all of us that Prince Sultan had grown up in different financial circles than the rest of the crew. [Laughs] But he was a nice guy, and I think we all got along pretty well. We didn't have any problems at all that I was aware of as a part of that crew, or for any of the other crews, for that matter.

ROSS-NAZZAL: Can you tell me about some of the PR [Public Relations] tours that you took? I understand that you went to Saudi Arabia and to France afterwards.

CREIGHTON: Those were fun. As I mentioned earlier, I was engaged at the time of my first flight. Well, I got married the day after I landed from my first spaceflight, so that was a busy week. Originally, I'd planned to get married at the Cape, because we were going to come back and land at the Cape, but then shortly before the flight, about three weeks before the flight—the reason we did that is because most all of my family and my wife's family were all coming to the Cape to watch the launch. Then they decided to land in California, and the only people who were going to be in California—they flew Terry [Creighton] out for the landing, but the families weren't going to be out there for the landing, so we just made a quick snap decision we'd get

married in Houston after I got back and any of the families that could cycle through Houston on their way back from the Cape. Most of the family made it, so we got married there.

The only reason I bring that up is because the first trip that we took was to France and the spouses weren't invited, which is a sore subject around my house to this day, because it was a wonderful trip. [Laughs] I mean, nobody wines and dines like the French. The food and wines were superb. We started out in Paris and spent about three days there. Went to the Eiffel Tower, and a couple of friends of mine, who happen to be here visiting as we speak, were in France not too long ago and they were up in the Eiffel Tower and, lo and behold, here's a picture of me in the Eiffel Tower and they were amazed.

But we toured there. We went to a number of places and would go visit schools and various things there. Then we went from there to Toulouse, which is their aerospace headquarters. It also happens to be the home of Airbus, but back at the time, Aerospatiale and their space efforts, their engineering center was there at Toulouse, and we ended up going down to the Bordeaux region. We ended up getting inducted into the Bordeaux Wine Society one evening there. It was very impressive. It was in the Lynch-Bages Estates, right next to the Rothschild Estates, and all of the owners of the various vineyards around there.

Patrick, when he'd gone up, carried four very small vials of wine up there, and they were sealed and we couldn't get our hands on them, but anyway, he took one of them back and presented them to the Bordeaux Wine Society. I think he kept one, and he gave the other two away to somebody else. You're allowed to do that. As long as it didn't weigh much, you could do that. As far as I know, that's the only time that alcohol has ever been carried on a U.S. spaceflight. I have heard rumors that it's not true on the Russian spaceflights, but at least on the

U.S. ones, that's the only time that I am personally aware of that we carried alcohol. But we didn't have access to it; it was down below the floorboards someplace.

Anyway, then we ended up at—I think at Nice was where we finally finished the tour, but we were wined and dined in royal style there that whole week. But the spouses weren't invited, so, sore subject around the house. That was a great trip.

We flew in June, 17th to the 25th of June, and that was in the July time frame, as I recall. Then we ended up going in December to Saudi Arabia for about ten days. There we dined—it was good food; no wine, but there was lots of food and teas and all kinds of beverages, fruit juices and that sort of thing. We ended up flying—I think we went into Jeddah and then flew from there to Riyadh. Spent most of our time in and around Riyadh, initially, and flew out, via helicopter, to Sultan's family farm there and had dinner in tents, like the old Saudi family, and got a chance to ride camels and a variety of things. The spouses did get to go there, but all of the socializing was done separately. Men would be one place, women would be another. I think they made one exception where Shannon came to something, but she was only there for one or two days and then she had something else that she had to go back to Houston for.

Then we went from there back to Jeddah, I think, for a day or day and a half. Then we went from there down to Abha, which is the summer palace for the royal family. Sultan had been talking about the mountains in Saudi Arabia, and I couldn't imagine any mountains in Saudi Arabia. I figured maybe there were some tall sand dunes, but that was probably all there was. Well, it turns out that he was right, that down in the southwestern corner of Saudi Arabia, there are some mountains that are the better part of 10,000 feet high, and that's where the summer palace is, to get away from the heat. The royal family goes up there. We stayed in the

guesthouse, where they bring in heads of state and that sort of thing. So each of us had about a seven- or eight-room suite to stay in. It was nice quarters.

Then we finished off. We went in a 737 at 2,000 feet across the desert and we saw a couple of camel caravans when we first started out from Abha, fairly close out, and then we got into the Deserted Quarter, and there's nothing but sand for a thousand miles. Pretty desolate. Didn't see any camel caravans out there. Then landed in Dhahran and spent the last part of our last day or two there, and there's a big petrochemical industries that we toured. During the days, we'd visit schools and various get-togethers. It was long days when we were there. I was surprised. There wasn't as much wining and dining—no wining and not as much dining in Saudi Arabia as there was in France. So we visited a lot of people, met a lot of school kids, and presentations in the evening and that sort of thing, and then flew home.

From there I think I stopped in Switzerland for a couple of days of skiing on the way back home, but both of those were very enjoyable trips.

ROSS-NAZZAL: I understand after this flight, you actually became the astronaut representative to the Space Shuttle Manager.

CREIGHTON: Yes. Shortly after I got back, after the debriefs and the PR, typically what happens is it takes about two weeks to go through and debrief all of the people there. Then you write up a crew report and then they turn you over to PR for about a month, where you go off and do nothing but public relations, talks at various and sundry places. Most of it in the United States. Every once in a while you do something internationally, but in most cases it was in the United States.

Then you go back to supporting the other astronauts that are in training, and my particular job was to be the astronaut representative on the Program Manager's staff there, and it turned out that I was in that position when the *Challenger* happened, so I was in a unique situation to be involved in all of the discussions and things about what caused the accident, and then after we knew what caused the accident, what are we going to do to fix it, and not only that, but take advantage of the time when the Shuttle fleet is grounded. What else are we going to fix to improve the capabilities and improve safety and that sort of thing?

So it was a unique opportunity to be in the right place at the right time to be involved in some of those key decisions and make a number of presentations to the board, reflecting the astronauts' point of view as to what we ought to fix. It was interesting, and I was in that job for about, I guess, maybe a year and a half, two years maybe.

Unfortunately, that winter, not too long after the *Challenger*, probably about maybe three months after that, we went on a skiing trip to Vail, Colorado, about four or five astronauts, and I ended up breaking my leg there, so for a good portion of that time when I was in that position, for a while there, when I had a full-length cast on, I'd come to work in a wheelchair, and then I was on crutches. I got pretty good at getting around on crutches. I almost run up and down stairs there for a while, because I was in a cast for about eight months. So that was a sidelight that I had to put up with while I was representing the astronauts on this panel or program review board.

Then after that, my next technical assignment was to be a CapCom [Capsule Communicator], which is sort of a holdover from the old days in the space program, where I was the astronaut in mission control. They wanted a flown pilot in there to be the CapCom when we resumed flights, for the first ascent and entry session. So I trained for, I guess, about a year,

maybe a little less than that, leading up to the first resumption of flights after the *Challenger*, because we were grounded for almost three years. I was the CapCom for the ascent and the entry for, I think, the first three flights after the resumption of flying, until I got assigned to another crew.

ROSS-NAZZAL: Any interesting stories from any of those missions that you want to talk about?

CREIGHTON: Nothing I can think of off the top of my head, but it did give me an appreciation for *Apollo 13*, the movie. Having served in mission control and having flown in space, I think that that movie was a very realistic portrayal of the coordination that takes place between mission control and the astronauts in space. So although I wasn't a part of the program during the Apollo era, I had an opportunity to talk to a number of the engineers, one of them I became friends with, who were and, based on their stories and my own personal experiences, I think that *Apollo 13* was a very realistic portrayal of probably what happened during those crucial days when it was nip and tuck as to whether they were going to get home.

But I can't think of anything. I'm sure after the fact I'll think of some interesting things that go on. One of the things that you always try and do is come up with some unique music to wake crews up on flight, and you typically, if you know one of the crew members likes country western music, for example, on one day of the week you'll try and get a country western song that comes over the loudspeaker when you call and they play the music. Typically you'll pick music that goes on for about forty-five seconds to a minute, and that's what you wake up to while you're on orbit.

It's the CapCom's duty to come up with the appropriate music and try to get something appropriate for each member of the crew. Sometimes that was the hardest part of the job to, number one, find out what people liked, and then, number two, get a copy of it and have it all reduced to the appropriate length of time so that on the various days it was all set to go and queued up and punch the button and wake up the crew.

What else? Nothing leaps out at me, but if I think of something, why, we can—

ROSS-NAZZAL: We can always add it later, too.

I understand you were also head of the Mission Support Branch before your next flight.

CREIGHTON: Yes, that was a job. We had a variety of things where, as you got senior in the organization, you began to get into leadership positions and you would have some of the newer astronauts that were selected after you, work for you. In Mission Support we did a variety of things. It used to be called Ascent and Entry Procedures and then we had a bigger group called Mission Support that took care of the ascent and entry, took care of some of the orbit things as well, and all of the things that go together to make a flight come together.

It was administrative, similar to what I do today here at Boeing. You have some very talented people working for you, and they're bringing to you things to sign off and you end up saying, "Yeah, that's a good idea," or, "Have you thought about this," and that sort of thing. You just sort of try and point the people that you've got working for you in the right direction. I tried to be not like T. K. Mattingly, when somebody'd come in and ask you one question, I wouldn't ask them two or three others. It was enjoyable, but really the thing that everybody in

the office wanted to do was to get back into training, get back up and go. So in a way, all of those jobs were sort of placeholders until you got a chance to get back into training again.

ROSS-NAZZAL: Let's talk about that next mission. That was actually a DOD [Department of Defense] mission. Can you give me a sense of how different this mission was from your first mission?

CREIGHTON: The biggest single thing is it's classified. You can't really talk much about it. In fact, you get briefed ahead of time. They undoubtedly ran some background checks on us. I mean, everybody had a background check when you go to selected for the astronaut program, but to get selected for one of these DOD flights, there was additional background information, because you were going to be cleared top secret for a clearance. Most of the military guys had already had a top secret clearance when they were in the military, but it's only good for specific purposes. So I'm sure they did a background check on us before we were announced as the crew, unbeknownst to any of us, and I was fortunate enough to get selected as the commander on this flight. It was a shorter flight; it was only five and a half days instead of a little over seven, like my first one. It was a smaller crew also, only five people on board instead of seven, so the living conditions were a little better; wasn't quite so crowded.

I know it was frustrating for my wife that I couldn't ever tell her, and still haven't told her, the real details of the flight. Some of the stuff, you can't hide it, so after the flight it would become declassified. For example, for a long time they wouldn't even tell you what day the launch was or even what month it was going to be. All anybody knew is we were in training and it was going to be a DOD flight, and that's basically all people knew.

The training crew, there were probably less than twenty-five people in all of NASA that knew what we did, to this day, know what we did; the Administrator of NASA, the Flight Directors. Most of the people in mission control didn't know specifically what we did. Obviously the crew did and a couple of people on the training team knew. But for ascent and entry—for example, at the time the particular parameters of the ascent, it was a very high-inclination flight. Inclination is just how far north or south you go. If you want to carry max [maximum] payload, you go due east out of the Cape with twenty-eight-and-a-half-degree inclination, which is the latitude of the launch site, and you don't get any farther north or any farther south than 28 and a half degrees. So from looking out the window and enjoying the world point of view, that's not a particular desirable inclination to fly, because you see a lot of ocean and a little bit of South America and Africa and not a heck of a lot else. Although when it's your first flight, you're just thrilled to be there, so you don't care about that. Fortunately, I got them in the right order. My low-inclination flight was then.

Then higher inclination, as I mentioned, is when you lift off and you roll 90 degrees, that's 28 and a half degrees. If you roll farther than 90 degrees now on launch, you'll go right up the East Coast of the United States. Normally, the highest inclination that you'll ever get is 57 degrees, which keeps you just off the East Coast of the United States, so in case anything bad happened, where you blew up or something, you're not going to rain debris down on a major city in the United States.

Well, this particular flight was the one exception, the only time in U.S. manned spaceflight where we've ever gone beyond 57 degrees. We were at 62-degree inclination flight. It's kind of hard to hide that fact after you launch, when you're up there and the Russians are tracking you, so that was declassified after we launched. But ahead of time, nobody knew that.

Then the altitude. My first flight, we were up about 200 miles. We started out at about 190 and ended up about 210, because each time we deployed a satellite, we got progressively higher in the air. This particular flight we were about 115 miles, so, much lower, about half the altitude. Then on my third flight, we set an altitude record. We were up about 330. So I covered the gamut. My third flight was also a 57-degree inclination orbit.

But anyway, back to the second flight. One of the hardest parts on that flight was the transition to the daylight schedule. When you go into quarantine, you shift your hours to when you're going to get up on launch morning. Ours was exactly a twelve-hour shift. It was the most you could do, so that instead of getting up at six in the morning and going to bed at eight or nine at night, we were getting up at six at night and going to bed at ten or eleven the following morning, so we were up when everybody else was asleep.

That was really hard on the body, trying to adjust to that shift, to the point where I ended up coming down sick after we were at the Cape for that flight. I thought I just had a cold or something like that, but it was probably a combination of exhaustion and having come into contact with somebody that had something. Anyway, I came down with the flu or something the equivalent to it, and I didn't realize it and we did the same thing that I was as sick as I was and I wasn't going to admit it to anybody.

I mentioned the beach house son that first flight. My wife was there with me and she used to be—we met, believe it or not, in a simulator. She was the instructor, and I was the astronaut under training for ascent procedures leading up to my first flight. Well, shortly after we got married, why, she quit and went back to medical school, so she's a doctor now. So, anyway, she said, "You don't look good," so I ended up calling the flight surgeon that was responsible for the flight.

He came out and looked at me and said, "This isn't good," so they ended up delaying the flight by a day and put me into quarantine within quarantine in the crew quarters in an area that was there. There's a big white room, stark white, with a bed off in one corner. I mean, you could have had—probably the room was three times the size of this room here, with a bed off in one corner and everything else in there. So to cheer me up, all my crewmates came in the next morning and they were all dressed with bags over their heads. They would slide things in under the door with a pole, just to give me a hard time. Anyway, I was pretty well over it by the next morning, so they ended up delaying the flight by about twenty-four hours.

Then it turned out that the weather was bad the following day, so they said rather than go out, man up, and just see if it possibly clears, they'd just waive it for another day. It was probably a good thing that they did, because I felt much better two days later than I did one day, although I probably could have gone the next day.

Then back up to the first flight, everything went perfect. We manned up the first time. Everything counted down and we went off right to the second, with no delays or anything else. After two days of waive off because of my health and then the weather, then we got out, manned up, and then we were right down to within I think a couple of minutes of the flight—well, actually, we didn't know about it on board that they were having problems until we got to the APU start, and we didn't get cleared for the start. Then we knew there was something wrong, and it turned out that the range computers had gone down, where they're tracking the Shuttle. Wasn't anything wrong with the Shuttle; it was the ground ranges. So we got waived off that day.

Then you go back, after you man up, and you sit out there and go through this and you wait to see if they could get the thing fixed, and the limitation for the crew is two and a half

hours after the opening of launch window, which means that you've been out there for three hours on your back, then two and a half hours after that. So you've been out there lying on your back for five and half hours before they'll close the window. You come back in, have lunch, maybe watch a two-hour movie and go to bed, and get up and do it all over again.

Next day we had bad weather, so we didn't get off on that day. Then there's a day off in between, because they can't go two consecutive days, so it took us the better part of a week to finally launch, before we finally got off. But the third time was the charm, and so we got off and did what we did, which I can't tell you about.

Then we came back and ended up landing again at Edwards Air Force Base, because of the—I can't remember whether it was weather or whether it was a planned landing at Edwards. It doesn't matter.

Anyway, we landed there, the same place as I'd done on my first flight, only this time I got to make the landing, being the commander. So there is a little added pressure on you, when you're the commander, thinking about that. It is a glider that you come down and you only get one chance at it, so you'd better not screw it up. So it was nice when the wheels rolled to a stop and it was over with. It felt like the weight of the world had been lifted off my shoulders. We were home safe and we'd done what we were supposed to do and it worked out well.

Again, you'd asked the question previously about how we got along. We got along as group and did a lot of entertaining and socializing together as a group leading up to the flight. We actually leapfrogged a couple of flights ahead of us because of the priority on this flight. I mentioned that we had an inclination of 62 degrees, which put us right over the Outer Banks of North Carolina and right over Boston [Massachusetts], New England. They were a high enough priority to go, and because of that and some other flights were having problems and sliding, why,

we ended up leapfrogging ahead of them. So we ended up going—a fairly short training program instead of like two years for the first one, this was a little less than a year, when we actually launched.

The same thing happened on my last flight. We ended up leapfrogging over a couple of flights and ended up going a fairly short training cycle.

ROSS-NAZZAL: Let me change the tape for a second.

[Tape change]

ROSS-NAZZAL: We are back, and I wanted to ask you, during this flight, you claim that you were the world's fastest skier?

CREIGHTON: Skier, yes.

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

CREIGHTON: Actually, I'd planned to do that on my first flight, then didn't get permission to carry the stuff on board. But I did on the second flight, so we ended up, I got—through a friend of mine—actually, it's the couple that is visiting us here in Seattle today—I got some telescoping, the old radio antennas for cars that used to telescope up or down. I got two of those I got permission to carry on board, and I got a cap from the U.S. Ski Team, and some skis that were actually made out of Nomex—they were flame-resistant—and rolled those up and had

some Velcro on the bottom of them. So what I ended up doing was, once we got on orbit and in the middle of the flight [unclear] days off, I unrolled these—they rolled up into about the diameter of a fifty-cent piece here, and the width of a ski is about four inches long—unrolled those and then slipped these telescoping antennas inside the skis and then I used two other telescoping antennas, and with the back cover of the checklist, cut out what would be the baskets for your ski poles and stuck them on there, and then put my ski hat on and my appropriate blue outfit with long pants and a jacket on that we wear, and then Velcro'd those skis to the bottom of my feet, with my ski poles there. I had a pair of dark glasses on and a ski hat, and went down in the middeck area, which is the living quarters, down below the flight deck. There's a little bit of room in there. Everybody goes down there, after you get adjusted to zero gravity, and does spins and flips and things to become the world's best gymnast for five minutes. Then you get that out of your system and then you just enjoy the convenience of getting around in zero gravity.

Well, this time I did my spins and flips with my ski poles and my skis on so I could say I was the world's fastest skier there for five minutes, going 17,500 miles an hour. But it's tough to do it without anything on you, but to try and do a complete 360 there, without having the ski tips drag on the ceiling or the floor or something, because when you try and do a spin, why, you tend to push off and you get some translation as well as some rotation, so it's hard to do a perfect spinning right out in the middle.

So I finally had to get one of the guys to come and grab hold of me and spin me around here so I could do that, and then back out of the way while I was taking pictures of this so I could show it to the—I gave a presentation to the U.S. Ski Team when I got back and gave them the hat that I'd carried for them in space. We went to where they were training at Park City, Utah, and gave them some of that stuff back. That was fun.

ROSS-NAZZAL: Yes, it sounds like fun.

CREIGHTON: It was.

ROSS-NAZZAL: After this flight you also served in the Operations Development Branch.

CREIGHTON: Yes. That's where we were looking at developing missions for the future, so I had people working for me that were responsible for—we'd assign an astronaut typically to a mission maybe as much as three or four years in advance. Sometimes they would be lucky enough to actually get to fly it at some point in time, but not always. It was similar to what I was doing in the previous one, although slightly different responsibilities, where you'd have maybe—I think in that particular one I had as many as fourteen astronauts working for me for a while, and that began to get in the early days of the Space Station. At that time it hadn't split off to its own group, so that was under me there for a short period of time, until they broke off into a separate organization within the Astronaut Office.

We looked at all of the things that were involved as far as bringing a mission together. Again, I just tried to stay out of the way and make sure that everything got done and people had direction on what needed to be done. That was one of the nice things about having a super talented group of people doing the job for you, you didn't have to worry about the job not getting done on time. So that made being a manager easy back in those days.

ROSS-NAZZAL: Why don't we talk just really briefly about your final flight, some of the highlights of that flight.

CREIGHTON: This particular flight was a science flight. We were assigned to launch the Upper Atmospheric Research Satellite, called UARS for short. We were assigned to this flight—typically, as I mentioned previous flights, you start off kind of slow and then you build as the year goes by. We were assigned to a flight actually a little bit late. Our original date was going to be—actually, by the time we got assigned to the crew, it was actually less than twelve months away. And it happened fairly quickly. I was surprised how quickly we got assigned to the flight, because normally when you fly, there's two or three years between flights, and there was almost five years between my first and second flight. This time I got assigned less than six months after I got back from the first one, I was assigned to another one, which I was totally unprepared for. I didn't expect it to happen then—happy about it, but unexpected.

So then you have low priority on getting into simulators and that sort of thing, so I don't want to say we wasted a month, but we hadn't accomplished a whole lot when, all of a sudden, we found out were going to leapfrog a couple of other flights and be sooner rather than later. So then we really had to scramble, so that was a tough nine to ten months of very intense training, because we didn't have as much time as you normally would to get ready to go.

Again, another high-inclination mission, not 62 degrees, but 57 degrees, typically what the high-inclination missions have been previous to our flight. And again, I mentioned before, we had set a world altitude record for a winged vehicle. We got up to about 330 miles up. I don't know whether it's been broken since or not, but at that time. So I've got a plaque in my office there at work that says that I'm a world altitude recordholder for a winged vehicle.

It was again a crew of five, up for about five and a half days, and got along well. All-male crew. Nothing unique about it; it was just the way it worked out. Our primary function on this flight was to deploy this communications satellite and to drag it just as high as we could to deploy it, because this particular satellite didn't have any boosters. A lot of the satellites we carry—I think communications satellites have another rocket motor on them that you just get it out of the payload bay and then back off a ways and then that rocket motor ignites and boosts the payload into a lot higher orbit.

This particular satellite did not, and it was designed to study primarily the ozone layer in the Earth's atmosphere. Its useful life was supposedly ten years, and as far as I know, it's still up there doing its thing. We launched it in '91, so it's been up there now for about thirteen years. We got some results back probably a month and a half or two months after we deployed it, after they calibrated all the instruments and whatnot, that they'd found the smoking gun, if you will, as to what causes the hole in the ozone layer.

It looked at several different things. One of the things it looked at is high-altitude winds around the world. It also looked at the chemistry of the atmosphere, and it looked at the energy balance, how much energy was coming in from the sun and then how much was being reflected back from the Earth. And one of the things they saw is the wind patterns and whatnot, that the chlorofluorocarbons that come from the industrialized northern hemisphere were migrating down over the Antarctic, and that's what was a direct correlation to what was causing the destruction of the ozone layer in the Antarctic spring. It would release all of those things that were trapped in the lower atmosphere and then it would be spiraling up because of the circular wind patterns, up into the ozone and then create that hole. So that was kind of exciting to say that what people had long suspected was proven, that that was the cause of it.

We also found something there that we didn't expect, or I guess it happened shortly before we got up, but Mount Pinatubo in the Philippines had erupted and, again, this satellite had measured the carbon dioxide that had been generated from the eruption there, and it had just circled around the Earth right around the equator, close to the latitude of Mount Pinatubo in the Philippines, and lo and behold, there was destruction of the ozone layer right around the equator because of the eruption of the volcano, and that nobody had expected. So that was kind of a surprise.

We also did some experiments on board. One of the things that we did, we put together a truss structure that was very similar to what they built the International Space Station out of, and we erected it. You've got about seven feet of height between the floor and the ceiling in the living quarters, so we erected this thing. It was almost being a kid with a Tinker Toy set, putting all those things back together again. This was built by MIT [Massachusetts Institute of Technology, Cambridge, Massachusetts]. Then we had a little shaker with a bunch of string gauges on it to vibrate this structure to see how it would react in space. What they were trying to do is verify the computer models down on the ground to make sure that the vibration and the characteristics of this truss would react in space they way they thought they were predicting they would in computers, and that was successful.

We'd been flying spacecraft for years, and we understand how the propellants in fuel tanks on the spacecraft work when they're full and how they work when they're empty, but there's not a whole lot of real good evidence on how these fuel tanks operate when they're partially empty. So we carried up some small vials and vibrated them on this special device and, again, it was an experiment designed by MIT that we took up there to look at and see how these fluids would migrate inside these clear Plexiglas tanks that we'd created. We weren't using real

rocket fuel. If it had gotten leaked, that stuff is potentially lethal, so we used fluids with similar characteristics to them to see how they behaved in a sphere type of an experiment.

Then we did a number of medical experiments, like we do on all flights, and each of the crew volunteered in which experiments you wanted to participate in. Some of the experiments they don't let the pilot and the commander do, but most of them were fair game for all the things that we did. I can't remember whether it was my first or my second or my third flight, but we wore a Holter monitor, which is a device where you measure the heart rate for twenty-four hours at a time. You wear this thing on your belt and it collects—similar to this remote mike device, about the same size. That wasn't bothersome, but you also wear a blood pressure cuff that inflates automatically, which isn't bad in the daytime, but about every fifteen minutes the thing inflates, and if you're trying to sleep and all of a sudden this thing inflates around your arm, it tends to wake you up in the middle of the night. So that was a bit of an annoyance, and we had to wear that three different times for twenty-four hours at a time, spaced out about a day or two apart.

What else did we do in experiments? On one of my flights we checked the eyes. There'd been some anecdotal information that your vision changes when you get in zero gravity in space, so we took these tests on the ground, a series of vision tests, looking at this black box, and you could program it into a series of different tests that you could do. Then did them in space, then we did it again after flight, initially every day and then it got longer to see if there was any vision—I never did hear the results of that, though, so I don't know if there were any. We were doing this test on numerous spaceflights; it wasn't just our flight. But sometimes the feedback wasn't real forthcoming on some of those flights, so I didn't ever hear whether they confirmed or disproved the theory that your eyesight changes.

ROSS-NAZZAL: We're getting close to the end of our time today, and I had a couple of general questions for you. When you look back over your career with NASA, is there any one point that you could look back and say, "That was my biggest challenge"?

CREIGHTON: I can't think of any one thing that was the biggest challenge. A couple of high points. The most exciting was probably the day that I was notified that I'd been selected, that phone call. And then launch morning on my first spaceflight. They're all exciting, every launch is exciting, but I think your first one is the most exciting. Sitting out there waiting and for somebody saying, "Ten, nine, eight, seven."

That was kind of strange after I got back, after my first spaceflight, because at that time I wasn't sure that I was ever going to get a chance to go again. I just sort of asked myself, "Now what? I've been pointing my whole life toward this and now that I've done it, what do I do next?" And I sort of felt like what I suspect maybe a professional athlete feels like when their career is winding down and they've gotten a chance to play in the NFL [National Football League] or baseball or whatever, and now your career's over. "Now what do I do?" Because you've basically spent from the time that you were probably ten or eleven years old training to play basketball or football or baseball or whatever, and now what do you do?

So it was a bit of an adjustment. I knew I couldn't do that forever, but I never really thought I was ever going to get a chance to do it in the first place. Then when I did get assigned to NASA, it was all exciting and fun, and then I was fortunate enough to get a chance to do it twice more. I could have stayed on and flown once or twice more, probably, had I chosen, but I wanted to get back up to the Northwest here sooner or later, and knew I wasn't going to live in

Houston forever. My wife was just finishing up her residency program in her medical training, so it didn't make sense for her to start a practice there in Houston if we weren't going to stay there. So it just was a convenient time to leave.

So I reluctantly left NASA and we moved up here to Seattle, and I was lucky enough to get a job. It wasn't space anymore, but it was still flying airplanes. So I continued on my flying career and probably did it in the right order. Started out flying fighter airplanes, pulling seven, eight Gs in there, and I'm not sure my body could take that anymore. Then with that experience, was able to go fly the Space Shuttle. Then after that, why, continue flying in the big commercial airplanes now instead of fighters. So I've had a unique opportunity that very few people have—in fact, I'm not sure that anybody has ever done that besides me, is to fly basically all three high-performance airplanes, fly in space, and then go back and fly commercial airliners. It's been a unique opportunity. It's been a fun career.

ROSS-NAZZAL: Is there anything that you think we might have overlooked today in the interview that you wanted to talk about?

CREIGHTON: Nothing I can think of. I've pretty well talked about experiences at NASA. I still have some good friends in the program, but we sort of drifted apart over the years as we've gone our own separate ways. I know a number of the people that came into the program at the same time I did are still in the Houston area, working on the space program. I tell people, sort of flippantly, that my timing was bad. I was too young to go to the Moon, and I'll be too old to go to Mars, but if we had been getting ready to go back to the Moon or to Mars, I probably would have stayed in the space program. But I had the opportunity to do what the Shuttle is capable of

doing, and at the time there was no guarantee that the Space Station was going to be built. In fact, just about a year after I left, why, they came within one vote of killing the program in Congress.

Then before the *Columbia*, each time when a Space Shuttle went up to help deliver a part to the Space Station, I was a little jealous. I didn't miss all the work in between, but would like to have been a part of one of those crews drifting up to a Space Station, gradually growing to the size of a football field, envisioning the theme song of *2001* playing in the background. That would have been fun. I'm a little bit jealous that I hadn't stayed in long enough to do that, although at my age, I'm not sure that I would have still been flying by the time they really started putting the Space Station together.

I will definitely be jealous of the people that get a chance to go back to the Moon and go on to Mars, although I'm not sure I'll live to see it. But it's been kind of frustrating in that I think that if we had put our mind to it, we could have been to Mars already. I've heard a story—I can't vouch for the truthfulness of it, but apparently Wernher von Braun, when the launch of Apollo 11, when they were going to the Moon, he was standing there with one of his German buddies and watching it and he supposedly told his buddy that "You give me $10 billion and ten years and I'll have a man on Mars." And he probably would have if he'd have lived to do it. Maybe not for 10 billion, but he probably could have done it in ten years.

I'm excited about President [George W.] Bush's suggestion that we get serious about going back to the Moon and Mars. The Space Shuttle is a marvelous vehicle, probably the most sophisticated vehicle ever built in its time, but it takes special care and feeding, and we need to get the flight into space as routine as flying on a commercial airplane. That will happen someday, probably not soon, but then a lot of people that want the opportunity will get a chance

to go do it. It's a thrill of a lifetime. I hope that all the people that want to do it get a chance to do it. I know that when I get asked by kids, "What is it that I need to do to become an astronaut?"

I tell them, well, as the years go by there will be more opportunity hopefully, but it still is going to be for quite a while a long shot. "Stay in school, work hard, study hard, and go into something that you like, for two reasons. Number one, if you like it, you'll do better at it than if you don't like it. And number two, if you don't get selected as an astronaut, you won't be stuck with something that you don't like to do just because the only reason you did it is because you thought it was going to help you get selected for the astronaut program." I believe that to be true, but I also encourage kids to think big and dream and go for the stars.

ROSS-NAZZAL: Thank you very much for sharing your experiences with me today. I've really enjoyed it.

CREIGHTON: My pleasure.

ROSS-NAZZAL: Thanks.

[End of interview]