

# NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT

## ORAL HISTORY TRANSCRIPT

RICHARD M. MULLANE  
INTERVIEWED BY REBECCA WRIGHT  
ALBUQUERQUE, NEW MEXICO – 24 JANUARY 2003

WRIGHT: Today is January 24<sup>th</sup>, 2003. This oral history with Mike Mullane is being conducted in Albuquerque, New Mexico, for the NASA Johnson Space Center Oral History Project. Interviewer is Rebecca Wright, assisted by Sandra Johnson.

Thank you, again, for allowing us in your home this morning and taking time to visit with us for this project.

MULLANE: Well, I look forward to participating, and thanks for coming all this way to meet me here.

WRIGHT: We're happy to do that. We'd like to start out today by you giving us some background information about how you first became interested in aviation and aerospace.

MULLANE: All my life, and by that I mean all my life that I can possibly remember, I had a fascination with airplanes and anything associated with the sky, really. I'm sure part of that has to do with my father. He was in the Air Force. He was a flight engineer on cargo airplanes in the Air Force, and I'm sure that had some influence, because he would take us out to the base and let us climb around airplanes, old airplanes, I'm talking about C-124s, C-97s, pretty old airplanes. I'm sure that had some influence, but it was beyond that, I think, an innate interest in flying.

My dimmest memories are of building airplanes, of drawing airplanes. As soon as there was a space program, I was fascinated with that. Even before that, I was fascinated with all of

the movies, the science fiction movies. There wasn't *Star Trek* when I was a kid, but *War of the Worlds* and *When Worlds Collide* and *Forbidden Planet* and all these other 1950s, early 1950s movies, I was fascinated by those that had a space flavor to them.

I was always dreaming that some day I would be a pilot. I wanted to be a pilot. That never happened, at least not as a military pilot. My eyes were too bad. When I graduated from [United States Military Academy] West Point—actually, let me back up. I'm skipping my childhood here.

When the space race started, I was twelve years old. When Russia launched Sputnik, I was twelve years old. That was 1957, and I was here in Albuquerque. My backyard was a desert as far to the mountains—it's now all built up, but it was a lot of open area out there, and I started building and testing homemade rockets. I got involved with the rocket clubs that they had in the schools. Well, most of them were school-sponsored. And started building these homemade rockets and testing them from the desert.

I'd go out at night and watch satellites when they were forecast to come over, watch meteor showers. I built hot air balloons. I took plastic, the plastic that covers the dry cleaning that comes back, clothes covered by this dry cleaning plastic, I would iron it shut with my mother's iron, the little hole where the hanger comes out, and go up on the roof on a still winter day when there's a fire going, and put it over the balloon and launch this hot air balloon. Had to be careful on how you did it or else it would melt. The plastic would melt. But I did that.

I built balsa wood gliders. I built rubber band-powered gliders. I was just totally, absolutely fascinated on anything associated with the sky, even weather. I built my own weather station. I had a little book that told you how to make an anemometer and hydrometer and things like that, and built that.

Anything, anything at all associated with the sky. Astronomy, weather, rockets, planes, balloons, I was just totally fascinated with. And as soon as there were rockets, as soon as there was the space race going on, I was just totally swept up in that. Watched every launch that I

could possibly watch. All the early pioneers flying in their rockets, dreamed some day that—in fact, one of my dreams as a kid—because one of the big things when I was a kid was that our rockets didn't have enough power. The Russians would launch tons of equipment up there, and we'd launch a fifteen-pound grapefruit-size satellite. Our rockets didn't have enough power, and they were always emphasizing how our rockets were not very good and not very powerful, and I had this vision that some day that NASA would be launching astronauts, but they would have to get kids because they were lighter. They wouldn't have enough oomph on their rockets to lift an adult, so that they would get kids. So I dreamt that maybe I could be a kid astronaut.

But any rate, I was just totally swept up in everything associated with space and flight, and, again, I'm sure my father had a lot to do with that, his background. But again, I think it's beyond that. I think it was some type of innate interest that was there from God, I guess. If I had to pick a source, I guess that would have to be the answer.

But any rate, as soon as I went to high school, I was focused on math and science and wanted to some day be a pilot. Wanted to go to the [United States] Air Force Academy [Colorado Springs, Colorado]. Could not get into Air Force Academy because my grades were too bad. My SAT [Scholastic Aptitude Test] scores weren't good enough to get into the Air Force Academy. I got a third alternate to West Point. Third alternate. And by some miracle, the primary student and two backup students dropped out of the way, and I barely made it into West Point.

I graduated from West Point in 1967, and again through West Point, of course, the space race was going full bore then with—let's see. I guess it would have been the Gemini Program, and then the early Apollo Program.

I was dreaming some day of being a pilot, test pilot, and trying to be an astronaut as I graduated from West Point. But then when I went into the Air Force, my eyes were bad. Could not qualify as a pilot because of my eyesight. Ended up flying in the back seat of fighters, the F-4 Phantom, mostly, and then started my Air Force career as a backseater in the Air Force.

So that kind of is my childhood background there. Does that answer it pretty thoroughly?

WRIGHT: Sure.

MULLANE: Okay.

WRIGHT: Were you in the Air Force at the time when you learned about the astronaut selection for the 1978 class?

MULLANE: Yes. Let me give you my Air Force career here. I went into the Air Force in the back of F-4s in Vietnam, went to England for four years in the NATO [North Atlantic Treaty Organization] forces that were over there during the cold war, and then came back to the U.S. [United States], got a master's degree in aeronautical engineering, and then went to the backseater course, the flight test engineer course, they call it, at the Air Force Test Pilot School at Edwards [Air Force Base, Edwards, California]. I graduated from there and when to Eglin Field [Eglin Air Force Base, Florida], doing some test work in the back of fighters at Eglin Field.

It was while I was nearing graduation from test pilot school, from the flight test engineer course at the test pilot school, that NASA announced they were selecting Mission Specialist astronauts, and this was the new thing, because now you didn't have to be a pilot to apply to be an astronaut. So this dream of perhaps being an astronaut was now back open to me. Before it had been closed, because all the people before they had selected were pilots, but with this mission specialist position, there was going to be a possibility for me to be an astronaut.

In fact, I remember that night that they announced it. This was big news at Edwards, because virtually everybody at Edwards Air Force Base wanted to apply to be an astronaut. [General Thomas P.] Tom Stafford was there, and he had a meeting over at the Officers' Club, because a lot of people were wondering, what do you think about this, how do you go about

being an astronaut? So we all went over to listen to Tom Stafford's thoughts on the astronaut process. Nobody could know what the selection process and the criteria and all that would be, but he just gave some of his insights on NASA and his experiences there. But I'll bet 99 percent of the fliers, frontseaters and backseaters, at Edwards, put in applications to be astronauts, and I put in my application. It was while I was at Edwards that I put it in.

It was going to be a year or more before they actually started selecting people. But I graduated, went to Eglin Field in Florida, was flying in the backseat of fighters there, and that's when NASA started doing the interview process. I was called down to Johnson Space Center [JSC]. I don't remember what month it was. I think they announced in December, so it probably was in summer of [19]'77, I guess, probably, that I went to NASA for an interview, and I never thought in my wildest imaginations that I would, (a), ever make a cut for an interview, and, (b), ever get selected after that interview.

I remember in the interview I was pretty laid back because I didn't think that I had a prayer. I had a snowball's-chance-in-hell-prayer is what I had, because I'd been around too many other super-achieving people and knew that certainly my academics were not as good as some of these other people that graduated first, second, third in their class from the Air Force Academy or whatever, or Annapolis [United States Naval Academy]. I felt pretty intimidated by a lot of those folks that were in the interview. As a result, I just sort of was pretty laid back and didn't expect much.

Then I was shocked in December, I guess it was, of '77. I think that's when they started calling people and announcing the thirty-five people that were going to be selected for the first group of Shuttle astronauts. I was actually, at the time I got the phone call, I was stationed at Eglin, but I was TDY, temporary duty, to Mountain Home Air Force Base in Idaho, doing some work up there. My wife called and told me that Abbey had called, George [W. S.] Abbey had called the house and was trying to get ahold of me. And the news had already—somehow they had leaked that the some of the women who had been selected were already known, because that

morning the press was interviewing some of the women, [Margaret] Rhea Seddon I think was on, I don't remember. But it was obvious that people were being called and this announcement was being made.

When my wife said that Abbey called, I was thinking, I cannot believe that Abbey would call to tell somebody they're not selected. That sounded to me like it would go to some minion there, not Abbey.

So I thought, gosh, could he actually be calling to tell me I'm an astronaut? I remember how frustrating it was, because this was back in the days when telephone communication isn't what it is now, and particularly when you're at a military base. You don't just pick up the phone and call long distance from a military base. You have to get authorization from the squadron—I guess it was the squadron commander's office to make a long-distance call, and you had to then put it with the operator. It was a long, involved process. So I had this phone number to call George Abbey, but it took me a while before—probably took me a good hour before I was able to return the call, all these administrative delays getting a long-distance call out of a base back in 1977.

When I called Abbey, he asked me if I still was interested in being an astronaut. And, of course, you know what the answer was there. "Yes, yes." I just went out and screamed with joy. I remember that night I bought some beer for the rest of the people that I was working with there at Mountain Home in the hangar there, and we had a little party. And I remember driving back to my apartment that I was staying in, stopping out in the desert. This is out in Idaho. It's like New Mexico. Go out in the desert; it's like being in space. Black sky. I remember standing out there and just looking at the sky and thinking that I had this chance of actually flying in space.

I still had these doubts that it would ever happen. I'm one of these guys that tend to think of all the things that can go wrong, like a medical problem or the rocket blows up or whatever it is. It's something that is going to not—ultimately it will not happen. Even though Abbey called and told me that I'm an astronaut, I felt like there's still a lot that could go wrong that would

prevent me from actually flying in space, but I still had this overwhelming sense of joy that I had this shot at getting into space.

WRIGHT: Great feeling.

MULLANE: It was. It was a fantastic feeling. It really was. It was a lifetime dream come true to be an astronaut. But again, I didn't really ever consider myself an astronaut until the SRBs [Solid Rocket Boosters] ignited on my first mission. All the rest of it I just thought it was name only. But it certainly was an overwhelming, joyful experience of the first magnitude.

I tease my wife how we are, that we tend to set these goals and think that once we reach this goal, it's going to make you happy for the rest of your life. It's one of those things that nothing will ever, ever—you will never desire anything other than this. Of course, that never happens. As soon as you—I remember telling my wife that if I just flew one time in space, just one time in space, that's all that I would need to be infinitely happy. And then I'll bet within two days after landing from my first mission, I said, "I sure would like another mission." [Laughs] It's just one of those things. It's a joyful experience to be told that you're going to get a shot at riding into space. So I was weightless at that point, I think. I was just floating around, already weightless.

WRIGHT: How did the arrangement work where you were still part of the Air Force and became a NASA astronaut?

MULLANE: NASA had an agreement with the Department of Defense that any DoD or Air Force, Army, Navy, whatever, officer who was being selected as an astronaut would just be on loan to NASA. It was for a—I don't remember the period of time, whether it was three years or four years. There was some period of time that the military was loaning us to NASA, and we

were still paid by the military, still promoted by the military, but we were on loan to NASA. And the renewal, this memorandum of understanding between DoD and NASA, was renewed. Whenever it came due, they would renew it.

It was always—in fact, there was one thing that always kind of—it was always in the back of our minds. The Air Force isn't in the Navy, and they're not in the business of training people to be astronauts. You ask the Air Force, the needs of the Air Force come first. The needs of the Navy come first. So in the backs of our minds, it was like, "Gosh, I hope I don't get close to a flight that have the Air Force say, 'Oh, you've got to come back and fly for us.'" Or there's some war that we need more people that have backseat experience or front-seat experience or whatever, because none of us had flown before that memorandum had expired. I don't remember how long it was, but I know it wasn't as long as it was that the first of our group started flying on the Shuttle. So there was a little minor thought, "Boy, I hope the DoD renews this thing. I'd hate to get here and do all this training and then be pulled back into the Air Force." That's never happened, as far as I know.

WRIGHT: Tell us about the move to Houston [Texas] and your starting and training as an AsCan [Astronaut Candidate]

MULLANE: Okay. Move to Houston. The first thing that I remember about the move to Houston is that the housing was so incredibly expensive. I had a house that I think we ended up selling for like \$55,000 in Florida, and when I got to Houston, I mean, to live in a \$55,000 house in Houston, you'd better be looking at a doublewide down in some trailer park. The housing seemed to be incredibly expensive. That's the first sensation, first thing that shocked me when I got down there. But like everybody else, you finally work a way around it and end up getting a house. It wouldn't have bothered me to live in a doublewide if I'd gotten a chance to fly into space.



But we moved down there and rendezvoused with all the rest of our group. We actually flew down. Abbey sent T-38s out to pick up people to fly down there ahead of time, before they actually had to report, to look for homes, to get that process going. So we had probably met a lot of the people that were actually going to be in our group, before we actually formally reported in there, which I think—I think that was May of [19]’78 that we actually officially began our astronaut careers with NASA. I’m not sure, but it was in the springtime there of ’78 that we actually reported in. Then got thrown into the process of learning this whole new world of NASA, and it was a little awkward, I think, at first.

One thing that surprised me about NASA, shocked me, really, was how unstructured, I guess, the training program was. In the military, the training was always very structured and always, when you’re talking about flying an airplane, was always delivered by pilots or backseaters who flew that airplane. So I had this vision that when I got there the astronauts would be training us. They were the ones that flew the Shuttle or had flown the vehicles before the Shuttle. So we would have these older astronauts that would be training us, and that it would be very structured as it was in the Air Force.

In the Air Force, before you fly a new airplane, you have this ground school, you have books, workbooks. I mean, you have to study stuff, and you take tests on it. You have to pass these tests before you move on to the next level. You fly with an instructor pilot before you’re ever turned loose in the plane by yourself. You have a certain number of minimum hours you have to get. It’s very, very structured, and I kind of expected that when I got to NASA, that it would be a classroom. You’d go to a classroom, and you would sit there and follow a workbook or these various documents, and that the astronauts would be teaching us, and I was really surprised to see how unstructured it was at that time. I think it probably is more structured now. But at that time everybody was coming up to speed on how to train these new astronauts to fly the Shuttle.

One of the things I look back on, one of the hurdles was trying to figure out what you

really needed to know, because the Shuttle was so complex. At what level did you go? And so that was something that I remember struggling with. It was so massively complex. Where do you focus your attention on? And after a while you finally, talking to older astronauts who were there, they would give you insight into various systems, and you got comfortable—“Okay. This is what I’m going to be doing, and this is what I have to know.” They had some part task trainers that started coming online that we could practice in, and some of the trainers would start giving us the detail that we needed to actually be proficient to fly on the Shuttle. But it wasn’t as structured as the military, and that surprised me. Really did. I expected it to be very, very structured.

WRIGHT: Did you have much interaction with some of the longtime astronauts that were still on—

MULLANE: When we got there, there was probably—I’ll bet there was probably twenty older astronauts still there. Two Moonwalkers; Alan [L.] Bean and John [W.] Young were still there. And, yes, we interacted with them quite a bit. Some of them were—I remember, speaking of trying to figure out, trying to learn the Shuttle systems; I remember the data processing system as incredibly complicated, just vastly complicated. I remember going to [Joseph H.] Joe Engle and asking him a question about the data process system. They had this term called “failed to sync,” when one of the computers wasn’t working with the other computers, and I was trying to get some insight into that. And I’ll never forget him explaining it to me by saying, “Well, Mike, have you ever looked inside one of these computer boxes? They got jillions of wires in there, and they’re curved and bent all over the place.”

And I says, “Yeah, I imagine it’s pretty complex, Joe.”

And he says, “Well, you know how they operate on ones and zeros or binary?”

I says, “Yeah, I understand that.”

He says, “Well, every once in a while, one of the ones that are going through the zeros can go through these wires really, really smoothly because they’re round. But every once in a while, one of these ones going through the wire gets turned sideways and causes a logjam, and all these other ones and zeros back up behind it.” [Laughs] I’ll never forget him pulling my leg, obviously, but I thought his explanation was as good as any at the time. Old Joe was a good guy. He was a lot of fun to talk to, had some unique insights into the space business.

Early on, they brought in older astronauts, too, that were not in the office anymore. They brought in Neil [A.] Armstrong to talk to us, some of these legends. [Thomas P.] Tom Stafford came through there, I think, to just talk to us about their experiences.

We had a lot of professors. They took us to the Lunar [and] Planetary Institute [Houston, Texas] in the early days there. Probably for the first three, four months or so, we had these lectures by these professors who were expert in their particular area, whether it was geology or meteorology or oceanography, and they were there to educate us on how space affected their particular science, how it affected geology, what we could do from space to help geologists, what we could see and record from space that would help oceanographers, that type of thing. And these professors were also renowned in their areas. So we had some top-drawer instruction there early on. It was kind of a shotgun, a little bit of science, little bit of past astronaut experiences, a lot of the Shuttle, insight into the Shuttle.

WRIGHT: This was the first class that NASA had selected in about ten years, and it was also the first time that it had selected minorities and women.

MULLANE: Yes.

WRIGHT: How did that affect your class or maybe you specifically?

MULLANE: [Laughs] Well, I'd be a liar if I didn't say it was difficult to learn how to work with women, and not because of the women; because I had no life experience in working with women. I tell my wife, I say—I tell everybody, there were two things that at age thirty-two I did that I had never done in my life, when I woke up to go to work for my first morning as an official astronaut at NASA, two things I'd never in my life had done: dressed myself, and worked with women.

Dress myself. Let me explain that. I went to twelve years of Catholic schools, wore a uniform every day. Woke up, put on a uniform. Went to school. Went to West Point. For four years I don't think I ever saw an article of civilian clothes. Didn't have it in the closet. Wore a uniform all the time. Went into the Air Force. Would wake up in the morning, go to work, put on a flight suit. Not one time in my life did I ever have to go to a closet, open it up, and pick a pair of slacks and shirt that matched. And that was a real struggle.

In fact, a number of times that I walked out of the house or walked through the kitchen on my way to work, Donna, my wife, would look at me and say, "You're not going to work dressed like that, are you?" [Laughs] In fact, she told me she was going to get Garanimals and put them on the clothes so that I could match the elephants with the elephants and the giraffe with the giraffe.

And I tell you, I wasn't the only one struggling in this regard, because I remember driving up one day to NASA with my kids in the car, who were teenagers at the time, young teenagers, and there was one of the astronauts walking around in plaid pants. Plaid pants. I mean, even I, with my absolute zero fashion sense, thought that maybe that looked a little bit retro. In fact, to this day, my kids, they're in their thirties now, if I'm with them and they see a golfer out in plaid pants, my kids will laugh and say, "Hey, Dad, check it out. There's an astronaut." [Laughter]

So that was one of the things that I had to do when I woke up on my first morning. The other was working with women. I had never in my life ever worked professionally with women.

In fact, my whole life, the Catholic schools I went to weren't gender-segregated, but a lot of the classes were. I mean, there were females in the school, but a lot of the classes were segregated by gender, and so had very little interaction with females as a young person, and West Point had no females at the time I was there.

In the Air Force, the flying community that I was in had no females when I was in there. So as a result, I was thirty-two years old when I was selected as an astronaut and I had never worked professionally with women, and I have to admit that I'm sure I was a jerk, in a word, because I just didn't know how to act around them, telling jokes that probably were not appropriate to tell and just doing dumb things that were inappropriate and probably would have gotten me a prison sentence in this day and age now with sexual harassment and all that.

The women had to endure a lot, because there was a lot of guys like myself in that regard, I think, that had never worked with women and were kind of struggling to come to grips on working professionally with women, but we all made it. That's for sure.

WRIGHT: Tell us about some of the first duties and assignments that you received as an AsCan and then after even your training.

MULLANE: The first duty assignment I got was working with Spacelab, which to me was a crushing blow, because at the time it was obvious to all of us, if you weren't working on STS-1 or -2 or -3, if you weren't a support crew member for one of those, that in our minds you were not in the running to get an early flight. And working on Spacelab, it was kind of like you're down to the bottom of the barrel, that that's so far down in NASA's launch—I don't remember when the first Spacelab flew, but it was going to be pretty far down on the launch sequence. So I remember supporting our guys like Owen [K.] Garriott and [Robert A. R.] Bob Parker and Karl [G.] Henize and these guys. They were scientists, basically, that were going to be flying on Spacelab, and so I was kind of supporting them. Great group of people, I mean really top-drawer

people, but it was one of those things that I felt like I was an outcast, that I wasn't in line to fly one of these earlier missions, which in fact was the truth. I wasn't in line to fly one of those early missions.

WRIGHT: You, though, became a member of the support group for STS-4 and STS-6.

MULLANE: Yes.

WRIGHT: Would you share with us what type of training or what type of support that you provided for these crew members?

MULLANE: Well, STS-6, in particular, I remember that, because that was going to be a TDRS [tracking and data relay satellite] mission, so I trained with the crew members, learning the tracking data and relay satellite, the IUS, the inertial upper stage, trained with them very thoroughly. I could launch a TDRS in my sleep after I'd gone through the support functions of going to the contractor, sitting down with the contractor, learning how the circuits worked, learning what possible things could go wrong. In most cases, I was going to these things, but some of the crew members from the mission, the STS-6 mission, would be there, and they would be learning the same things. So it wasn't like I was the guy that was going out there learning all this and reporting back to them. There was a little of that, but a lot of the times we were together on it and learning at the same time. So I was almost like a crew member. I learned all of this stuff. I wouldn't fly on the mission, but it certainly was very beneficial to my training to be involved so intimately with their operations.

WRIGHT: During those years before you were selected to be on a crew, you were learning so many of the different activities and assignments, duties. Did you have any feelings of which

ones of these that you would like to do? Did you want to cast yourself in one of those roles?

MULLANE: I wanted to do what everybody else wanted to do. I wanted to do a spacewalk, which I never did. I wanted to operate the robot arm, which I did a couple times on the missions. I wanted to be involved.

I'm not a scientist, and, frankly, I didn't have any interest in any science mission. I did not want to fly on a Spacelab mission. I absolutely was dreading getting assigned to one of those. I just didn't have any interest in it. I shouldn't say any interest; my interest was low in it. I wanted to operate things, as I had done in the Air Force. And I think the pilots are the same way. I was kind of like a pseudo pilot. And I think probably the other backseaters were the same. They were used to operating things, being mechanics. Certainly the pilots flying something. I'm sure the pilots, they were totally focused on flying the rocket. And what happened on the science mission, for example, I'm sure it was kind of secondary to what they really wanted to do. Certainly that was what it was in my mind. I did not want to fly any science missions. I wanted to fly missions where I did things, like operate the robot arm, and saw the results. Science is great, but you don't ever see anything. You collect data, and somebody else three years later publishes a report about it, and it's not the instant feedback as you would get, say, on a spacewalk or operating the robot arm. Those were the things I most wanted to do.

WRIGHT: You were selected for mission STS-41D. Tell us how you learned that you were going to be part of that crew.

MULLANE: Well, I'll be honest with you here. One thing I think that I really felt that could've been done a lot better was more visibility into flight assignments. That was a real, I felt, a real morale problem when I was there, is that flight assignments were kept so secret. There was a secretiveness about flight assignments that was incredibly frustrating to our group and I'm sure

to the other astronauts, too. I always felt there should be a sign-up list. I mean seriously. I felt like, hey, you ought to just go out there and ask people, “What mission would you like to fly?”

Now, I’m sure there would be a lot of overlap in that in that you would have had as a manager, you would have had to place people where the needs were. But it just was incredibly frustrating to never really have a sense of when you might fly or what the criteria was to qualify for a flight. I mean, I felt that was very frustrating, and I hope it’s changed. I hope there’s a lot more visibility into the flight assignment process than there was when I was there, because I know morale suffered in our group because there wasn’t that visibility into flight assignments.

Basically, you didn’t really have a sense of when you might fly until the phone rang and you were called over to Abbey’s office to be told that you were going to be on a mission, which was a very joyous event, I mean, but I think it would have helped morale a lot if we could’ve had a better visibility, long-term visibility into that, if people’s could have said, “Okay. We’re thinking of putting you here and here and here, and that’s the grand plan of things,” then I think it would have made people a lot more comfortable. As it was, people were just paranoid. “When am I going to fly? Is it ever going to happen?” You know, that type of thing.

But eventually Abbey’s office called, and myself and the rest of the STS-41D crew got called over to his office to be told we’d be flying on STS-41D. At the time it was going to be an IUS, a TDRS mission, which I’d already been thoroughly trained on through the STS-6 mission. But as it turned out, there was a lot of problems along the way. The TDRS that was launched—was it the first TDRS? The first IUS went out of control, had some problem when it was launching, and so that delayed that program and gave us a new payload on STS-41D and had to learn how to deploy PAMs, these spinning satellites, these propulsion assist modules with communication satellites. That’s what we were going to be flying.

On 41D, our first launch attempt, as probably you’re aware in your history there, was an abort on the pad. Maybe I’m jumping ahead. Maybe I ought to jump back to your next—maybe I’ll stop there and see what your next question is.



WRIGHT: I'd like to talk about the training, how you trained as a crew. You were all primarily rookies, except for [Henry W.] Hank Hartsfield [Jr.]?

MULLANE: Yes.

WRIGHT: But yet you were out of that class. Tell us how all of that came together and the training activities that you went through, you in specific, for your roles on that mission.

MULLANE: The best time of my life was being in training for a mission. Then it was *your* mission. Before all the support stuff, you were learning a lot, but it wasn't your mission. You wanted *your* mission. So I really felt that was the best time of my life, was training with these crew members for a mission that we were going to fly. I felt we had a very good team. We all got along. That's not always true. I mean, a lot of missions or some missions fly with people who have some differences. And we didn't have that on our crew. I felt like we had a real good friendship and professional bond there. It made it easy to train, and we got very good, I felt like, in the simulator.

We were blessed with Steve [A.] Hawley. In the Shuttle they have these five GPCs, general purpose computers. It's the heart of the Shuttle, the brains of the Shuttle. Well, the joke in the Astronaut Office is that when you had Hawley aboard, you had GPC-6, a sixth computer, because his brain was like a steel trap. I mean, he read complex documents like most people would read a comic book, and comprehend everything instantly and have instant recall. So that was good to have. Hawley was one of the smartest guys I've ever in my life met. So I really had a good sense of being with that guy and with the rest of the crew.

Of course, Hank had already flown. [Michael L.] Mike Coats was great. I felt good about it. I felt we really got along well, were very professional, very good, and when it came

time to launch, we were thoroughly, thoroughly trained. The simulations were great. The support we got from the trainers was great. The support we got from the contractor was great. I really felt like we were as well trained, and as far as teamwork goes, as best as we possibly could be when we went out to launch.

WRIGHT: What were your duties on this mission? What were you going to be doing?

MULLANE: As a mission specialist, myself, [Judith A.] Judy Resnik, and Steve Hawley all responsible for the checkout and deployment of the PAM and SYNCOM [Synchronous-Orbit Communications] satellite we were carrying, three communication satellites. So we checked these things out and were responsible for checking them out and for deploying them. There was no robot arm operation on that mission.

WRIGHT: You also had another crew member, [Charles D.] Charlie Walker.

MULLANE: Charlie Walker, right. He was a payload specialist for McDonnell Douglas [Corporation], flying a [Continuous Flow] Electrophoresis [System (CFES)] experiment, I believe is what it was called. Yes, he was great, too, fit right in.

WRIGHT: Did it affect the crew at all to have a commercial space partner?

MULLANE: Well, yes. I tell you, all astronauts, I think, carry, and I certainly did, and I think we all did, had a sense of exclusion, I guess. We felt a little bit like the payload specialists were outsiders, and a lot of us, I think, felt like, hey, if they're flying, that's a slot one of us could be flying. So there was some friction there, I think, that we felt like, hey, why isn't a mission specialist doing this experiment, that type of thing. But I'm mature enough now and particularly

after you get your one mission under the belt, you become a little more tolerant of the outsiders. By that I mean the payload specialists.

And certainly they did a great job. Charlie did an outstanding job. I think that's a great program and it's necessary. But in being honest with you, I have to say that certainly there was this undercurrent of feeling that these people were outsiders that had taken a seat from a mission specialist. But, again, it never manifested itself in any type of intent to prevent Charlie or any of the payload specialists from doing their job. I mean, we all were professional, and we all pulled together as a team, and I'm proud that Charlie was there. He did a great job, and he went on to fly two more times, I believe. That payload specialist program, I think, is important for the success of the Shuttle. But at the time we were kind of childish, I guess.

WRIGHT: Originally, the mission was supposed to launch on June the 4<sup>th</sup> [1984], but you didn't launch till August the 30<sup>th</sup>. Tell us what it was like to go through those weeks of delays.

MULLANE: Actually, let me back up to that other question there. One thing that I think—I'm going to say here probably nobody else has said, but I know a lot of people thought about it. It was about the passenger program. I don't know if you were going to ask me anything about that. I'm talking flying the foreign nationals, the congressmen, senator, Christa [S.] McAuliffe. I felt that when I talked about payload specialists, those people were welcome and did a great job, but I think that the passenger program was, in my opinion, was a terrible thing. I really always felt that the Shuttle is too dangerous to be flying people for public relations purposes. So I felt it was even a moral issue. It was immoral to be putting people in harm's way for public relations purposes. And I think a lot of astronauts felt the same, and a lot of astronauts were disturbed, at least, by the presence of the passengers, not the payload specialists, but the passengers who were flying just for public relations purposes. That was one thing that really bothered me, and I was heartened to see after *Challenger* [STS 51-L] that that program was canceled, that they don't fly

people just for public relations purposes.

Barbara [R.] Morgan, who's going to fly, has been trained as a mission specialist, and that's the way you do it. If you want somebody to fly on this rocket, train them as a crew member, and they're flying as a mission-essential crew member. The fact that she has a teaching background, fine. But when she flies, she's going to be doing spacewalks, she'll be operating the robot arm, doing experiments, doing a mission specialist job. She just happens to have a background in teaching, and that's fine, but I thought the way they were doing it pre-*Challenger*, putting people aboard that were just flying for no other purpose other than public relations purposes, I thought that was a crazy program.

Anyway, I interrupted you there.

WRIGHT: No, that was all right. Thank you for that point. Let's talk about the delays leading up to your launch.

MULLANE: You're going to have to remind me. How many were there?

WRIGHT: Many. You started out with the main engine that had to be looked at with a thermal shield problem as well, and then you had the GPC failed on June 25<sup>th</sup>. You scrubbed at the T-9 hold. And the next day your main engine fired, and that was with the possibility of a fire.

There were a number of delays, including the one that you were on on the pad and you had the post ignition.

MULLANE: Yes. Let me just comment about delays. There is nothing that is more exhausting than being pulled out of that cockpit and knowing you have to do it tomorrow. It is the most emotionally draining experience I ever had in my life of actually flying on the Shuttle. I will admit that it is terrifying to launch. Once you get up there, it's relaxing, but launch, it's

terrifying. And people assume that it gets easier. I tell people, no, it doesn't. I was terrified my first launch. I was terrified my second launch. I was terrified my third launch. And if I flew a hundred, I'd be terrified on a hundred. And as a result, you have this sense of death. You think about it a lot before you go fly.

Before I launched, a month or so before I launched, I wrote a letter. I had three insurance policies, and I'm one of these guys, I'm not a lawyer, and I don't want to read all the fine print of these insurance policies, which I had gotten when I was not an astronaut. So I wrote a letter to each of the insurance companies asking for them to—I said, "I'm an astronaut. I'm flying on the Shuttle. If I die, are you going to pay this policy?" Because I wanted them to say it. I didn't want my wife finding out after I was dead that there was some little clause in there, "Oh, by the way, this doesn't apply if you're flying a spacecraft," or something. And they all wrote back and said, "You're covered." And I stapled those answers to the policy and to my will.

You prepare for death, basically. I know it's ridiculous to think you can predict your death. You could get in an auto accident driving out to get in the T-38, and that's your death, and here you are thinking it's going to be on a Shuttle. But I certainly prepared for death in ways, in a formal way. I served in Vietnam, and there was certainly a sense of you might not come back from that. And I said my goodbyes to my parents and to my wife and young kids when I did that, but this time it was different because it's such a discrete event. It's not like in combat where in some missions you go off and fly and never see any enemy antiaircraft fire or anything. But this one you knew that it was going to be a very dangerous thing. And as a result, twenty-four hours before launch, you go to that beach house and you say goodbye to your family, to the wife, at least. That is incredibly emotional and draining, because the wife knows that it could be the last time she's ever going to see you, and you know it's the last time you might ever see her.

In fact, my wife, we have these astronaut escorts, family escorts. My wife identified one time—a month, six weeks before launch, the wives have to pick an astronaut who's going to be a

family escort, and she says, “What I’m picking isn’t a family escort; it’s an escort into widowhood.” That’s the person that’s going to stand next to them on the top of the LCC [Launch Control Center] and watch that launch. NASA wants that person there. And we say it’s a family escort that helps deal with the—the crew’s so busy in the training. Getting the families down to the Cape, if there’s issues there, the family escort can help with that issue. But really, they’re casualty assistance officers. They are they are going to be standing on that LCC roof next to the wives.

So my wife was saying, six weeks before this event, she has to think, “Now, who do I want next to me at the moment I’m a widow? Who do I want?” So you have this buildup, this incredible emotional investment in these launches that just ticks with that clock. Picking the astronaut escort. The goodbye on the beach house, at the beach house, that lonely beach out there. And now to go and get into the cockpit and then you yourself—like I said, I thought a lot about death. I mean, I felt this was the most dangerous thing I would ever do in my life was ride this Shuttle. And the reason I say that, it has no escape system.

And there’s another mistake that NASA made, building a Shuttle without an escape system. I mean, NASA’s a great organization, but I look back on that, and that was—I mean, it didn’t happen when I was there. I don’t know what the thought process was to think that we could build this rocket and not need an escape system, but it was the first high-performance vehicle I was ever going to fly on with no escape system. If something went wrong, you were dead. So that was the sense of death that kind of rode along with you, as you’re driving, preparing for this mission and driving out to the launch pad. You know it’s the most dangerous thing that you’ve ever done in your life. And to get strapped in and be waiting for that launch, and, man, I’ll tell you, your heart is in your throat.

I mean, after a launch abort, I swear, you could take a gun and point it right at somebody’s forehead, and they’re not even going to blink, because they don’t have any adrenaline left in them; it’s all been used up. To be strapped in out there and then to be told,

“Oh, the weather’s bad. We got a mechanical problem,” and to be pulled out of the cockpit, and now it’s all going to start over. Twenty-four hours you go back, you’re exhausted, you go back, have a shower, meet your wife, say goodbye again, and then start the process all over the next day. And you do that two or three times in a row, and you’re ready for the funny farm. It really is a very emotionally draining thing.

When we finally did have main engine start on the—what was the date on that one? June? Where we had the pad abort and the fire.

WRIGHT: June 26<sup>th</sup>.

MULLANE: June 26<sup>th</sup>, yes. I remember thinking we finally got down to the final seconds, got the “go” for main engine start. I remember thinking, “Well, we’re going now. It’s going to happen.” And you get that heavy vibration when the liquid engines start on me. It’s a [demonstrates], really shakes you really good in the cockpit. And watching those numbers flicker off the countdown clock, and then to have the master caution light go on, and quiet. Obviously, the engines shut down, or at least we thought they did because there were two shutdown lights on. One wasn’t. Mike Coats kept pressing on the—we didn’t want any engines on at that point. Whatever’s going on, we wanted all the engines off. I remember Mike pressing on the engine shutdown switch to get a light on, but nothing ever occurred.

I’ll tell you what was so terrifying when that happened was the confusion, the momentary confusion on the radios. You’re so used to NASA, to launch control and mission control, so used to it being just razor-sharp and electrically quick. If there’s ever anything, I mean, I tell people, it’s no accident when they were headed to the Moon with Apollo 13 and they had an explosion, the first thing they say is, “Houston, we have a problem,” because those people are so good. They’re guardian angels. You just have such tremendous confidence in the LCC team and the MCC [Mission Control Center] team. And to hear any hint that they are confused is a dagger

of fear right to your heart.

I don't remember exactly how it was said or who said it or whatever, but on the net you hear, "We've had an RSLS [Redundant Set Launch Sequence] abort." You hear these calls, and it's obvious that it's not like, "Oh, we really know what's going on here," like it had been in all the simulations in all of our training. So that was a dagger of fear to hear any hint that the LCC was a little bit confused. They rapidly figured out what the heck the problem was, but there were those few seconds there where the tone of voices that were being used and the things that were being said were like a dagger of fear right in the old heart. In the cockpit, the rocket was waving back and forth and the hold-down bolts, that's a little disconcerting. I'll tell you, we were sitting there praying.

I know as an engineer, you know it's not going to happen. The safeguards to keep the solid boosters from igniting are in place. You somehow sense, "Oh, my gosh, we were down to within a couple of seconds of the SRBs igniting. Oh, my gosh, are they going to ignite?" Well, a couple of seconds in the world of electronics is a lifetime, and I'm sure that all the safety devices had rotated to prevent them from igniting, but in the back of your mind, you're thinking, "What happens if those ignite?" I mean, if they ignite, you're dead, because you have no liquid engines running. And that's one of those things you can talk to yourself out of as an engineer. "Oh come on, now. The safety system is working fine. Those things aren't going to ignite." But it was disconcerting, to say the least, in that cockpit.

Then we got the word that somebody reported seeing a fire on the pad, not on the vehicle, but on the pad. And as I tell people, when you're sitting—they reported it as a small fire on the pad, and I'll never forget thinking, "There's no such thing as a small fire when you're sitting on four million pounds of propellant." That was a real terror to hear the word *fire*.

And there was a big debate in the cockpit whether we should get out of the cockpit and run to the escape baskets. The ground hadn't called for that, and Judy had unstrapped downstairs and was looking out the hatch window to see if she could see any fire, and she couldn't. They



turned on the fire-suppression system, so the vehicle was being sprayed with water. The launch pad was being sprayed with water. And she couldn't see any fire. Hydrogen, as it turns out, burns clean, so she wouldn't have seen any fire.

But it was one of these things, do we run out? What do we do? We just unstrapped, were ready to bail out of the vehicle if the LCC called, but we stayed with it, which was the right decision. The LCC was right to keep us in there, because we could've run out into some invisible hydrogen fire that might have been there. So that was the right decision. But it was definitely, definitely terrifying.

I remember Steve Hawley—I don't know how soon after the pad abort, but I remember looking at him, and he looks at me and he says, "Gosh, I thought we'd be higher when the engines quit." [Laughter] I wanted to kill him. I wanted to hit him. I says, "This is not funny, Hawley. This is not funny." But that was just so incredibly scary

And on the LCC—I later talked to my wife about it—it was just terrifying up there, too, because it was very hazy that day, kind of a haze-fog, so the vehicle was hard to see, and they have the speakers, of course, going, and they saw the bright flash of main engine start. Heard the countdown, and then that stopped, and it takes a few seconds for the sound. So here there was this instant—instead of a long roar like you normally see with the launch, you had this discrete [demonstrates] and then it stopped, like an explosion. And it was foggy out there, and they had a hard time seeing it, so my wife said she was just—it crossed her mind that the rocket had blown up, because it was this instantaneous roar. But that's the scariest I think I've probably ever been in my life, was sitting out there wondering what in the heck's going on with that fire on the launch pad.

WRIGHT: Was there a discussion among the crew about the use of the wire basket escape system?

MULLANE: Yes. Yes, yes.

WRIGHT: And what were your thoughts on that?

MULLANE: Well, again, it was one of these do we or don't we? Do we or don't we? They said, "There's a small fire out there on the pad." The gantry or the access arm had been swung back to the side hatch. I don't know that we argued about it. I know there was some discussion like, "Should we run out and get in those baskets and get out of here?" And I don't know why—I don't think we ever queried LCC as to whether we should do that or not. It was an internal debate. Maybe one of the other crew members have some better memory than I do on that. But it was just a discussion in the cockpit whether we do, whether we don't. And we just kind of decided that we would sit tight and wait for LCC to give the call.

WRIGHT: In August, you had a chance to launch again.

MULLANE: Yes.

WRIGHT: And you did have a couple of delays as well.

MULLANE: Yes, I know. There was never a time I went out and launched on my first launch attempt, ever, ever, ever. Yes, and again, it's all that emotional investment again. Actually, I'll tell you the thing that was so bad that I remember about that abort is, going back to what I said earlier, that I was paranoid that something like this would happen and snatch this dream from me at the last second. And this was proof. I mean, in my mind, it was obvious we weren't going to launch anytime soon. So we were pulled out of the cockpit and told, "Hey, you're heading back to Houston. We don't know what's wrong. We don't know when we're going to fly." And I

just catastrophized in my own mind. I was like, “Oh, my gosh. I’ll bet they find something terribly wrong with the engines. They are going to have to redesign the engines. It’s going to be years before we ever fly again. Who knows what’s going to happen, who will fly that mission.” That type of thing. I just felt so absolutely depressed to have gotten within a couple of seconds of this lifetime dream and then have the rug snatched out from underneath me.

My whole family, as, I think, most astronaut families, sort of like a family reunion to go down there to the launch. So I go back to the condos where my family is, and have all these relatives I hadn’t seen in seemed like forever who were there. They’re all in Florida, right? They’re all having a great time, right? The fact the rocket didn’t fly, that’s no big deal, right? They’re all drunker than skunks and having a good time partying. All my cousins and all these people, they’re out on the beach. This is a wonderful time. And let me tell you, there is nothing worse than being a non-flown astronaut who has just aborted a mission, who feels pretty bad, and now you have to go to a party. I couldn’t stand it.

I remember thinking, “I can’t stand this.” I couldn’t be around people who were happy, because I was miserable. And I walked out onto the beach and just laid down on the beach and fell asleep on the beach. Then I remember my grandmother came out there and says, “Mike, you’d better get up. You’ll get sunburned out here.” [Laughter] I couldn’t escape.

I told my wife then, I said, “If this happens again, if the next launch attempt, whatever that is,” I told her, I says, “I am not coming back to the condo. I am going straight to the T-38, and I’m hitching a ride back to—I will not be around a bunch of people that are happy and drunk, having a great time while I’m miserable, so I’m flying back to Houston.” So that was the rule from then on out.

But we came back in August and finally launched. It was literally a dream come true. Terrifying again. Nothing had changed in that factor. It was still a very emotionally gut-wrenching fear factor involved in launching on this thing. In fact, I remember, I was sitting behind the pilot, and they have those two windows overhead, the back cockpit there, and I

remember launching and thinking that “This rocket could blow up right now, and I will have never seen the Earth from space,” because the nose is too high. All you’re seeing is black.

I remember after the boosters separated, I craned my neck back as hard—I about broke my neck by doing this, but I craned my neck back, because the rocket’s going into orbit upside down. It’s still a pretty high angle, but I thought if I could at least look out that overhead window and be looking back and down I’d see—we were up at like twenty or thirty miles at that point and I’m craning my neck back to be able to do that, and got a glimpse of the Earth. That was my first glimpse of Earth from, well, certainly extreme altitude. It wasn’t my definition of space. It was under fifty miles. It was probably around the thirty-mile mark or so. But it was just a breathtaking glimpse. I could see this pointalistic display of the clouds on the blue of the Atlantic, down there. Just a fantastic view. It was obvious I was seeing the ocean and the clouds from extreme altitude. But that was my first glimpse, and I remember thinking, “Well, if it blows up now, at least I had that one glimpse of Earth from extreme altitude.”

I remember on my launch, too, the training was—again, NASA’s training is superb, but the thing that surprised me was SRB separation. I’m sure some astronaut in one of the earlier missions probably had mentioned it. I don’t know if I just wasn’t there or it didn’t register in my brain, but the first two minutes have a lot of vibrations and shaking, particularly when you’re going supersonic and getting those shockwaves. The boosters are with you still, so they’re making a lot of racket. So you have a lot of shaking and noise for the first two minutes. And then when those boosters separate, you hear this loud bang, you see this fire across the windows, and then it’s like a switch. It’s nothing. No sound, no vibration, just dead quiet. And the Gs also, because the boosters are gone. You’ve lost six million pounds of thrust. Those are gone. So it’s very, very—you’re light in the seat. It’s almost as if you’re ballistic, like you’re weightless.

And I had this momentary panic attack at SRB separation that all three of the liquid engines had shut down, because it was so quiet. I assumed that there would be some noise from

those liquid engines all the way to orbit, some vibrations or something, but there wasn't. It was just glass-smooth. And I remember thinking—I didn't say anything, but I remember thinking, "All three of the liquid engines." And I was looking at them. I didn't see any lights on them. I was thinking, "Well, surely somebody would say something if they all had shut down," and nobody was saying anything, so I figured, "Well, I guess they're still running."

That was the only thing that I remember being surprised about, just completely taken aback by, was the discrete change in the noise and vibration at SRB separation. It just got glass-smooth from that point on.

Then we got up where the main engine cut off. As soon as the engines cut off, we were weightless. We were flying the first flight of *Discovery*, and they try to keep those cockpits really clean. People wear bunny suits inside them. They vacuum them a lot. There's cracks and crevices and stuff, dust and stuff falling into that they can't get to, and so at MECO [main engine cut-off], when the main engines stop, you're instantly weightless. This debris that had been trapped in these cracks starts coming up. So you'll see bits of dirt and other things floating. I remember seeing a couple of little nuts and washers, wondering, "I wonder what that's off of. Hope it's nothing important." [Laughter]

And then I see an X-Acto blade tumbling in the cockpit by me. And then I see a mosquito [imitates mosquito], trying to fly in weightlessness. It was August that we were launching. Those mosquitoes down there, just clouds of them down at the launch pad area. So one of them had gotten in while we were strapping in, and it was wiggling around trying to figure out how to fly in weightlessness. And I nailed that thing. Wham! The last thing I wanted to have is a mosquito running around in that cockpit.

But then we fired our OMS engines, got into our final orbit, opened the payload bay doors. That really was—actually, it wasn't until I unstrapped from my cockpit that I really got a view of the Earth, just sitting a little too far back to really get a glimpse of it out the windows, but I remember unstrapping, and this was right after the OMS burn, unstrapping from my chair

and floating up and looking out, and I tell you, it was just—well, as I tell people, we all try to describe it, but it's indescribable. Your eye can pick up a lot more than any camera can, and it was just so glorious to see the Earth, the horizon of the Earth, the blackness of space, the blue of the oceans, the white of the clouds. It was just breathtaking. And every expletive that you could possibly throw in there to say how incredible it is would not do it justice to see the Earth, looking out those windows. It was just great. And I remember at that time thinking, "This is all I need to be happy the rest of my life, to see this view." Of course, then, that went rapidly by the wayside. Just a couple of more missions, spacewalks, something else. There's always something else you're trying to get to. But it was glorious up there.

I tell you what. Why don't we take a little break here.

WRIGHT: We were talking about your mission, that you had launched, and as much as you enjoyed looking out the window and getting the chance to see that view you've wanted to see all your life, you did have duties while you were there.

MULLANE: Yes, we had to get to work, unfortunately. [Laughs] No, we got to work checking out the satellites. That all went exceptionally well. There was no problem at all with any of the satellite releases. Everything was just exactly by the book.

One thing I remember, Judy Resnik, we had an IMAX camera up there, and we were doing some filming of the SYNCOM launch, the one that rolls out sideways, and Judy was floating between me and Hank. Hank was on the starboard side of the vehicle looking aft with a camera filming the deployment. Judy was floating next to him. I was floating next to Judy, throwing the switches to release it. Hawley was up front doing a countdown to release. And when we threw the switches and this thing started going out, that IMAX camera has a belt-driven magazine, and Hank was filming it as it moved away from the vehicle, and Judy—I don't know if you ever saw pictures of Judy, her hair, that long black hair of hers was just a wild riot around

her head in weightlessness, and that belt-driven magazine sucked up a shank of her hair into that IMAX camera and jammed it. I remember Mike Coats, we helped cut her hair out of the—free her from the camera. It popped a circuit breaker, stopping the camera from driving. It looked like we might have destroyed the camera. Mike went down to the mid-deck and spent hours picking hair out of the gearing of that thing to make it so it could work again. For a while it looked like we would not be getting any IMAX.

And I tell you, I have the greatest admiration for the women in our group. I never had a sense of any of the males wishing that they would fail or have any problems or anything. I mean, there was never any of that. They were pioneering into an all-male bastion, one of the last, I guess, the Astronaut Office. But I always felt that everybody considered them equals and they were part of the team, and everybody wished them nothing but the greatest of success. But the press didn't. [Laughs] Let me tell you, the press had the women under a microscope and were looking for the slightest indication that a woman was different than a man. And as a result, the women were paranoid about displaying anything, anything that would remotely be construed as, "Oh, you're different than a man."

When Judy's hair got jammed in that camera, Hank was going to call MCC and tell them, "Hey, we're going to miss all of these IMAX filming for the day and may miss it all for the mission, depending on whether Mike can recover from this thing." And Judy looked at him, and I don't remember her exact words, but basically it was, "I'm going to cut your heart out if you so much as say a word over the air about my hair getting caught in this thing," because she knew. —I mean, to us it was baffling, like, "What's the big deal?" But it quickly became apparent to us what her concern was, was that if that was blabbed to the whole world, it would be the thing—it wouldn't matter how well Judy did on the mission, all the things she did, she would be remembered as the woman who had her hair that jeopardized the IMAX. "Women are different than men. Their hair's long," that type of thing. That's what the press would pick up on. She knew it. That's what the press would pick up on. So as a result, she absolutely was adamant that

nobody say anything over the air about her hair getting caught in that IMAX. That was one example of that.

Another one occurred later in the flight, too, when our urinal on our toilet failed. We couldn't use the urinal. Obviously, it's a trick urinating in weightlessness. I think it was Judy observed, men are at an anatomical advantage on camping trips and space trips in using that urinal.

MCC called us. The heater on the outside of the dump nozzle failed, so this blob of frozen urine froze on the side of the vehicle, and what they were worried about was on reentry this blob of ice would break off, fly back, hit the tail, gouge out the heat tile. The tail would be burned off, and the Shuttle would crash. I thought of my life being threatened in many ways, but never by a block of frozen urine.

Any rate, so we ended up using the robot arm. Hank used the robot arm to knock this piece of frozen urine off, but we were prohibited from using the urinal from that point, because they didn't have any way of dumping it after that. But there was still some of what they call ullage, which means there is room left in the tank for some urine. MCC called up and said that they estimated there were like, I don't know, like three man-days of ullage left in the urinal. It was clear what they were saying: Judy could continue to use the urinal. The men are going to use the plastic bags, which, let me tell you, is a mess to do. But Judy could use—I mean, they didn't say it, but it was obvious that, hey, we've got one woman aboard. There's three days of ullage, three man-days of ullage left. Let her use it. But Judy didn't, because she knew, she knew that if she did, and she got back to Earth, the press would eventually pick up on it. "Aw, they had to cut this woman some slack. Women are different than men. They had to cut her some slack and let her use the urinal. The rest of the men had had to pee in plastic bags."

So that was another indication of how these women were—all of us had the paranoia of "We don't want to screw up. We don't want to screw up, not for ourselves, not for the team. We don't want to let the team down. We don't want NASA to look bad." We had this intense



pressure. “Don’t screw up anything.” Well, the women had all of that and then the extra pressure of never revealing, of never having the slightest revelation that they might be different than men come out. They couldn’t afford it, because the press—nowadays it wouldn’t matter. If a woman got her hair stuck in a camera, nobody would care. But for those women that were flying those first couple of missions, they were under a microscope by the press. So you saw it manifested in several different ways in that area.

What was the question? I rambled here.

WRIGHT: Let’s talk more about this situation that occurred with the frozen icicle.

MULLANE: The urincicle?

WRIGHT: Yes. You were called onto possibly—

MULLANE: Possibly do a spacewalk, yes. Hawley and I—which we were really hoping for. Hawley and I had trained as the backup—what do you call them? The contingency EVA [Extravehicular Activity] crew members, in case there was a problem. There was no planned EVA, but they always have two crew members trained in case there is a problem that requires an EVA. So Hawley and I did a—I guess we prepared to do a spacewalk. I later heard on the ground that the ground really felt that was a real long, long, long shot, that they would ever send out anybody to do a spacewalk to get rid of this thing. They felt like they would be able to do it fine with the robot arm, which they did. But, of course, Hawley and I were praying that they would call us and say, “Go out on a spacewalk and knock this thing off.” But I was really looking forward to that, but it wasn’t to be, didn’t happen. Hank used the robot arm and reached in there and knocked the thing off.

WRIGHT: Hank Hartsfield had training on the RMS [remote manipulator system]?

MULLANE: He had used the RMS on his mission, STS-3. He'd used the RMS on his mission, I think, and so he was trained. Judy was trained on it, too. I don't remember the logic process by which Hank used the arm and Judy didn't. I don't remember what the rationale was there, but I remember Hank used it to knock off that urine. So we'd better hope that any aliens that are in orbit go by the old Boy Scout adage, "Don't eat yellow snow." [Wright laughs.] Because there was going to be a blob of it floating around up there.

WRIGHT: Our research has told us that during this situation that you guys became very resourceful of having to handle all of the lack of sanitary efforts up there. You ended up using some of your used clothing to help—

MULLANE: Yes. Here, let me tell you about peeing in a plastic bag in weightlessness. I'll get really graphic here. When your bladder is full and you're urinating, the urine separates from your body and moves away. And when you have the urinal, it's being sucked down that urine hose and going into the waste tank. Now, when you are using a plastic bag, the first thing we did was we tried to pee in a plastic bag, and that urine would hit the bottom of the bag and splash back out, and so you would have urine floating around, or you'd be trying to trap it. We figured out then that if you took articles of clothing—and socks worked really great. We put socks in the bottom of those, but any other dirty clothes would work fine, too. And you urinate, the wicking action would still work fine in weightlessness. Things would wick in to the cotton or whatever it was, the clothing.

But you had to regulate your bladder, your flow rate of your urine to not exceed the wicking capacity, because if you did that, then it would start splashing again. So you had to be careful, regulate your urine flow rate to make sure it didn't exceed the wicking capacity of

whatever it was that you had down there. And that worked pretty good. The problem is, as your bladder pressure dropped off, a big ball of urine would stay with you, would stay on you. So then you had to use tissue to mop that off of you. That was a lot of fun, let me tell you.  
[Laughs]

WRIGHT: Make for some interesting conversation at the dinner table.

MULLANE: Oh yes. Oh yes.

WRIGHT: Come up with a plan of sharing what worked and didn't work.

MULLANE: I remember Judy was floating in the cockpit one time and had on a pair of socks. We all just wore these socks up there, and we were getting down into the mission, and we didn't have a lot of clothing, and people were talking about—and I remember Judy was floating. Just kidding, I went floating over. I grabbed her feet, and I started pulling her socks off, like "I've got to go to the bathroom. I need your socks." And she was screaming, "I'm being socked! I'm being socked!" [Laughter] That was real, real interesting.

Another thing that's disgusting up there is when people are vomiting from space sickness. That is bad. I didn't get spacesick up there. We all floated around. As rookies, we had our barf bags out of our zippers ready for a quick draw in case we ended up getting sick, and it's one of those things, again, paranoia things, like every single time your stomach does anything, it's like, "Am I getting sick? Am I getting sick?" And it takes a couple of hours before you finally decide, "Well, no, I'm not getting sick."

But a couple of people on the crew did get sick, and that's disgusting. Like I tell people, even if you're not sick, if you're sitting in a volume hardly bigger than the back of a pickup truck and people around you are vomiting, that doesn't do anything for you. I remember taking

somebody's bag that had vomited and stowing it in the wet trash container, and I remember Hawley looking at me, as I had this warm bag of barf that I'm pushing into this wet trash container. He says, "Well, I guess you must be feeling okay." [Laughs]

I says, "Yeah, so far so good." But that is disgusting.

I remember somebody threw up once, too, and I felt something on my cheek, and it was barf. So there's some nonglamorous sides of being an astronaut, certainly.

WRIGHT: Hopefully, it met all the expectations that you had wanted and more.

MULLANE: Of the mission?

WRIGHT: Yes.

MULLANE: Absolutely. Absolutely. It was just the most joyous thing, and it was so wonderful to be part of a mission that went so well. I mean, we had the urine problem, but the satellites all were released, because before that, they had had some problems with satellites blowing up after they released. You didn't want to have your name associated with anything that had failure on it, and even though for those earlier missions—it wasn't the crew's fault that the rocket blew up after it was—not blew up, but it had a—what was the problem with those PAMs? They had some problem with the PAMs. I don't remember what it was. They didn't ignite or something? I guess they didn't ignite. That's what it was.

Any rate, ours worked perfectly. Everything went very well. And you just had this—it was just this ultimate high to be part of this great team, to have a great mission, to have everything go well, or most everything go well.

And looking out the window was, obviously, a dream come true. I remember my first sleep period. The rest of the crew slept downstairs because it was so light upstairs and so hot.

So they would put their sleeping bags downstairs, and I took my sleeping bag upstairs, and I stretched across the cockpit and floated into it, so I was looking out the overhead windows, which were looking down on the Earth, because we had our top to the Earth. So I had this Earth in my face, and I just sat there, and let me tell you, you cannot go to sleep looking at something like that.

So I would sit there and look out at the world down there, looking at the oceans and the landmasses, just totally fascinated. And then the sun would set, eventually, and the sunset and sunrise are beautiful.

I think if there's one thing that you could truly say is the most beautiful sight you can possibly see as a human, it is watching sunrise over the Earth, because imagine, you're looking at blackness out the window, black Earth, black space, and then as the sun comes up, the atmosphere acts as a prism, and it splits the light into the component colors. It splits the white light of the sun into the component colors, so you get this rainbow effect, and it starts with this deep indigo eyelash, just defining the horizon, and then as the sun rises higher, you get these reds and oranges and blues in this rainbow. For a couple of seconds you will have this brilliant rainbow defining black, black Earth, black space, and this color rainbow right there splitting across it. You never got tired of looking at those. And in sunset it was in the reverse. But those were always beautiful to watch.

But what had happened when I was sleeping there, is that the sun would finally go down, and I'd finally fall asleep, just from exhaustion, and then the sun would come up forty-five minutes later, light up the cockpit, and I'd wake up, and then it was like, wow! Look out the window, and forty minutes later fall asleep. I mean, it doesn't make for a good night of sleep, but I'm sure I don't think I got a couple of hours of sleep up there the whole—any particular night. I can sleep back on Earth. How many times could I ever look out the window from space? So I tended to cheat myself from the sleep.

Also, I didn't do any of the exercises. Again, I thought, there's no shower, why do I want

to exercise, get all sweaty? And there's an hour that you're involved, probably more than that when you think about getting ready for it and doing it and cleaning up afterwards on the treadmill. Why do I want to do this? I'll take that hour and look out the window. And it was a short mission, so I didn't feel like it was—on a space station, you'd better exercise, but on a six-, seven-day mission, you don't need to exercise. You'll be fine.

WRIGHT: What opportunities did you take to take pictures, photos?

MULLANE: Every opportunity. I sat there at every opportunity taking pictures, taking photos, just clicking away at anything and everything that looked interesting, bringing them back. On a low-inclination orbit like that, you don't really—a lot of it's ocean. The world's a big ocean, but still, we got some great photos.

WRIGHT: The mission ended. You landed at Edwards.

MULLANE: Edwards. All three of my missions landed at Edwards. Yes, it was—

WRIGHT: Was that kind of a homecoming? You were back to where you'd spent some time there?

MULLANE: No, not really. Oh, I spent some time there, but it wasn't—I never considered Edwards a real part of home, I guess. It was fun to land there. Yes, reentry and landing were pretty straightforward. I remember the G-forces seemed to me to be very high on reentry, even though they were under 2, 1.8 or something, but because you'd been weightless, you feel like you have an elephant on your back on reentry.

Watching the glow of reentry out the windows was a kick. Entry is not very scary. I

mean, you do have some thoughts in your mind, “Well, I hope this thing holds together, and I hope these engineers knew what they were doing,” but it’s not like launch. Launch is terrifying, but entry is fairly relaxing.

WRIGHT: When you returned—

MULLANE: Oh yes. You asked about returning, yes. We landed, and the wife was there to meet us as we got off that bus. All the wives were holding their nose as they embraced us, because they were embracing guys that hadn’t had a shower in a week. I’m sure the flight surgeon, when they crawl into that cockpit after landing, have to gag, too. And after a while you get used to those smells. You don’t smell them. But I’m sure the cockpit must smell of vomit and urine. Can’t imagine what it must’ve smelled like for the flight surgeon to crawl in there right after we landed.

But I remember, I was so high. I was just absolutely, just—I wanted to scream. This mission was complete. I was an astronaut now. There was this sense like, “I don’t care what happens now. I have this flight under me. I can say I’m an astronaut now.” Because up to that time I never considered myself an astronaut, even though NASA gave you the title “astronaut.” Like I tell people, that’s sort of like being—as a matter of fact, they gave us this silver pin. They don’t give it to us; we have to buy it. But once you go from astronaut candidate to astronaut, you get an astronaut pin that’s silver. Then when you fly, you can buy a gold one. And you’re not really an astronaut until you’re wearing that gold one, and I remember I never wore my silver one. I don’t think I ever put it on, because I remember telling somebody, I don’t know who it was, to wear that, to consider yourself an astronaut, to me it would be like wearing stewardess, flight attendant wings, and saying you’re a pilot, that type of thing. To me it was like you’re not an astronaut until those SRBs ignite. So I had this overwhelming sense that I had finally accomplished this life mission.

I remember on the plane, the STA [Shuttle Training Aircraft] flying back, I had a beer, and I was telling—I probably had about ten beers, because I remember telling Mike Coats, I said, “Watch this. I can drop this and grab it.” Of course, I dropped it, and the beer spilled everywhere. But it was one of those memories. I was just being childish. I was silly. I was just silly on the high of having finally landed from this mission. It was great.

WRIGHT: When you returned home, you served some time as the CapCom [capsule communicator].

MULLANE: Right.

WRIGHT: Could you share with us some of those experiences and what it was like to be in the mission control while—?

MULLANE: I really have to say that being a CapCom was really—it’s a privilege, and it’s also something that gives you an insight into the best team on the Earth, and that’s that MCC. I had the greatest admiration for those people. To see them working together. It’s just there are times when you’re on teams, and usually they’re smaller than that, that click really well, but to have a team that large that is that trained and that good, I really felt proud of being part of it, and every astronaut should be a CapCom. I hope that’s part of the training. Every astronaut should get in there and be part of the CapCom because it is just such a neat view of what NASA’s all about. That’s the heart of NASA in that MCC.

In fact, that’s one thing, too. I was always outraged at the politicians that flew, all of them. Jake Garn, Bill Nelson, John [H.] Glenn [Jr.] even. I was against John flying. I felt that was again a flight for public relations purposes that was inappropriate. But any rate, I remember Garn and Nelson justified those missions that they needed to see how NASA operated to better



vote on NASA bills or something like that. I remember thinking, if you want to know what NASA is like, you don't ride a Shuttle; you sit in that MCC. If you really want to know what NASA truly is, sit in MCC. Don't ride a Shuttle. The analogy there would be saying, "Okay. I'll show up for a vote on the Senate floor, and therefore, I'll know how the Senate operates." You've never gone to any of the behind-the-scenes meetings. You've never gone to any of the lobbyist actions and all this other stuff associated with getting to that point. It's the same analogy. You don't know what NASA's like flying on a Shuttle. You know what NASA's like sitting in that MCC. So I felt very privileged that I got a chance to do that.

WRIGHT: The first launch from the Vandenberg [Air Force Base Space Shuttle] launch complex [California] was to be STS-62A, and you had been selected for that.

MULLANE: Right.

WRIGHT: Tell us about that selection and your whole reaction to being part of a new launch complex and being part of that first crew.

MULLANE: That was another high point in my career. Actually, I had been assigned to another flight, and I don't remember—or I don't think I had formally been assigned to it, but there was a mission, a military mission that my name was kind of attached to. It was kind of a given that I was going to end up flying on this. And then I got pulled off of that and switched over to the 62-Alpha mission, and I was really happy about that. The idea of flying into polar orbit, oh, man, I was just looking forward to that so much. You're basically going to see the whole world. In an equatorial orbit like we were flying, or a low-inclination orbit like we were flying on the first mission, you don't get to see lot of the world. So I was really looking forward to that. And I really liked the military missions. I ultimately flew two more missions there, both military

missions. I really enjoyed working with those people. You had a sense of this national security involved about it, which made you feel a little bit more pride, I guess, in what you were doing and importance in what you were doing.

The first flight on Vandenberg, first polar mission, it was something I was really, really looking forward to. And again, I thought we had a great crew there, too.

WRIGHT: Did you have any apprehensions or concerns about launching from a complex that hadn't been tested before?

MULLANE: No, not any more beyond—I had the natural terror of riding a rocket. I don't care where it was launching from. I didn't personally have any fear about it being a new launch pad and therefore more danger associated with it. It's just that on launch on a Shuttle, you fly with no escape system—no ejection seat, no pod, no parachute of any form. You fly in a rocket that has a flight-destruct system aboard it, so it can be blown up in case something goes wrong. Those are reasons why you're terrified. It's not where you're launching from, in my opinion; it's the inherent act of flying one of these rockets is dangerous.

WRIGHT: This mission got delayed because of a number of issues.

MULLANE: Well, certifying the pad delayed it and delayed it and delayed it until eventually *Challenger* occurred, and then they canceled any Vandenberg operations for the Shuttle. Obviously, *Challenger* was the major factor there. I was crushed that I lost this mission, but that was minor compared to the trauma of *Challenger*.

Did you want to ask any more questions before we get into *Challenger*? I expect *Challenger*—

WRIGHT: I was going to ask you about *Challenger*, where you were and how you heard about that mission.

MULLANE: *Challenger*, I was with the rest of the STS-62 Alpha, the Vandenberg crew. We were in training at Los Alamos Labs here in New Mexico. One of our payloads was being developed at Los Alamos Labs, so we were up there at Los Alamos. We were in a facility that didn't have easy access to a TV. We knew they were launching, and we wanted to watch it, and somebody finally got a television or we finally got to a room and they were able to finagle a way to get the television to work, and we watched the launch, and they dropped it away within probably thirty seconds of the launch, and we then started to turn back to our training.

Somebody said, "Well, let's see if they're covering it further on one of the other channels," and started flipping channels, and then flipped it to a channel and there was the explosion, and we knew right then that the crew was lost and that something terrible had happened.

I tell you what I thought had happened, is that somebody had either inadvertently activated the vehicle destruction system, or it had inadvertently—I thought there was some malfunction that caused the flight termination system, the dynamite that's on the SRBs and the ET [External Tank], to go off. I was certain of it. I mean, the rocket was flying perfectly, and then it just blew up. It just looked like it had been blown up from this dynamite. Shows how poor you can be as a witness to something like this, because that had absolutely nothing to do with it.

But it was terrible. Judy was killed on it. She was a close friend. There were four people from our group that were killed. It was a terrible time. Really as bad as it gets. It was like a scab or a wound that just never had an opportunity to heal because you had that trauma, and we left Los Alamos and flew back to Houston. I remember on that flight the air traffic controllers gave us clearance to Houston, which normally you don't get a clearance to Houston.

You fly various navigation points. And obviously, the air traffic control people knew that any NASA plane out there was wanting to get back to Houston. So we took off from Albuquerque, and the guy said, "Clear Houston direct." Each time we checked in on another frequency, the flight controllers offered their sympathies, and cleared us to continue to Houston.

It was dead quiet in the formation. I think we had three airplanes, three T-38s, and everybody was just lost in their grief at having lost the vehicle and lost the people.

My wife met me at Eglin. Started going to the memorial services. Started going to the wives', the widows' houses to console them. It was terrible, going to the memorial services. It was one of those things that didn't seem to end, because then—they were looking for the cockpit out there. I personally thought, "Why are we doing this? Leave the cockpit down there. What are you going to learn from it?" Because by then they knew the SRB was the problem, a couple of weeks into it. Actually, a couple of hours into it, they knew the SRB, because they looked at the video from the launch on one of the different angles, could see the black smoke from the SRB failure.

But I remember thinking, "Why are we even looking for that cockpit? Just bury them at sea. Leave them there." I'm glad they did, though, because later I heard it was really shallow where that cockpit was. It was like, I don't know, like eighty feet or something, which is too shallow, because somebody eventually would have found it and pulled it up on a net or been diving on it or something. So it's good that they did look for it.

So you had these several weeks there, and then they bring that cockpit up, and then you have to repeat all the memorial services again, because now you have remains to bury. And then plus on top of that, you had the revelation that it wasn't an accident; it was a colossal screw-up. And you had that to deal with. So it was a miserable time, about as bad as I've ever lived in my life, were those months surrounding, months and years, really, surrounding the *Challenger* tragedy.

WRIGHT: What duties were assigned to you during that time?

MULLANE: I don't remember I had any duties. I remember the Air Force sent us around the globe on a "re-bluing" exercise to reacquaint us with what the Air Force did and how they used space assets. I think the Navy did that, also. I did have. I'm sorry. The duty I had was working the flight termination system. NASA wanted to go back and look at everything, not just the solid rocket boosters, but everything to determine, is there another *Challenger* awaiting us in some other system. I was assigned to the flight termination system, which is the dynamite system that blows up the vehicle in case she goes out of control.

That was a—I always felt—again, it was a moral issue on this dynamite system. I always felt it was necessary to have that on there, because your wives and your family, your LCC people are sitting there two and a half miles away. If you die, that's one thing. But if in the process of you dying that rocket lands on the LCC and kills a couple of hundred people, that's not right. So they should have dynamite aboard it to blow it up in case it is threatening the civilian population.

That was my view. It was not the view of some of my superiors. And I could not go to the meetings and present their position. I couldn't. I mean, to me it was immoral. It was immoral to sit there and say we fly without a dynamite system aboard. That's immoral. And we threatened LCC; we threaten our families; we threaten other people. We're signing up for the risk to ride in the rocket.

That was another bad time of my life, because I took a position that was counter to my superior's position, and I felt that it was jeopardizing my future at NASA. I didn't like that at all, didn't like the idea that I was supposed to just parrot somebody's opinion, and mine didn't count on that issue. As I turned out—and the Air Force, of course, who was responsible for the flight-termination system, they absolutely were adamant that it remain, because they are the ones that are responsible for the safety of civilians around there. If the rocket went out of control and landed on Orlando [Florida], NASA wasn't going to get crucified. It was the Air Force, because,

by law, they're the ones who are responsible for the safety of the civilians.

So I did not like that time of my life at all. I felt I was really—I had an astronaut come to me once; in fact, it was [Ronald J.] Ron Grabe, who was sitting outside—I don't want to use any names here, but a superior's office, who heard my name being kicked around as a person that was causing some problems. And that's the last thing you want in your career is to hear that your name is in front of people who make launch crew decisions, who make crew decisions, and basically, it looks like I'm a bad apple. But I just couldn't do it. I could not go in there to those meetings with that position this superior wanted me to take. I said, "You go. You do it. I can't. It's immoral." Any rate.

By the way, the end of that is that the solid boosters retained their dynamite system aboard. It was taken off the gas tank, making it much safer, at least now two minutes up when the boosters are gone, we don't have to dynamite aboard anymore, so it could fail and blow you up. But that's the right decision right there. You protect the civilians; you protect your family; you protect LCC with that system.

Okay. I'm sorry.

WRIGHT: No, that's okay. The Orbiter did return to flight, and you were on the second mission [STs-27] after that time period.

MULLANE: Right.

WRIGHT: Tell us about that selection process, and the fact, too, that you were going to be flying a DoD mission and how different that was.

MULLANE: Again, I have no idea how the selection process was made, because it was all too secretive, but I got assigned to the second mission, and again, a great group of people. [Robert

L.] Hoot Gibson is an outstanding commander, really enjoyed working with him and with Guy [S.] Gardner and the rest of them. It was just a great group of people. That was one thing; I was blessed. There were other crews that had problems. There's frictions and tensions among crew members, personality conflicts and stuff, but I never saw that on any of my missions, or if it was, it was sure buried deep, because it just didn't manifest itself, and it was just a pleasure working with these other folks.

The DoD aspect, again, I really enjoyed working DoD. It was another team that was superb amongst these other teams. It was like having this other opportunity to serve with some really truly great, great people associated with a mission that was being overseen by a group of great, great people, and being a crew member with a good group of people. So I felt very privileged, really had a good time with these folks. They were very professional. I can't talk about the payload, obviously, since this was a Department of Defense mission. But I did get to use the robot arm associated with the payload. I guess I can say that. And it was a highlight of my life to be able to do that, use it.

WRIGHT: How was the training different since you were working with payloads that were not open to the public for information?

MULLANE: Well, from our crew point of view, it wasn't—I mean, all the software was classified. The people that were working on it, the MCC, everybody supporting it had to have clearances, but that was pretty transparent to us. We would go to a simulator. We would see our software. We would do our thing and launch the missions or launch the payload and do the—it was pretty transparent to us, the security aspects of it.

WRIGHT: Did you have any concerns of getting back on for a launch since you had just witnessed *Challenger* just two years before?

MULLANE: That's a common question. A lot of people, when they hear you flew once before *Challenger* and twice after, assume you must've been scared more after *Challenger*, and I said no. I was terrified on my first launch, I was terrified on my second, and I was terrified on my third. *Challenger* did not change the fear factor at all. If anything, it was a very slight sense that it was safer on the post-*Challenger* missions than it was before because people were more focused. Disasters tend to do that, tend to focus folks. So I had this sense of maybe a little slight less apprehension about my second mission, although in lots of ways I was still terrified. *Challenger* didn't change a thing.

WRIGHT: After STS-27, just a couple of years later, you were flying on *Atlantis* again, on STS-36.

MULLANE: By the way, on STS-27, there was one aspect of the 27 flight that I thought I would mention. On STS-27, after we got in orbit, MCC called us and asked if we saw anything go by the window during launch, which those are the type of calls you don't want to get. And we said, "No. Why do you ask?" And they said on one of the engineering cameras that they look at after launch, they saw what appeared to be something breaking off the tip of the solid booster and flying down, and they were wondering if he had saw it, and then they wondered if it hit the Orbiter belly. And so they sent up instructions for me to use the robot arm to bend around and look under the belly, and we saw a lot of damage to the heat tiles. Something obviously had damaged those heat tiles, which gave us a little bit of concern. You don't need them in orbit. You certainly need them coming home.

And I remember there was a case where MCC and the crew were kind of at odds over the damage. We were looking at this and saying, "My god, that's a lot of damage." And we saw one place looked like a tile was completely missing, but it looked to us like there was a lot of, lot



of damage on the belly of this thing. We told MCC, and MCC just kind of seemed blasé about it, like they were looking at the video, and they just didn't have a sense of urgency like I think we did, and expected them to have. It kind of baffled us. We said, "Why are they not more concerned about this?" It was obvious to us there were probably hundreds of tiles that were damaged.

And when we came back, it turned out that the video was such a poor quality with the sun shining on those black tiles, it's hard to see things, is that they really couldn't see what we were seeing, and they saw a few scrapes and scratches and stuff and didn't think it was all that big of a deal, and I think everybody was shocked when the vehicle landed, and I think they ended up changing out like 700 heat tiles or something. It was a lot of heat tiles they had to change out that were damaged on that thing.

I remember we were all kind of looking at each other and says, "Why are they not more concerned about this? Look at it. It's lots of damage out there." But again, it was just the video, the quality of the video that we were beaming down to them.

I'm sorry. Go ahead with your question.

WRIGHT: No, that was a great comment. I was going to ask you about STS-36 and how that DoD mission compared to or how was it similar to the others.

MULLANE: It was similar, and I really can't go into any details at all about the payload or any aspect of the payload. I can tell you again, it was a great crew. I know you're tired of hearing that, probably, but a good group of people, both on the DoD side, the NASA side. We were, again, thoroughly trained.

The thing that I liked about STS-36 was it was the highest inclination that was flown and is the highest inclination ever been flown on the Shuttle, 62 and a half degrees. Is that right? Yes, 62 and a half degrees, I think is what it was. I know it's the highest inclination that's ever

been flown on a Shuttle, which means the tilt to the equator, so you see more of the Earth. So that was a kick to have that opportunity.

By the way, going back on STS-27, that was the first time on that mission, because of the orbit tilt, that I was able to see my hometown, Albuquerque. On the first mission, the only part of the U.S. that you go over is extreme South Florida or the southern half of Florida and a little bit of South Texas. So you really don't get over the continental U.S. It was only on my second mission that I got to fly over Albuquerque and look down, and I'll tell you, that was a very emotional moment, because here I am looking down on this area, this desert, this cradle of this dream of a child, where I used to launch my homemade rockets, and now I'm flying over this thing, these many miles up looking down. It was a dream come true. I really felt complete on that second mission, getting to see my hometown. And of course, I got to see it on the third mission, too, because it was even tilted more to the equator.

WRIGHT: You did mention that you used the arm.

MULLANE: Right.

WRIGHT: How did it compare using it in space as you trained in the simulator?

MULLANE: Very similar. I felt that I was well prepared through the simulation: The simulations were very good. I didn't really find anything that surprised me in the use of it. Just was very careful. Didn't want to bang anything. I felt really, really good about it. Well prepared. The simulations were perfect.

WRIGHT: Before your last mission launched, you announced that you were going to be retiring.

MULLANE: Right.

WRIGHT: What led to that decision, and specifically why at that time, from the Air Force and from NASA?

MULLANE: Oh, it was a combination of factors. I was frustrated with our management. That's one thing I was frustrated with. I was frustrated that there wasn't better visibility into flight assignments, and you couldn't really plan your life very well not knowing what the plans were to fly you and what missions you might fly. That was kind of frustrating. That was part of it. The stress on the family was incredible. The stress on me was incredible for these things. It was a tough decision, very tough.

In fact, I remember thinking that I wished almost—I did wish, that there would be some minor physical defect that the docs would see and take the decision from me and say, “Oh, if you stay, you're never going to fly again” so I didn't have to make the decision. It was one of those things that I wanted to go off—this house had become—my father-in-law had passed away. My wife inherited this house, so it was sitting empty here in Albuquerque. We always wanted to move back to Albuquerque. The kids were out of high school, so we didn't have to worry about changing them from high school. There were a lot of personal reasons, and the unknowns of staying with the Shuttle Program.

Personally, another thing in the back of my mind is that I could stick around here for another two or three years for another flight. Then there could be another *Challenger*, and you've wasted that time. There was also that sense, is there going to be another big glitch in this program, maybe not a *Challenger*, but something that's going to ground it for a year, and I didn't like being there when we weren't fully employed and certainly in those years after *Challenger* to when we got assigned to a mission certainly was underemployed. There was just not a lot to do. So I had in the back of my mind that fear that I may be staying here and not ever fly again

anyway. The stress on my family, the house, the fact I'd done it three times.

I think if God could have come down and told me, "If you hang around for two years, you'll fly another mission," I would have stayed. If I would have had that visibility that it was going to happen, I would have stayed. Particularly if God would have said, "You're going to get a spacewalk," I would have definitely stayed. But again, that secretiveness about the flight assignments always bothered me. I thought that was bad for morale. I hope it's better now. I do. It's just bad for morale.

WRIGHT: Looking back during your career with NASA, what do you find to be the most challenging aspect of that time?

MULLANE: The most challenging aspect of being an astronaut? The wait. I was there for twelve years, and I flew a total of two weeks in space on three missions. That was the most challenging part, I think, is not being—when I was assigned to a mission and then obviously flying a mission, were the best times of my life, bar none. Absolutely the best times of my life. And that probably occupied—let's see. It's probably a year and a half involved in the training and the flying and the mission. That's four and a half, five years of twelve years were really, truly, absolutely the best years of my life when I was doing those things.

I don't know that I had a good personality for the waits, waits between the missions. In fact, sometimes I look at my own personal—my personality is, I like instant feedback. I like to do things and see the results. That's why I enjoyed missions where I could use the robot arm. I did this. I did it. Of course, with the support of the crew and all the trainers and all of this thing, but I could see the results of my actions, releasing a satellite, using the robot arm, whatever it is. And that was very, very fulfilling.

Most of the things in NASA are long, long lead times. I remember after, I think it was after my second mission, I was working up in Canada on the robot arm that's going to be used on

the Space Station, and this is back like in 1988 or so. And this thing just recently was put up there a couple of missions ago, that robot arm. And that, to me, was very frustrating, the idea that I'm working on something that I will never, ever touch. It's a decade in the future, at least. And there's a lot of things about NASA like that. A lot of payloads, a lot of things that just take a long, long time. And I guess I have to admit, my personality isn't well suited for that. I have a hard time being passionate about something that's so far off in the future.

And thank God there are people that can devote a whole life to one payload that launches or something. In many cases, that's a fact. They devote their whole lives to some contractor, some experiment or whatever, and I'm glad there are people like that, but I do have a personality that isn't well suited for that. That's probably another aspect of why I left after the third mission.

WRIGHT: Is there a moment in time or an event, activity that you consider to be your most significant accomplishment?

MULLANE: The DoD missions I feel very proud about. Even though I can't talk about them, I feel very, very proud about those DoD missions. I felt like that was something that had a significant impact on America's security, and I was part of it, and I felt really, really good about those two missions.

WRIGHT: Before we close today, I was going to ask Sandra if she had some other questions for you that she might like to ask.

MULLANE: Sure.

JOHNSON: Going back to 41B when you were training for the satellite deploys, did you go to the vendors where the satellites were actually created, and if so, do you feel that that helped you

understand what you were going to be doing on that mission?

MULLANE: Oh yes. Yes. Yes, we did go to the vendors, both the people who made the propulsion module as well as the satellite on top of it, and that absolutely helped, to see the hardware, real hardware, talk to the engineers about various aspects of the deployment sequence, things to watch for. It was absolutely necessary and very beneficial.

When I look back on all three of my missions, the only surprise I had on all three of my missions was that SRB separation, the quiet that occurred after that, smoothness of flight. Either nobody ever commented about it, or it wasn't significant to other people, but that was the only thing I remember thinking, "What is this? What's going on?" All the rest of them, I felt like whatever I was doing, I had done a thousand times before, because I had done it a thousand—well, probably two thousand times I had done it. It was very well done. NASA's training is superb. Hey, any training program that puts a camera in the bottom of the toilet trainer is a great training program, let me tell you. You've heard that story, I'm sure.

WRIGHT: Share it with us.

MULLANE: Well, the Space Shuttle toilet, for solid-waste collection, has a very small opening on the top, and it has to be small because they focus air flow to come in from 360 degrees around in toward the center, and then it's being pulled down by a fan down inside of the toilet to draw the waste away from your body. And to use this thing effectively, aim is critical, because that opening is so small. So NASA built a toilet trainer that we have there in Houston that has, inside the toilet trainer, an upward-pointing television camera, and there's a television in front of the toilet. You sit on this toilet, you look at unmentionable things on that TV screen, and you wiggle around until you got a bull's-eye. And then you memorize where your buttocks and thighs are in relation to the landmarks of the seats so up in space so you can get a bull's-eye every time.

In fact, there is somebody you guys ought to interview, I think, are the people who were involved with the design of the toilet. Before, they were using plastic bags and all that. I talked to this colonel, Air Force colonel, Colonel Kersey [phonetic], I think was his name, who flew the KC-135 out at Edwards when they were developing this thing. There are some unsung heroes out there, let me tell you. They flew bunches of nurses up there, because they knew they were going to have to address female waste collection, which they'd never addressed before in the history of the program. They had these nurses sit in the back of this KC-135 drinking gallons of iced tea and going up and doing these parabolas, while they urinated in various designs they were trying—while photographers filmed them so the engineers could better understand flow separation and collection and all of this. Who were those women? Don't have a clue. Their names aren't anywhere. But they're unsung heroes.

You had people that waited. He told us there was a lieutenant that volunteered, male, for solid-waste collection. When he had to go, he picked up the phone and said, "I gotta go," and they scrambled into the airplane and went up there, here's this guy doing his thing on this toilet while they're doing this zero gravity, trying to make sure that was going to work.

I heard that at JSC, because the engineers needed data on urine separation from females, put a camera in a—I didn't see this, but I heard it. You'd have to verify it with the JSC people, but put a camera in one of the toilets in one of the buildings there, put a sign on it telling women that if they wanted to volunteer for science, they could use this, and their private parts were going to be filmed while they were urinating, so the engineers could get some idea on flow separation and various ideas on how to collect urine from females. And who were the women that volunteered to do that? They probably don't want their names out there.

But the point is, there were a lot of people who never flew in space that volunteered to do some pretty raw things to make it more comfortable for us after we got up there. I'll sure buy them a beer some day. [Laughs] I didn't like using plastic bags, so whoever it was that got that toilet working, well, I'm appreciative of them.

JOHNSON: I just have one more. I was wondering, you mentioned before the stress on you when you didn't have the launches, and the stress on the families, all throughout your career, and I was wondering if you could just talk for a moment about NASA's support system for families.

MULLANE: [Laughs] You ought to bring my wife in and ask that question. To be honest with you, before *Challenger*, the support system wasn't very good. Not from the—we all supported each other, but here you had the family, we get in our jets and we fly down to the Cape to go fly. Before *Challenger*, the families did not fly in the STA down to launch. So here the families had to make their own arrangements to get down there. There was no guarantee when the mission would fly and when they'd get back, so the flight reservations were always a pain. Condo reservations were always a pain because there might be sometime where, "Okay. We're going to be down there from this date to this date." Then the mission delays for a couple of days. Well, we got to stay longer. Well, they've reserved the room for somebody else coming in.

It added a stress on the families that they didn't need. I wrote a novel once, and in that novel I used that experience and said—this is an exaggeration, but it kind of hints at it, is that NASA would have just as soon had orphans, unmarried orphans flying, because then you don't have that baggage of a family. Now, that's a little severe. That's a little exaggeration, but there wasn't a lot of help given to the families by the NASA organization, particularly flying them down, having somebody there reserving blocks of rooms, making sure that they didn't have to deal with any of that. That did not occur until after *Challenger*.

The family escort was there ahead of time. I mean, that was there all the time, but it got a lot better after *Challenger*. Then they started flying the families down, had a full-time person, Trudy Davis, was taking care of—you ought to interview her if you haven't. She could probably tell you some real interesting stories. [Laughs] She's retired now. I don't know if you know Trudy, but just ask anybody about Trudy Davis there at JSC. She was the one that would handle



a lot of the families' situations down there. That was great. After *Challenger*, NASA got their act together and really did a great job on supporting the wives. But before that, they were lacking.

You know, there's another thing, too. NASA had the foresight to see disaster before *Challenger*. Some of the procedures that were in there, the family escort, clearly, they knew what the purpose of that was. After *Challenger*, they tightened up on some of the rules so you didn't have family members sitting out there with a camera in their nose when the rocket blew up as they did with the McAuliffes and some of those other things that happened there.

Again, going back to the families, you ought to read the procedures that the families have to follow when they're down there, because on launch morning, the families have to pack and have all their bags waiting for checkout at the condos, even though there's a pretty good chance, weather and all that, that the rocket's not going to fly, and they're going to be checking back in. So you ask your question, why would NASA require them to pack all their bags and have them ready to go? And the reason is, is because if the rocket blows up, they don't want those families having to go back, have access to the press, checking out of a condo. So they require them to have their bags there, ready to go, so if there's disaster, an astronaut will go back, pick up those bags, they don't have to go to go to the rooms and do anything. They're all ready to pick up the bags and take them away.

So there's another aspect of that, that the wives know exactly what they're doing. They're not dumb. They know they're packing up, and they're put on that LCC roof not for the view. They're put there to shelter them from any press that might try to get to them. So NASA had those rules in place before *Challenger*. They just weren't as tight as they should've been. They made some better adjustments afterwards. But as far as the support, the support amongst the astronauts was always there, the families, was always there. It's just that NASA made a great leap forward after *Challenger* when they started flying the families down.

Actually, I don't think they fly the children. I think they only fly the wives. I have to ask

my wife that. But at least that was better. Still, it's a pain to get kids down there. But I can understand there is some limit on room and cost and all that, but at least they get the wives down there on the STA, which is what they should do. And then they have Trudy Davis or somebody like her there to make sure the condos are no issue, and it makes it a lot better for the families.

And then that goodbye on the beach, NASA provides that. That's great, too, to be able to go out there and meet your family, say goodbye.

WRIGHT: Before we end today, is there anything else that you would like to add or any other thoughts or stories that we didn't have a chance to cover—

MULLANE: Probably a million stories, but unless somebody asks the question, I don't remember what they are. It doesn't key on me.

No, I feel very blessed that I got to fly in space. In spite of some shortcomings at NASA, I thought it was a great organization. I think it could've been better, with more insight into flight assignments. That would have infinitely helped morale in that Astronaut Office. I thought that the passenger program was very wrong-headed, flying people for public relations purposes, immoral, even, I would say. But I wouldn't want that to—there are a few things that NASA, I felt, had done wrong, but it was, I would have to say, one of the best teams that I'd ever been with in my life, the best in MCC, the best in the crews and the LCC. No question about it, they were the best, and I felt privileged to be involved with it.

WRIGHT: We end the session by asking you a question, since this is how we started out. You were a young boy, standing out in the middle of nowhere, looking up into the sky, and hoping that one day you'd be able to have that reverse view, which you were able to accomplish. We know that you talk to students and adults alike. What do you tell them about reaching for the stars?

MULLANE: [Laughs] I have a whole program on that, that I talk to students. I tell students that I look back on my life, and there were a couple of things that I did accidentally that put me in a position that made it possible for me to have a chance at flying into space, and those four things, I tell them are: Dream big, set lofty goals for yourself. Don't shortchange yourself. You can be a lot. You don't know what your true capabilities are unless you set the bar very high in your life. So, do dream big. Don't worry about what other people did with their lives, what your parents did with theirs, what your brothers and sisters or friends are doing with those. Just wipe that out. Just set the bar very high in your life and aim big.

The other thing I say, do your best always, because it's going to count. You just don't know when, but it will count. Take care of the only body you're ever going to get. Nobody's going to give you another one. You're going to need it for whatever dream you're pursuing. And make school number one in your life. Education opens so many doors out there, that you've got to get a great education. But those are the things I tell people, is make sure you do those four things every day of your life.

WRIGHT: We wish you the best in your new life with all that you're doing.

MULLANE: Well, thank you.

WRIGHT: And thank you for taking time out of that life and giving it to the project today.

MULLANE: Well, glad to do it, and I think it's a great project, and I hope you compile a lot of great stories.

WRIGHT: Thank you.

[End of interview]