

**NASA JOHNSON SPACE CENTER ORAL HISTORY PROJECT  
ORAL HISTORY TRANSCRIPT**

RONALD D. DITTEMORE  
INTERVIEWED BY REBECCA WRIGHT  
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WRIGHT: Today is August the 24<sup>th</sup>, 2007. This oral history interview is being conducted with Ronald D. Dittimore in Magna, Utah, for the NASA Johnson Space Center Oral History Project. The interviewer is Rebecca Wright, assisted by Sandra Johnson.

Thanks again for letting us come to your office and visit with you today. You began your career with NASA in 1977 at the Johnson Space Center [Houston, Texas] [JSC], and you started in the Guidance and Propulsion Systems Branch. Eight years later you moved to the Office of Flight Director. Tell us how you first came to work in those areas and share with us those first impressions of working in the Shuttle Program.

DITTEMORE: Do you want me to start how I first came to work with NASA?

WRIGHT: I think so.

DITTEMORE: I graduated University of Washington [Seattle, Washington] in 1975. Always wanted to work for NASA in some place, and didn't really apply in 1975. Was working in a company called AirResearch in Phoenix, Arizona. In about the same time frame NASA was looking to hire their first set of Shuttle astronauts, and being enthusiastic, I applied back in 1975 or '76.

What they did at the time, I learned later, is when they got their applicants in, if you didn't quite fit the profile they wanted, they just skimmed your resume and sent it around to some of the other areas that thought they were starting to gear up. We were in the lull of—Skylab was over. They were between Skylab and Shuttle, the gap, another gap that NASA is so familiar with. A number of people had left, and they were looking to start to hire up for the generation that was going to fly Shuttle.

I got swooped up into that and just got a phone call right out of the blue and asked me if I'd be interested in coming to Houston to work in Mission Control [Center, Flight Control Division]. Just to keep a long story short, I thought that was an exciting thing to do. I never interviewed. I never came to Houston ahead of time. I'd never been to Houston, and from Phoenix, packed up my wife and a four-month-old child, and we drove to Houston.

We arrived in August, the second week of August in 1977, having grown up in the West. A shock to our system. I can still remember my wife staying in the hotel; I'm going to work; and it was the same week that Elvis [Presley] died. So that was our introduction to Houston.

But my first day at work, I go to work, and who do I see in the hallway but Alan [L.] Bean. He had stepped on the Moon. I knew all about this. I watched all the flights. He walked by me in the hall. He had his flight suit on. And I went home and told my wife, "This is the place to be." If you're in the aerospace industry, and I always wanted to be in the human space flight business, and I'm walking in the same building where the astronauts have walked on the Moon, I said, "This is it for me," independent of the humidity.

We stuck it out and had a great career, twenty-six years at NASA, and I have to tell you a fabulous time and a great place to work, so much so my own son lives and works at the Johnson Space Center today.

WRIGHT: Tell us about some of those first assignments. You were there when the gap was starting, as you said, to move into the Shuttle era.

DITTEMORE: Back in 1977 they were just doing the drop tests out at Edwards Air Force Base [Edwards, California]. In fact, I drove into Houston when—that morning I got up in the hotel, our last drive in. They were doing the drop tests out at Edwards Air Force Base, [NASA] Dryden [Flight] Research [Center; Edwards, California] facility. We were gearing up for a launch that was supposed to occur in late '78 or early '79. It didn't happen till 1981; a number of Shuttle problems occurred.

But I spent that four years since I was there, between the time I got there and 1981, it was a time of building procedures, creating drawings, all in preparation for flying the Shuttle. We had drawings that were engineering drawings that we were converting to mission operations drawings. We were building procedures from scratch, working closely with Bob [Robert L.] Crippen and John [W.] Young, Dick [Richard H.] Truly, and Joe [H.] Engle, on just how we're going to fly these systems.

I was in the Propulsion Systems Section. I was particularly trained for OMS [Orbital Maneuvering System] and RCS [Reaction Control System] as a flight controller, and so I was building the malfunction procedures. I was building the drawings for the OMS, Orbital Maneuvering System engine, and I was building the procedures to support the way we were going to fly the vehicle before we even knew how to fly the vehicle. All that was in the four years prior to 1981.

About a year or two prior to 1981 we started simulations with great energy. We spent hundreds of hours in the Mission Control Center preparing for the first flight. An exciting time of new learning, developing a brand-new spacecraft, much of which NASA is repeating and will repeat over the next several years as they build an Orion spacecraft with the new launch vehicle Ares 1. They'll go through the exact same thing we did twenty-seven-some-odd years ago.

But that's how I spent the first four or five years, mostly in Mission Control. Started out in the back room in a support role, and was the backup. PROP [Propulsion Engineer] was the front room console position; I was the backup PROP for STS-1, and then I was assigned to the front room in the Flight Control Room for STS-2 and subsequent flights. Eventually did ascent and entry PROP in those early years, '81 through '83. I think I became a Section Head in the Propulsion Systems Section in about the '83 time frame. We had a group of about sixteen, [maybe] eighteen, that supported the Shuttle flights. Then I applied and was selected for a Flight Director in December of 1985.

WRIGHT: Those first years that you were there, well, it was just first for a lot; first flight for the Orbiter that you've started talking about; and the mission specialists, Sally [K.] Ride being the first American woman. Tell us about your experiences of being part of that and how those years were just so fast-flying, and you were able to accomplish as much as the group did.

DITTEMORE: Well, there was a tremendous amount of work, because every Shuttle flight was the first of a kind. The STS-1 was the first time we'd flown a reusable spacecraft. STS-2 was the first time that we actually flew the reusable one that we had refurbished to get ready for flying STS-2. STS-2 was the first time we had the robotic arm.

So every mission was like we were going to the Moon. It was jam-packed full of brand-new things to do, first of a kind, never been done before. We were using the robotic arm. We were testing the airlock. We were sending people outside to do EVAs [Extravehicular Activities]. It wasn't long, in just a few flights, before we were actually capturing satellites and repairing them, which was unheard of, and all this was such a fast-paced time frame.

Within Mission Operations Directorate we had something called Flight Techniques. The Flight Techniques, whether it was ascent or orbit, or entry, were specific meetings. They were run by specific Flight Directors. We participated in those meetings, and they developed all the techniques to support a given flight. They were intense. They lasted days. They were on a weekly basis.

Out of those Techniques meetings derived the procedures for the particular mission, and because each mission was a first-of-a-kind, things were happening fast. They were furious. It was an exciting time for any young person to be involved, much less many of the experienced people that had been through Mercury, Gemini, Apollo, Skylab, Apollo-Soyuz. Those people were still there in the late seventies and early eighties. All the Apollo guys were still there, so it was a time of transition from the generation of Apollo to the generation of Shuttle, and I was the generation of Shuttle. I never worked on anything other than Shuttle in those years, twenty-six years, basically, associated with the Shuttle Transportation System.

But the handoff occurred in the late seventies and early eighties. It was the passing of the baton from the Apollo era to the Shuttle era. They only had so much time to do it before they left, they retired, they did other things. I think that's going to be a very important transition now that we do Ares and Orion. The same thing is happening. It's the end of the Shuttle era. It's the

end of the Shuttle generation, and they have to pass that baton of experience and learning to the next generation that will carry Ares and Orion for another decade or two or three.

So there are going to be very similar learning experiences, and I know the processes, they're going to be very similar, but it's tried and true. What worked in Apollo worked in Shuttle and will work in Ares and Orion.

WRIGHT: Do you believe there was a value with those workers being there, of setting that pace before?

DITTEMORE: There is an absolute, tremendous value. In fact, I worry more about the gap in skills and knowledge than anything else, and I know that's what NASA is worrying about today. There needs to be a transition. There needs to be some type of retention where the people are still there when you start to fly Ares 1.

Think about back when Shuttle first flew. The last Apollo mission was in 1972 that went to the Moon. Then they didn't fly Shuttle until 1981. It was a nine-year gap, and in between they did Apollo-Soyuz, and they did Skylab. So they did a couple of missions there to keep their people around, energized. They weren't leaving. They retained them with a couple of missions.

I think we're doing the same thing today. We have Shuttle missions. We're transitioning to Ares through a series of test flights. There's Ares 1-X; there's Ares 1-Y. There's a lot of these same similar types of concepts where we're going to be flying flights, non-Shuttle, but transitioning the Shuttle generation to the Ares generation over the series of test flights, and then having the Ares generation ready to pick up and operate for decades in the early teens of the next

decade. Very similar process; very important that we retain the Shuttle generation of skills through the beginning of the Ares, the start of the Ares Program.

WRIGHT: One of those you mentioned very slightly was about launching satellites. There were a lot of scientific efforts and a lot of commercial partnerships that were during those days, those first years again. How did those aspects meet the overall objectives of the Shuttle Program, and how valuable or how vital were those to meeting everything that the program was supposed to be?

DITTEMORE: Well, in the early years of the Shuttle Transportation System, we still had the dream or the vision that it was going to be the transportation system of the future. Remember, it was sold that we were going to launch once a week, fifty-two times a year. We were going to take satellites up; repair satellites. It was going to be our transportation system for humans into space. We were going to live and work in space on a regular basis.

In the early years of Shuttle it was still there. It was all very viable. We were flying fairly regular. We were building up to a pretty good flight rate, even though it was in the development time frame, in the first four to five flights. But then we started carrying satellites and then multiple satellites. Then we started retrieving satellites from orbit and repairing them. Not until [Space Shuttle] *Challenger* [STS 51-L, accident] occurred in '86 did we take a time-out and look back at ourselves and ask, "Is this transportation system really going to be able to do the things it was advertised to do?"

After *Challenger* a whole different paradigm came to pass. We weren't going to carry a bunch of commercial satellites to orbit. We were going to leave that to the expendable vehicles.

The Shuttle Program turned into more of a research and development, very specialized type of transportation system; on-orbit science, Spacelabs. We transported high-priority payloads and some security payloads, but mostly it was all about science and the future, and we did not do commercial. We never flew a commercial mission as the sole primary purpose of flying the Shuttle after *Challenger*. It was all science or basically science or human science.

WRIGHT: What was your role during the downtime from *Challenger*?

DITTEMORE: Let's see. I had the fortune to be selected as a Flight Director one month prior to *Challenger*. I was working on a mission that was slated to launch in the spring, late spring of 1986. We were going to carry a Centaur payload. And *Challenger* came and changed the landscape. My role as a Flight Director was to relook at all of the entry techniques that had been developed over the first five years of Shuttle flights; look at the way we did business; look at all the flight rules that had been established; review all the entry procedures.

I did entry as a Flight Director [and also led] Entry Flight Techniques. We had Lee [Alan L.] Briscoe lead the Ascent Flight Techniques, and then there was an Orbit Flight Techniques [forum]. [Each forum] went back and looked specifically at lessons learned and weaknesses and what would we do different.

We found a tremendous number of weaknesses. We had developed, in the early stages of Shuttle, into a very operational oriented team, and we did not have all the hooks in place. We did not have the bells and whistles to really be a robust, safe transportation system. We added a lot more rules on how to operate the system. We added more equipment on the ground [to aid in the launch and landing of the Shuttle]. There was a lot more infrastructure in place as a result of

*Challenger* that was developed through these Flight Techniques Programs in MOD [Mission Operations Directorate] to enhance the way we flew the Shuttle in the future.

The *Challenger* accident [resulted in a new] baseline for how we were going to operate Shuttles for the next twenty years, and we've stayed pretty consistent with those lessons learned, with some exceptions, modifications. Flight Techniques goes on today. Even after twenty years they're still holding—MOD, they're holding Flight Techniques and seeing where they can improve on their processes.

But right after *Challenger* there was a tremendous amount of activity to go back and scour every procedure, every malfunction procedure, every crew procedure, every landing, every launch procedure, every checkout procedure, whether it was Johnson or [NASA] Kennedy [Space Center, Florida] [KSC] or [NASA] Marshall [Space Flight Center, Huntsville, Alabama]. Look at every procedure, and then come out of it healthier, so that when we launched again in 1988 we would not have the same mistakes occur again.

WRIGHT: At what point after the Return to Flight in '88 did you feel that, yes, the agency was on track with all of its new procedures, and that you felt this was the program that needed to happen?

DITTEMORE: Well, I think that I felt confident that, as soon as the leaders collectively agreed that we were ready to launch that Shuttle again in 1988, that we were ready to go. With all the background work that had gone on over the previous two to three years, that first launch, STS-26, was as safe as any launch. It had so many thousands of eyeballs on the hardware. Our communication systems, which were deficient prior to *Challenger*, were really strengthened after

*Challenger*. So, coming out of *Challenger*, [we became] a much stronger space agency [with] a much more viable transportation system.

I'd say it again today as a result of [Space Shuttle] *Columbia* [STS-107, accident]. Very similar instances happened over a period of time between *Challenger* and *Columbia*. What happens over so many years [in that] you [experience] process creep. You have things that go unnoticed. They're very small in detail, but they add up over time. You also have people that transition in and transition out, so every time that happens you lose some corporate knowledge. I think *Columbia* is coming back very similar to the way *Challenger* came back, and that is the agency comes back stronger, sees the weaknesses that had developed or that were not addressed twenty years ago, and we'll come back stronger than ever before.

The difficulty is maintaining that intensity and robustness over time when people consider everything to be running smooth again, and then try to find out where you can start to back off some of the labor in the system, some of the checks and balances you say you no longer need. It is very difficult to know where you draw the line that says, "I can no longer go below that line," and yet it's a safe zone to continue to operate. I think they're going through the same process right now as we did post-*Challenger*.

WRIGHT: During the time after *Challenger* your role started to shift again. You worked into different types of management. Talk about those different roles that you got. They were working in the Space Shuttle integration, the vehicle engineering, and how all those worked together, and what you learned from one that you were able to take to another.

DITTEMORE: I worked as a Flight Director until about 1992, so that was about seven years or so. Then I went through a series of different positions, and mostly in the Shuttle Program Office. I was a Deputy Director for the payload integration for Shuttle, and then a Deputy for the systems integration for Shuttle. Then I [performed] program integration for a few years, and ended up the Project Manager for vehicle engineering, which was the old Orbiter Project [Office], for a few years before I ended up running the Shuttle Program. I [joined the Shuttle Program Office in about] 1993, and I was selected for the Program Manager job in '99.

So in [the six year] period [between 1993 and 1999,] I learned all the different attributes of how to run the Shuttle Program. It was the payloads. It was the systems. It was the program integration, working with all the [NASA] Centers and understanding where the communication ties were necessary; what the relationships [were] between the civil servant and the contractors, between hardware and the mission operations, between engineering and operations. Those were all very formative years for anybody that's trying to be a Program Manager.

When I was selected to be the Program Manager in '99, I probably had as good a background as anybody in the pieces of the Shuttle Program and the Shuttle Program Office necessary to even understand how this big system is put together, and it's a large system. The Shuttle Program basically is a corporation, if you look at it that way, a \$4 billion corporation, and it's got ten or eleven different divisions, if you want to think about it that way. KSC; Marshall has four projects. JSC has four projects.

It's like managing a corporation with nine to eleven different divisions, and each division being [well] over \$100 million in value. You have to pull all that together and integrate it, and you have to keep on top of it.

The folks that have done that in the Shuttle Program Office have done a wonderful job over these many years. My hat's off, especially today with [N.] Wayne Hale, who's had to pull together post-*Columbia*. Bill [William W.] Parsons and then Wayne Hale, and really Wayne Hale, technically speaking, for the last several years. [He has] done a marvelous job.

WRIGHT: You mentioned a number of pieces of that from civil service, the contractors, engineering. Was there one aspect that was a little bit more difficult than the other ones, or more challenging or demanding, in trying to get a handle on how to best move us toward the future?

DITTEMORE: Well, I think the struggle is in the late nineties [when] there was a report that came out. It was called "Vision 2000." "Vision 2000" was the first attempt to try to identify what next after Shuttle, and it laid out a plan of what we were going to do post-Shuttle. It set the stage that said Shuttle is going to end in the future, and we're not going to spend any more money on Shuttle hardware, and we're not going to upgrade the Shuttle. A mistake at the time, as we look back on it, because what happened was not a lot of money was focused into maintaining and implementing the Shuttle properly.

Then we moved into another phase of Shuttle upgrades, because suddenly "Vision 2000" was cast by the wayside. A single-stage-to-orbit was not going to happen. VentureStar [X-33, Lockheed Martin Corporation] was not going to happen. Too much technology, not enough technical readiness level, just too big a leap for us to go, and so Shuttle was going to fly till 2020. So we went into a Shuttle upgrade portion of time in the early 2000s and spent a lot of money upgrading the cockpit, taking a lot of risk out of the Shuttle.

So I think the challenges at the time vacillated from skinning the budget down year over year and try to take money out of the system so we can continue to operate, but continue to operate safely. And swinging around rapidly to a Shuttle upgrades program, throwing a lot more money into the system rapidly, and trying to implement these upgrades as quickly as possible. A little bit of a sine wave going on there. Cut the budget; add to the budget.

So those were challenges. Those were challenges. When you cut the budget, you're taking engineers out of the system. You're taking quality out of the system. You are decreasing your checks and balances across the program. All done with foresight, for the most part, but collectively looking at it, probably, and I would say today, too much. Too much was done in the nineties to decrease our overall level of oversight.

Then upgrades came in, and we started pouring more money into it. Then you start looking; what's the right level of quality? What's the right level of safety? What's the right level of engineering? Marshall, Kennedy, Johnson Space Center. Those were the challenges. What is the right level of labor? What's the right level of civil servants? What's the right level of contractors?

There was another initiative in there about 2002. Should we privatize the Shuttle? Should we just take NASA out of the business completely and turn it over to a contractor? There's a myth out there that's perpetuated; anytime you get into any type of problem with the civil servant workforce, the myth is that the contractors can do it better, and the civil servants are always bogged down into bureaucracy, and they're not motivated to save money. That's the myth, and that is perpetuated by a number of different factors in our [industry].

In reality, there is a good balance between a government workforce and a contractor supporting workforce. And, in fact, I think you can turn over large operations to a contractor,

given the right format, given the right foundation, and given the right government oversight. We kept trying to dance between owning the Shuttle on the government side and turning more and more over to the contractor. We just didn't seem to hit the right happy medium.

I was actually asked whether I thought privatization would work, and I do believe privatization will work. I do believe you can turn these operations over to a contractor, but it must be done under the right circumstances. In fact, the NASA Shuttle Program documented how we thought we should privatize the Shuttle, and I think we put out a report in the 2001 or [200]2 time frame, I forget which.

But those were the challenges that we faced in the nineties and early 2000 time frame. It was all about engineering. It was all about labor. It was all about checks and balances. I think that [through] all this period of time we were eroding the proper checks and balances, and didn't recognize it.

WRIGHT: Your analogy of it being a \$4 billion corporation is an interesting one. Anytime you have a large organization, an issue that seems to always arise as a good challenge is one of communication. How are you able to flow that information down, and then being the Program Manager, how did you always know if the information was getting up to you that you needed to have to make the decision?

DITTEMORE: I will agree with you that communication is absolutely imperative. In order to have good communication, you must have strong relationships of trust between all of your major program or project leaders, number one. What we did in the Shuttle Program is we instituted

what we called Shuttle Council meetings. We would meet maybe once a quarter or more often as needed, and we would bring all of the Shuttle leaders together.

The Shuttle leaders consisted of some that lived at Kennedy Space Center; [those that] lived in Alabama at Huntsville at the Marshall Space Flight Center; and [those that] lived in Houston. They each had responsibilities, Project Leaders, whether it was ET [External Tank] or main engine or SRB [Solid Rocket Booster] or SRM [Solid Rocket Motor]. Some had ground ops [operations] responsibilities. Some had mission ops responsibilities, engineering responsibilities. Big, diverse group, and they all had their different issues that they had to deal with.

We would pull them [all] together as a team. Every quarter we would find a place where it was convenient for us to meet, and we would meet for a day. Anything could be on the agenda. When we first started [these council meetings], our communication was still, amongst ourselves, somewhat guarded. We didn't have the strong relationships of trust. What we did over time was, in these meetings not only did we meet technically, but we socialized, and we spent the time together to have dinners, to take a little bit of extra time where it's not just work, work, work all the time, but to get to know each other socially.

Those [meetings] really built strong relationships of trust, and we broke down barriers. Sometimes, believe it or not, in this business there are barriers between Centers. There are barriers sometimes between programs and institutions. We eventually broke down these barriers, and we started operating as a single program team, independent of which Center you belonged to.

Our relationships of trust were really strong, and then people started communicating, not only between the Project and the Program Manager, but between Project to Project, because they

knew each other. John knew Joe, and he'd call him up on the phone, because it wasn't [but] a month ago that they were out golfing together at our retreat. Call him up on the phone and say, "You know, we're having this problem. We need to go and work it out."

So these relationships really did cement our overall improvement in communication. I would say absolutely key to these large organizations, diverse locations, [is that] you've got to get together on a regular basis and hold these types of meetings where they see the people, know the people, understand the agendas, and get past some of the things that inhibit our communication. My belief is that these Shuttle Council meetings did that, and that it made us a stronger team. I watched it happen and got the feedback from the people that participated. They enjoyed the meetings; they enjoyed the relationships. They had a good time working with each other, and that made it a better [environment] as far as us trying to work the program.

I think it's so successful a trait that I do it today, even in [my current] business. I use the very same techniques today, whether it's government business or private business, the same type of techniques to build relationships. I know that they're still doing it in the Shuttle Program Office, and I recommend every large organization has to have these retreats to build relationships of trust, or the communication is not going to be very good.

WRIGHT: One of the other impacts to the Shuttle Program, not just all the things that you've mentioned, but when [International Space] Station [ISS] came up and came alive. Talk about—because you had worked just a little while, I believe, in part of the Station Program and then went back to the Shuttle Program, so you got to see that, and then how the Station began to impact the Shuttle operations more and more.

DITTEMORE: Yes, prior to Station we were flying SPACEHABs [pressurized habitation modules]. We were flying science missions in the Shuttle. Every Shuttle mission was a mixture of different types of science. Then Space Station came along, and our primary customer [became] Space Station as a program. We [Shuttle] became the transportation system. They [ISS] became the object of why we were in business; a little different shift. Prior to that time we were the transportation system. You wanted a ride, you'd come to us and you'd talk to us. Who was our customer? Our customer was the science payload that we're going to put into orbit that goes on into the planetary system, or the science community.

Now all of a sudden it shifted. Our customer is Space Station. We're going to put Space Station together. In fact, 90 percent of our missions are all Space Station-related missions. Space Station started to come up to speed. We started building Space Station. They formulated Space Station control teams, engineering teams, and the same thing that I described to you going from Apollo to Shuttle was happening now from Shuttle to Space Station. They were reaping the knowledge and skill base from Shuttle over into Station.

So as the Shuttle Program Manager, I was seeing a loss of talent over into Space Station, yet they weren't going very far, which is *the* way to do business. You can shed your people off into the new program, but you can pull on them when you need them for experience [if] you have some event that requires their skill. So Station started getting a very strong skilled workforce immediately, from at least the government side of the business, and still retained their skills for Shuttle if we needed them. Two separate programs; still had a large community of people we could pull from; supported both programs.

So I look at that today; how can we apply the same? And we're doing it. NASA is doing it. We have a Shuttle system. They're setting up the Constellation Program Office. The

Constellation Program Office, just like Station, is being seeded with those experienced people now from both Shuttle and Station who have done it. Before Shuttle ends, Shuttle can still pull on them. Station can still pull on them, if need be. But Constellation is being built [upon] the foundation of Shuttle first and Station second.

But as Station became more of the customer and more of the dominant [reason] we're in the Shuttle business, it brought the relationship between Shuttle and Station very tightly coupled. We are very tightly coupled. Someone was very wise in locating the Program Offices on the same floor in Building 1 of the Johnson Space Center, because then we [were able to] just walk down the hall and talk to each other instead of having a building or a floor in between. Communication suffers if you're just a floor apart. If you're a building apart, it's magnified. Originally the Station Program was over in [Building] 4 South on the JSC campus, and they moved over into Building 1 on the same floor as the Shuttle Program. Again, another wise move to co-locate and help the communication problems that do exist between the two large programs, and it was very effective.

WRIGHT: I'm going to throw in one more thing, since you're on that pathway. Before Station got up and running, you had something that filled the gap between there. You had the Shuttle-Mir Program, and now you were working with international partners that way. Talk about that and what your involvement was.

DITTEMORE: I didn't do much with Shuttle-Mir. My good friend Tommy [Thomas W.] Holloway did a lot with Shuttle-Mir. Tommy, I'll have to read his history, because that's got to be a magnificent history. I have followed Tommy through a lot of my career. He was the Chief

of the Flight Director Office. He selected me to be a Flight Director in 1985. When I was [finished with] my Flight Director job assignment, he recruited me to come over into the Shuttle Program Office. When he was the Shuttle Program Manager, I was his Program Integration Deputy. He also asked me to go up and do the vehicle engineering job, the Orbiter job.

Tommy has had a great and very positive impact on my career, and Tommy's one of the real heroes of the space business. He really is. He's just an unassuming, tremendously dynamic leader. So he goes and he runs the Shuttle-Mir Program before he's even the Shuttle Program Manager, and I worked with him in that capacity. I never did Shuttle-Mir; [but, from my Shuttle position, I helped] him [with] what he needed to do Shuttle-Mir.

Then he became the Shuttle Program Manager, and then ultimately he was the Station Program Manager, and I succeeded him in the Shuttle Program. So we had a very close relationship, very close working relationship. If there's something that the Station needed, the Shuttle would provide it. There was no doubt about that. Because we had a good relationship together, and we knew each other well and trusted each other well, we worked with each other to make the Shuttle and the Station successful. That was our mindset, and he was a tremendous Program Manager.

So Shuttle-Mir, I didn't have a lot to do with other than to help Tommy wherever he needed it. It was over quickly, but, from my own vantage point, if I look at it now, someone was wise to put that together, because what did we learn? We learned how to deal with an international community that we hadn't done a lot of business with, the Russians. Before we ever had to rely upon them to do the International Space Station, we had it pretty well greased on what we needed to do with them through working Shuttle-Mir. It was very wise to do that.

WRIGHT: You have all these programs going on at the same time now. How were the funds? Did there seem to be a tight race for the funds? Was there a competition as far as the fiscal needs with everything that was going on?

DITTEMORE: I don't recall there being any competition for the funding. Every year it was a challenge to meet the budgets. It's always going to be that way. That's never going to end as long as we're printing money. But you just dealt with it, and every year you need to be more efficient, because there's always less money. No one's giving us more money just to do our jobs; why make it easier? It's always going to be harder year to year. Every program had their challenge. Every program had to figure out how to do it with less money, and we did.

I did not see the competition of funding. If it was there, I didn't see it in any pronounced way. We did haggle from time to time over whose responsibility it was to pay for a particular organization, but those were generally very minor.

But I think our biggest challenge was individually running our programs with the budget that we were allocated by the agency. We always went in with a request that was a little larger than what we got, and we always operated to the allocation, and that was our biggest challenge from a funding standpoint.

I think Station had a much larger funding challenge in the early days of when Tommy first got there than Shuttle ever experienced, at least under my regime.

WRIGHT: One partner that we haven't talked much about, and maybe you can't. Can you talk to us about working with the Department of Defense [DoD] and the challenges that came along with that?

DITTEMORE: Again, I can't add much there. Not that I won't; it's because I didn't have a lot of interface with the DoD. Even as a Flight Director when we were flying secure missions, my role was in launch phase and entry phase, and in those phases the payload is secured. It's in the payload bay. And my job, especially as an Ascent Flight Director, is to get that payload to space. I don't even know what it is; get it to space.

Then I go off and the orbit team comes in and they manage the flight, and those particular individuals were very attuned to the DoD needs and their interfaces. I got to go home, and I only worried about what was the weather like when I was going to land the Shuttle. So I did not have a strong interface with any of the DoD.

I flew one mission as a Flight Director where I was the Lead Flight Director. It was STS-39. It was a DoD mission. It had a lot of classified material on it. But our interfaces, by that time, were well established, and it was an enjoyable experience for me. We did not have issues, and we executed the mission. In fact, the current Center Director, Mike [Michael L.] Coats, was the commander, and I was the Lead Flight Director at the time. It was an enjoyable mission.

So I don't have a lot of experience with the DoD from the Shuttle side of the story, but it was all positive on my interfaces.

WRIGHT: Were there others—I'm just kind of thinking about flight controlling again and Flight Director Office. Were there other missions that brought back a lot of good memories? I know you were part of the Hubble [Space] Telescope as well.

DITTEMORE: Yes, I have to tell you that I spent most of my Flight Director years worrying about ascent phase and entry phase. Very few times did I actually put the mission together, which, it turns out, really is the business end of why you go to space to open the payload bay doors and conduct the operation. But my total focus was on launching and landing safely. I spent [the majority of] my time [concentrating on launch or landing issues.] What [are] the winds? What was the weather? What was the system's capabilities? Was it a good day to launch or not a good day to launch? Did we have all the right systems in place?

We had all the support material there and all the support organizations, and when we got to orbit, I handed it over to the orbit team and said, "Do a good job, because I'm coming back in here in a week or ten days, and we're going to land," and that was my role. I spent most of my time as a Flight Director just absolutely focused on ascent phase, working with the Kennedy Space Center and our Mission Control folks, and on the entry phase in the same way.

WRIGHT: What did you find to be the most challenging part of your job when you were Program Manager? Everything that you had experienced firsthand, now you were responsible for.

DITTEMORE: I probably am one of the few who had so many jobs that when I got to be the Shuttle Program Manager, I knew more about the pieces of the Shuttle Program than probably anybody in the Program. That's because several of them had left [the agency], so I became kind of the resident guy that was left standing that knew all about payload integration and system integration, like I told you earlier.

But that background, I think, prepared me better than anything as far as growing up in MOD, doing flight control for fifteen years and a Flight Director, payload system integration,

program integration, vehicle engineering, hardware development. By the time I got to the Shuttle Program Manager job, it was just second nature.

Besides having Tommy be there before me and working directly for him when he was the Shuttle Program Manager, it was just a seamless transition to walk in and do the Shuttle Program job. From the first day I walked in, I did not feel it as foreign. A lot of people get in that position and say, “Oh, this is a big job. It’s overwhelming.” But since I had been there for six years in the Program Office, it was just riding a bike, and it was [comfortable].

But the things I mentioned to you that were the most challenging were making sure you had the communication right. That’s where part of the risk [is] in flying space flight, or flying humans into space, the communication. We did not always communicate well the issues or the risks, and I spent a large amount of my time building this communication and building [a] team that would offer communication without having to pry it out of them. I think that’s the challenge.

In fact, here I am in private industry today, four years now, and I spend most of my time on the very same things. Someone asked me recently, “Is private industry and running a company a lot harder than running the Shuttle Program?” Absolutely not. Running the Shuttle Program—and at the time I didn’t think anything about it, but you’ll ask the other guys, too—you start at six in the morning and you leave at six at night, and you do that six days a week, or five or six days a week. It just becomes second nature.

Then you come to private industry, and it’s not the same type of intensity. The civil servants that work in the Shuttle and Station Programs, and now the Constellation Programs, are very, very skilled individuals, and they work extremely hard, and our support contractor community complements them in a very strong way.

WRIGHT: One of the teams that I wanted to ask you about before the afternoon was gone was the Mission Management Team and the role of that and how that's changed over the years, or if it's changed at all.

DITTEMORE: I don't really know if it's changed over the years. Certainly it got a lot of notoriety in *Columbia*, the *Columbia* time frame, because of the decisions that were made within the Mission Management Team. I don't think it has changed a great deal.

There are representatives from every organization that participate on the Mission Management Team. It meets on a regular basis. It doesn't have to meet every day. It can meet every other day or as required. It doesn't conduct the flight; it only addresses the issues that the flight control team needs brought forward for management to make the types of decisions that are required of management. Other than that, the flight control team is perfectly capable of managing and operating and executing the mission.

I think the notoriety comes from people asking is the communication level within the Mission Management Team appropriate. Are people speaking up? Are you getting the right information? Are you diligent in asking sufficient questions? I don't think the role has changed much. I think the real question is whether or not it is functioning up to the level that people think that it needs to function in order to get to the right decisions.

So no, I don't think the role has changed. I think, if anything, it's just a matter of making sure that the responsibilities within the team are being conducted appropriately.

WRIGHT: You had made your decision to leave NASA, I believe, in 2002. It was prior to the *Columbia* accident. What made you start to think that you wanted to change your career?

DITTEMORE: Well, the tenure of a Shuttle Program Manager is not very long, for good reason. I had started in '99; in 2002 it was three years. I knew that four years was a long tenure, and so it was just natural in 2002 to start asking yourself what are you going to do next. So it was appropriate for me to consider that in 2002.

The other thing that I was thinking about—[why] you can't stay very long in these jobs—is because you have such strong individuals that are supporting you, you need to give them the opportunity to also have the leadership position of the Program Manager. If you stay in there too long, all you're doing is blocking the talent from moving up. I thought I probably would serve around three years. That was probably an average tenure. I ended up serving probably about four, but in 2002 I was on my third year, and I was working on what was I going to do next.

I had even talked about it to some of our senior managers, that it was probably time for me to be thinking about moving on, and they needed to be thinking about [who] was next to come in and replace me. I think it's important also to have that conversation early with your senior leadership so that they can have an orderly thought process and transition about what they would like to do next instead of just announcing your resignation, and in two weeks they've got to fill—that's a very unfair way to do it.

So they had plenty of knowledge to know that I was thinking about making a move, and that gave them a lot of time to consider what they would like to do. So I gave them plenty of notice, even though I didn't know what my plans were, I gave them some notice that it was time to start thinking about a successor.

WRIGHT: And you didn't get to leave when you wanted to because of *Columbia*.

DITTEMORE: No. In fact, I thought *Columbia* was going to be my last mission. I didn't know it was going to end that way. It was my last mission, as it turned out. But *Columbia* was going to be my last mission, and I looked forward [to a very successful flight.] *Columbia* was interesting in that if you go back and really penetrated the thoughts of the people, what was our greatest concern on *Columbia*? It was that we were in the middle—it was right after 9/11 [September 11, 2001, attack on World Trade Center and Pentagon], fairly soon after 9/11. We were concerned about the fact that we had an Israeli astronaut on board [and] we were very concerned about anybody attempting to injure or harm along the way; lots of issues as we thought through the process on what we needed to do to have a successful launch. That was absolutely preoccupying our minds.

It was a great launch, and I felt pretty good about *Columbia*. I figured, "Great launch. It's going to be a great orbit and a nice landing," and I was going to fade stage right after that in a very orderly fashion. It didn't exactly turn out the way I had anticipated. Very tragic events, obviously, and it did delay a little bit of what I thought I would do until, I think, the process was a little more stable after *Columbia*, and it looked like the reports were coming out. Then they didn't really need me to stick around any longer. It was time for me to exit.

WRIGHT: You were in a totally different position with that mission than you were when *Challenger* happened.

DITTEMORE: Totally different, right.

WRIGHT: Can you share with us some of those thoughts over those days afterwards and trying to handle so much information coming in and trying to find an answer?

DITTEMORE: On *Columbia*?

WRIGHT: Yes.

DITTEMORE: I have to tell you that—we have a close-knit group; we didn't hold all those Space Shuttle Councils for four years without getting pretty close to each other—*Columbia* is an open wound for us that worked and knew those people. I'll bet you a day hardly goes by that we don't think about the crew of *Columbia*, and if there was something that we might have been able to do to prevent. Always that's the case when you look back and do your hindsight treatment. It's not a fair thing to do, but that's just human nature.

But *Columbia*, certainly the events were tragic. We had trained for those type of events. We knew what to do if they occurred. We executed our training, I thought, very, very well. The flight control team did; the program team did. The time frame right after the tragedy, you can't imagine how difficult [that was], but I think [we had a] cast of very strong support people [struggling with] a very difficult situation. People drew together and supported each other like they were brothers and sisters to get them through it. It was a very challenging and tragic time.

But let's go on. Let's talk post-*Columbia* a little bit. I think that was a difficult time frame. Anytime you have an investigation to come in and examine what you've been doing and

how you conducted yourself as a team, it's difficult; difficult on the investigating team and difficult on the receiving end. I think the members of the team did it very professionally and did it very well, and the facts are whatever the facts are. It's what the independent teams come in to do, and they have the report. That's their view of it.

What we learn out of that is what are the weaknesses, and out of that tragedy came the Vision for Space Exploration, because one of the strong weaknesses identified [was that] we had no vision. We had no direction. Absolutely true. NASA had for a period of years been known for start and stop. We start; we spend a billion; we cancel. That's what we kind of got used to doing. We started VentureStar. Spent a billion dollars and canceled it. We started Shuttle Upgrades Program. Spent a bunch of money; canceled it. So our reputation was kind of sullied there, because we never finished what we started out to do.

So this independent team comes together and says, "You know what? One of the real problems here is that there is no vision. There is no policy. There's no forward thinking. Where are we going?"

Because we're just reacting one year at a time, and because of that, we're not planning. We're not laying in the funding, or we're not making sure we have the people. We're not making sure we have the skills. So we're setting ourselves up for a problem. *Columbia* was a result of no vision, no planning. At the highest levels there was no direction on where we were going next, and consequently, budgets were whatever people made them to be or whatever we could afford, and that made it challenging for the programs.

So I prefer to think about *Columbia* as the opening of a new door. It was a very tragic event, but out of that tragedy rises the phoenix, right? So the phoenix rises from the ashes, and out of the tragedy comes the new door of opportunity, comes the dawning of a space age where

now where are we going? We're going not only to low-Earth orbit, but we're going [back] to the Moon, and we're going to Mars.

Why are we going back to the Moon or Mars? Not just to plant a flag. Now it's the journey; it's not the destination. It's the journey back to the Moon that's most profound, and it's the journey to Mars that's most profound. It has very little to do [with only] the space community, [but] it [is] very much about the long-term vision and health of the United States of America. That's the dawn that comes out of the tragic events of *Columbia*. It's very positive. It could have been that seven people lost their lives and we wallowed in the mud, but we haven't, as a nation nor as an agency. To that, I commend all those that worked on the vision and in the agency today to make it happen.

WRIGHT: You did stay on a few months longer than you had planned. Were there things that you wish you could have accomplished before you walked out the door?

DITTEMORE: Why did I stay?

WRIGHT: Well, you can share that as well.

DITTEMORE: Was that the question?

WRIGHT: Why did you stay, and then were there things that—

DITTEMORE: I couldn't leave because the team was under duress. February 1<sup>st</sup>, 2003, is tragedy. It's not the time to resign and say, "I'm going to go do something else and leave you guys in the lurch, and let somebody else come in and take over." So I stayed through the time frame where I thought the program was well on its way again. It was on its feet.

All the interviews were done. The report was coming out, I believe, in May, May or June; at least it had been written. The conclusions were coming out. The weaknesses were identified. [The next step was fixing what caused the problem.] The process was [moving beyond] identifying the weaknesses.

It was all about okay, now that we've found it, now we're into fixing it. All right. Whoever is going to fix it needs to be the guy that flies it, because if you stay [until it is fixed] and then leave and then someone else flies it, you don't have the [desired] transition or the continuity. So I wanted to make the [leadership] transition so that the person fixing it, flew it, and the team that fixed it, flew it.

So I thought I should exit [after] the "find it" stage. It's just how much time it took to get to that point, and it looked like May was about right. So I think I made an announcement in April with the agency's leadership, and then transitioned over to Bill Parsons in the May time frame, and I retired August the 1<sup>st</sup> or something like that. So I thought it was about the right time

I saw your note, the "find it, fix it, and fly." I think that's exactly what the team did.

WRIGHT: Well, let's look back. We've talked a lot about the roles and contributions you made, and one of the questions that we'd like to ask you before we leave today is for you to tell us, after working for twenty-six years in this program, the Shuttle Program itself, what do you feel and believe to be the most significant or unique accomplishments of this Shuttle Program?

DITTEMORE: Well, gosh, there are so many, so many associated with the Shuttle Program, but let's talk about duration. The Shuttle Program flew well over a hundred flights; a reusable spacecraft of three or four vehicles operating, continuing to operate today, well over twenty-five years. We tend to think of the glory days of the space age as Apollo, but Mercury had six or so flights, Gemini about the same, and Apollo had seven [missions to the Moon]. So when you look at Mercury and Gemini and Apollo, it's less than twenty-five flights total, and it spanned a time frame from the early sixties through 1972, basically, the end of the Moon landings.

Shuttle, on the other hand, has operated for well over twenty-five years with reusing the first-stage boosters—refurbishing them and flying them again—[and also] the vehicles, Orbiters. And then holding a program together, [a] remarkable success [for] over twenty-five years [within] a very complicated system, and flying in a regime where it's very difficult to operate, is probably [as great a] feat [as] flying seven missions to the Moon in a period of three years.

[The] first landing on the Moon was [19]'69, and the last [landing] was '72. [A] three year [period], and they had a tremendous amount of intensity over those three years in going to the Moon. A tremendous feat.

[The] Shuttle Program had to have the similar intensity, but had to operate well over twenty-five years with a transition from generation to generation, whereas Apollo was the same core group of individuals, basically, for those many years. Shuttle transitioned from one generation to the next generation, and operated safely doing so, for well over twenty-five years. That is not insignificant.

We proved that we can fly and operate this marvelous machine in a lot of different regimes. We can upgrade it. We can refurbish it. We can maintain it. We can make it cheaper.

All these types of things that we learned how to do over the past twenty-five years will be applied to how we go back to the Moon. So I think it's a tremendous technological leap [forward] and an operating leap [forward] to prepare us to go back to the Moon in the next decade. I think that's probably one of the most enduring legacies of the Shuttle Program.

As much maligned as the Shuttle is, for its cost, I would say, that's only a matter of policy, because the policy said, "Thou shalt not fly as often." Okay, so the cost per mission will definitely go up, but the capabilities of the vehicle were visionary and can't be matched. You can't build this vehicle again. It's too difficult. It's too complex.

Those that designed the Shuttle were absolutely visionary, Max [Maxime A.] Faget and others associated with it. I'm amazed as I look back on it; the foresight to design a vehicle the way they did; to add a robotic arm the way that it was added, and its capabilities with an internal airlock; and the size of the payload bay, where we actually added an external airlock for Station missions. And we had Spacelab missions and carried planetary missions. It was amazing. For it to endure for well over twenty-five years when it was designed for less than ten from a lifetime point of view, I think that's the major accomplishment.

It's not on any specific individual mission. It's on the entire span of the Shuttle Program, flying to the end of the decade, and being as good at the end as it was [at the beginning]. In fact, being better at the end [than] it was when it started. That's a pretty good legacy for generations of workers in the space field, whether it be contractor or civil servant.

I was fortunate; I worked my entire career [on the] Shuttle [Program]. I have some passion towards it.

WRIGHT: We noticed that. [Laughter] And thank you for sharing that.

There is one other question I'd like to ask, and then ask you if there are some things that you'd like to add. It really isn't about the Shuttle; it's about the fact that when you walked out of the NASA door, you didn't leave aerospace. You just moved to a different door. Share with us what you're doing now to help that vision back to the Moon and on to Mars.

DITTEMORE: Well, it goes back to 1962, I think, when I played hooky from school so I could watch John [H.] Glenn launch. You know, he didn't go the first time. I played hooky several times. I was sick a lot that year until John Glenn got off the ground. But [I am] absolutely passionate about getting humans into space, and it's been that passion since I was a small boy. It doesn't stop just because you leave NASA.

I've been fortunate to be aligned with a company that's very much aligned with the NASA vision. ATK's top priority as a corporation is human space flight. So not only do I get to work in a company that has that vision, but I get to continue in some way to help NASA get back to the Moon.

Now I'm doing it from a little different vantage point. I'm doing it as a contractor to NASA, and our motivation is to do whatever it takes to help NASA be successful. I'm telling you, whether it was with NASA for twenty-six years or with private industry for how many years I continue to work, the ride is just as stimulating and just as exciting. The roles are different. The responsibilities are a little bit different.

But the end game is the same, and what's the end game? To successfully launch humans into space and return them back to Earth. Now I'm doing it again on the Shuttle; I have a role with the Shuttle, this company does. As we move toward the next launch vehicle, this company [ATK] is all over the next launch vehicle, and we want to help go back to the Moon and for

decades to come. So I've had a charmed life. I started out saying what did I want to do? I wanted to work in the human space flight industry, and I've done it my entire career, whether it be with NASA, which I think was really fortunate and I have really strong feelings about NASA and their success, and with private industry to support them.

WRIGHT: Is there anything that we didn't get a chance to cover much in details that you'd like to go back and add some thoughts to?

DITTEMORE: Heck, I don't know. [Laughs] I'm limited in my capacity to remember.

WRIGHT: And you did very well. We will then close for now, and then when we have an opportunity to send you the transcript, if there are some things you'd like to add, then we sure would like for you to do that.

DITTEMORE: Okay. That would be good.

WRIGHT: Thanks so much. We appreciate it.

DITTEMORE: All right.

[End of transcript]