

ORAL HISTORY TRANSCRIPT

DALE D. MYERS
INTERVIEWED BY CAROL BUTLER
KIRKLAND, WASHINGTON – 26 AUGUST 1998

MYERS: So how do you want to start?

BUTLER: Well, we'll start with a...tag. Today is August 26, 1998. This interview is with Dale Myers at Kistler Aerospace in Kirkland, Washington. The interview is being conducted as part of the Johnson Space Center Oral History Project. Carol Butler is interviewer, and assisted by Summer Chick Bergen.

To start, I guess maybe if we could just go over briefly some of your roles and responsibilities when you started with North American.

MYERS: This is going to be a long interview. [Laughter] I started as an aerodynamicist. I worked on airplanes. The first airplane I worked on was Mustang, which was a very famous World War II airplane, and my first job was to design a dorsal fin for the airplane. Whenever you see a P-51D, there's my dorsal fin on it. I became project aerodynamicist on the Twin Mustang, went on through other aircraft activities, and then in 1946, I went to a small new group that was called aerophysics, and that was to work on advanced supersonic cruise missiles. What had happened is that the United States found that the Germans had done such an immense amount of technology in World War II, those V-2s and buzz bombs and all the things that they developed, that the U.S. realized they were way behind in technology. So they started these new programs with all the aerospace companies. I was asked to move over to this Aerophysics group, moved from there, from aerodynamics to system engineering, to assistant director of the laboratory, and developed the missile called Navajo, which was a very advanced, high-speed, long-range cruise missile, Mach 3 ram jets, rocket-powered.

It started a whole echelon of technology that involved the development of new rocket engines on the part of the United States, in a group that spun off from our aerophysics group and became Rocketdyne. It involved the development of inertial navigation systems, it involved the development of the titanium industry for the United States. All these things to get to high-speed, high-temperature, long-range operations.

Those same rocket engines ended up being used on Atlas and on the Delta rockets that are still used today, so they started a whole spinoff of technologies. Great program, but we didn't know much about how to do redundancy and backup systems and things of that sort. So even though this Navajo flew a thousand miles off of Cape Canaveral, as it was then, at Mach 3, the ballistic missiles were coming along at the same time, and the decision was made, "Let's go ballistic, let's not go cruise." So our program was canceled.

Then we proposed a cruise missile to be carried by the B-52, and I was the program manager on that. That program was a total success. Then in 196[4]...I was asked to come over onto the Apollo Program, and I became the program manager for the Apollo Program, which included the command and service module for Johnson Space Center. I was involved in that program from '63 actually until about August of '69.

After the first lunar landing, we recognized we had to do something else as a company to keep other business going, so I moved over to what was called preliminary design and worked on space station, Mars mission, Shuttle, anything that I could work on that would get ideas for the next activities for North American, which was Rockwell by then. They changed from North American, to North American-Rockwell, to Rockwell in that period of the Apollo Program.

Then in late '69, I was asked by George [M.] Low if I would leave industry and come back to headquarters and head up manned space flight. So I did that and went back to NASA in January of 1970. Our first launch was Apollo 13. [Laughter] We can talk about that.

Well, I launched more—I put more men on the moon than George [E.] Mueller did. So I was in charge of 13, 14, 15, 16, 17. I watched NASA's budget be cut in half across that time period. We have an interesting schedule back here that was put together by some guys in General Dynamics that compares George Mueller's schedule of programs that he had set up in 1968 when he was head of manned space flight, and what I set up in 1970—I think it was late '70—but I put together a schedule of what I thought we were able to do, and he had a space station, he had a Mars mission in his program, he had shuttles flying out through that whole time period, he had many more Saturn V's in his program.

By the time I got there, we had canceled Saturn V's back to seventeen, and I don't know whether I was—I think I'm the dirty guy that had to cancel the space station and the Mars missions, and all the other things that George had in his program, and just focus on the shuttle. That's the only thing that we'd be able to do. That was something that all of us, George Low, and—I can't remember who the administrator was at that time. Jim [James C.] Fletcher came in in 1972, and I don't remember who the administrator was in 1971. But anyway, it didn't make much difference, because the budget was coming down so fast that there wasn't any question that the only thing we could possibly do was the shuttle.

So that sort of gets you to where my career with NASA—well, no, there's another piece of it. The Shuttle Program was really a tremendously difficult program to get started. We had been looking at a two-stage fully recoverable system, George Mueller's original dream. With the budget going down the way it was, and with the OMB [Office of Management and Budget] the way they were, we kept going to OMB and getting nowhere on the Shuttle, and finally when Jim Fletcher came in as the administrator, he and George Low went to see President [Richard M.] Nixon. I think it was about the second time they saw him, he said, "You can build any kind of Shuttle you want to as long as it doesn't cost more than \$5 billion." Well, we'd just spent \$24 billion on the Apollo Program, so \$5 billion didn't sound like very much.

So we had to figure out what do we do about that, and that's when we set up all these Phase A studies with the contractors that led to many different configurations of the shuttle. I'll want to talk more about that, because that's a really important part of the game, and one where Johnson was very much involved.

So we went through that period and finally got the shuttle established at \$5.25 billion, not including a 20 percent reserve for the administrator. I kept saying all through this activity, "No program with all the technology and complexity of this program can be done with any original estimate of the job. So you, the administrator, have got to have a reserve." Jim agreed, and he got that reserve with OMB [Office of Management and Budget]. They agreed with him, but he never got it in writing. So it disappeared the year that Jim Fletcher left as administrator. So we were back down to the 5.25 again.

We had always managed programs in manned space flight from headquarters with equal partners at Marshall [Space Flight Center, Alabama] and Johnson [Johnson Space Center] and...[Kennedy Space Center]. It was a very expensive way to manage. It took a lot of overhead, a lot of interaction, a lot of meetings, lots of press talk, lots of competition between centers, and so on. So I proposed to George Low and Jim Fletcher that we do this with a lead center at Johnson. After a lot of discussions and some discussion with Congress, we decided we would do that, and we gave Johnson the lead center responsibility on the Shuttle Program.

That reduced costs dramatically, put one center in charge, created some tensions that had to be worked on very hard, but over a long period of time, we almost met the cost estimates that had been set up for the shuttle. If you included inflation in it, it turns out the only missed it about 10 percent, which is pretty terrific. But, as I'm sure you've heard from some of the other interviews, we ended up with some—when I left in 1974 and John [F.] Yardley came in—by the way, I hope you're talking to John Yardley—John was such a strong manager, he did such a terrific job on the Mercury and Gemini, that when he came in, he, I

think, kind of took away the responsibilities of Johnson to himself, and allowed Huntsville guys to come see him about money. That destroyed the system, as far as I'm concerned, so we lost the real lead center management situation, and it led to some really difficult problems, which, I think, contributed to the *Challenger* accident. We can talk more about that.

There was a huge division between Marshall and Johnson on communication, like on, for example, quality control and safety and things of that nature. If you talked to Marty [Martin L.] Raines, you may have heard some of that problem, because Marty was in charge of QC [Quality Control] at Johnson at that time. He lost communications with Marshall on a lot of those activities. So that was a big problem, a problem that you could probably trace back to the idea of a lead center, that we were not able to overcome the competitiveness and the...egocentric views of each center in that lead center activity. I'll get back to that later, because we got into this same problem with the space station. I've lost track of it [the space station management], so I don't know how that's going now.

Anyway, we got the shuttle configured. We did the Apollo-Soyuz the same way. We had a lead center at Johnson, they did a great job, met the budgets, met the schedules. It showed that if there's not a lot of entanglement with another center, a lead center activity will just work like a charm. The problem is, NASA, in my view, has got to learn how to work [with] a lead center...work[ing] with other centers [as subcontractors] and make it work like industry does with subcontractors all the time. But it didn't work very well on the shuttle from the standpoint of the safety issues. Worked great from the standpoint of the technical [decision] issues.

I left NASA in 1974. Couldn't work on the space activities anymore because I had to recuse myself from everything in space, because I had been so much involved in it. So I went to work in the airplane business, and went back to Rockwell as head of the aircraft group there. We had commercial airplanes, Navy airplanes, and Air Force airplanes, so had a lot of fun there for a while.

Then from there on, funny things happened, like Presidents calling me to be Under Secretary of the Department of Energy. Then I got out of that and got into the construction business at Jacobs Engineering. I was president of the Jacobs Engineering Company for a while, and then I retired. Then I became a consultant, couldn't stand retirement.

Then in 1986, after the *Challenger* accident, Jim Fletcher called me. He had gone back to be the administrator after *Challenger*, and wanted me to come back with him. I said, "No, I've been in the government twice, that's enough." So the next Monday morning, I got a call from a young lady who said, "The President is calling." So [Ronald] Reagan was on the phone with a three-by-five card that knew all about me, you know, and he worked me over for a while, and I decided I'd go back.

BUTLER: Hard to say no to the President.

MYERS: It's hard to say no to a President, especially a big salesman like Ronald Reagan was.

Anyway, I went back and worked with Jim on getting the Shuttle untangled from all of the horrible inquisitions and finger-pointing and everything that was going on, and tried to build the morale back up. Did the best we could on that. I think it started to work. We got the Shuttle going again. I told Reagan I'd stay through his administration. Reagan left. We put in our resignations, nothing happened. We put them in again, nothing happened. So Jim and I sat down one day and said, "Well, let's just leave. They know we've resigned. Let's leave." So we made a deal, he'd leave in April, I'd leave in May. So we did. He left in April, and I was the acting administrator for a month, and then I left and went back to the consulting business.

I ran into George Mueller at an AIAA function in '95. I was heavily in the consulting business by then, and he wanted me to do a little consulting with him on this new thing he was getting into here. I don't know whether you know what this is, but it's a privately

financed, two-stage, fully recoverable launch vehicle. It's what George Mueller has always wanted to do, is a two-stage fully recoverable launch vehicle. And me, too. Having gone through all that sizing and shaping of the Shuttle, we never were able to make it a two-stage, fully recoverable system. We'd throw away the tanks, we'd essentially throw away the solids, so it's expensive. We figured if we could make a two-stage, fully recoverable system, bring it back to the launch site, stick it back together and launch it again, it would save an immense amount of money and really make a major reduction in the cost of getting into space.

So I found out George was working on this thing, and I said, "Man, I want to work on that, too." So he got me and Henry [O.] Pohl and Aaron Cohen, and George to start from scratch and design what we thought was the best thing to do with this thing. So it's really been exciting, and has, we think, great potential for—well, for a profitable business. We're having a lot of fun working on it.

BUTLER: Great. Wonderful.

MYERS: And that's sort of where I am, up to date. Okay?

BUTLER: Wonderful. Well, that's a great overview. Great.

MYERS: Let's go back. How do you want—let's see, we can start—

BUTLER: Maybe if we can start—

MYERS: 196[4] when I came on to Apollo.

BUTLER: Sure.

MYERS: We were still building up. We had just broken loose from the direct landing approach to use the lunar module. That decision had been made, so I knew we were going to carry a lunar module, and SLA, Spacecraft LM Adaptor, was mine, and we had to make the adjustments to install the LM, so we were very active at that time, because we were kind of reconfiguring the program to take care of that. We still had mockups of the direct lander. The direct lander would have required a booster bigger than the Saturn V. So we always thought that, [Wernher] von Braun thought that that was a heck of a good idea, because it would have...[required development of] a booster big enough to go to Mars. So he had been dragging his feet on the whole idea of the lunar module, and so had a lot of people from a technical standpoint, too, because you were just dropping off pieces all the way, and you get down to the moon, and you're down to this little tiny thing that has to come back up, and you can't check it out, and you've got to leave a piece on the moon, and go up with this stuff. A lot of people thought that was too complicated, including von Braun. It took a long time to get him bent around to accepting that idea. He wasn't the only one against it, either. [Our company had been in favor of direct landing too.] It was a difficult decision for NASA to make. But once made, we were sure on our way on that.

Well, there were a lot of interesting things that happened during the Apollo Program development. Lots of things. We had so many innovative people that we had great ideas, many of which didn't work, like we were going to measure the fuel in tanks with nuclear devices that had nuclear detectors. You put a radiating source on this side, and a detector on this side, and the fuel would dampen, would reduce the intensity of the radiation, so you could measure the amount of fuel in the tank. Didn't work practically. So we had to switch over. Had a lot of changes like that as we went through the program.

That's what really program management was all about, was to meet cost schedule and performance, and that meant balancing advanced technology versus the real world and getting

stuff done in time. The whole idea, I guess my guiding philosophy in everything I've done, is to keep it simple. During when I did this cruise missile in the '57 to '62 time period, we had a big sign on the wall, about the size of that wall that said "KISS" [Keep It Simple Stupid], and it worked. Guys really thought about finding good neat ideas that were simple. That was what we kept pressing in the Apollo Program all the time.

I worked with Kenny [Kenneth S.] Kleinknecht. He was the project manager down in Houston at that early time period. Then, well, let's see, I think I made some notes here on that. Nope, don't find them. Yes, that's right. Kenny Kleinknecht. Now, I can't remember the sequence of this, but in '6[7] when we had the Apollo fire, I don't remember whether I was working with George Low out of Houston at that time, or whether George came on the program at that time. The reason I'm confused is Frank Borman came on the program then also. I interfaced with Frank Borman during that time period.

BUTLER: I believe Joe Shea was the [JSC] project manager up through the fire, and then George [Low].

MYERS: You're right. You're right. Joe Shea had come on the program. Yes. I don't know when Kenny—when it was switched over to Joe, but Joe came on the program. Joe was working with me at the time of the fire. You're right. You're right. Then George Low came on. So George worked with me. You're right, because I can remember going to those change boards every week down to Houston with George Low after the fire, and that was when we were changing over to the outward-opening door that North American had originally proposed, by the way, and the two-gas system that North American had proposed originally, and all these changes were coming into the system.

The other things that were happening, by the way, as a result of that fire, is we put protective panels on everything like an airplane. Airplanes don't have wire bundles sticking

out to be walked on. What happened is that—and I don't give Johnson a lot of credit on this—Johnson and Huntsville fought out what the weight of the command module ought to be, and they had us scrounging for every pound of weight on the command module, and they had a big margin on the Saturn V. Now, I couldn't go back and show that on a piece of paper, but the fact is, we added a lot of weight after the fire, protective panels, more insulation in the wires, a lot of things of that nature. I never heard a peep out of the Huntsville guys. We sort of made it to the moon that way, so I think they overdid their concern about weight. I understand that, because I've been in the business of saving weight, too [on other programs], and I think when you have a payload, which the command [and] service module was [along with] the lunar module. The lunar module was new, nobody knew what it was going to weigh, so I can see where the Huntsville guys would try to keep plenty of margin for the Saturn V, and they did it by really milking us all on weight. So the command module was very lightweight at the time of the fire.

We had never tested the material at 16 psi oxygen. We had tested at 5, and we had complained about—and I'm sure you've heard this story from many people—everybody was complaining about the astronauts putting too much Velcro inside the command module. I don't think that that was a make-or-break issue as far as the guys are concerned, because 16 psi oxygen will burn anything. It'll burn anything. We got a spark in there some way. I'll never know what it was, and I don't think anybody knows. There were so many wire bundles in so many places that even though technicians were very careful, had protective padding and all this stuff when they worked on it, the fact was we had a lot of exposed wire bundles that you could walk on, and cause abrasion on insulation, and who knows what did it.

After the fire, Lee [J. Leland] Atwood and I were the main testifiers to Congress from North American, and I know Jim Webb was getting beat up so badly by Congress that he had to have somebody hide on the deal. Harrison [A.] Storms [Jr.], who was the overall director of the [space] activities at Rockwell, which included the S2 booster and the command

module and service module, he was the one that got fired from North American. Lee was very—what's the word—nonaggressive, I guess is the word, in the testimony. We never brought up the issues I just brought up about our original proposals for the command module, never brought them up in Congress, never tried to protect ourselves from the criticism that occurred at that time.

The Phillips Report came out. I had never seen it. I was the program manager on the command and service module, and I had never seen it. It had gotten stopped someplace. It went to Lee Atwood. Lee saw it. It went to him, but it apparently went to [other] senior people in the company, but never came to us. It may have gone to Stormy [Harrison Storms]. I don't know whether Storms saw it or not.

The program had been such a crash program that there were plenty of problems. My job after the fire was really to clean up everything that was in that Phillips Report, and to make darn sure that we did it right. I can remember, I'll never forget, George Mueller and Sam [Samuel C.] Phillips coming out and beating me over the head on schedules, because we weren't meeting the new schedule that they had set, that they had set up for getting the new door on and all this stuff. I wasn't going to change anything that would affect the safety of that thing. I think that was part of the strong reaction they [also] had to the fire was, "We're going to make this damn thing perfect."

Wally [Walter M.] Schirra [Jr.] was the first guy we were going to carry into space, and of course, Wally is a great punster, but he's also a perfectionist. So we formed a team on that thing, and really went to work to make those things right. Wally got a good ride, but he still sent me a little piece of teflon that floated around in the cabin, debris. He put it in a plastic thing and sent it to me. I still have that on my desk.

Let's see. Let's move on from the fire. Any questions or anything on the fire? Let's see.

BUTLER: You've covered most of what I had.

MYERS: Yes, I think we covered most of the things we had there.

I was really sorry to see Joe have the problem he had, Joe [Joseph F.] Shea. I'd been through the airplane business and I'd lost test pilots, and I had suffered, and understood the problems with the wives and all that stuff, but I think that saved me when we went through the fire. Joe had never had anything like that happen to him before, and it was just a very tough thing for him.

Let's see. So let's get on with the responsibilities there. I said cost schedule and performance. There's a lot more than that. It was all the interaction with Johnson. I was the prime interaction with Johnson, rarely testified, but once in a while I was called back to testify in Congress. Had a terrific experience. It was a great thing. When we had flights, I'd go down to Houston and be in the span room in the back area there with a lot of guys that were later in important positions. Arnie [Arnold D.] Aldrich I remember in the back room, and all these guys who were the smart young supporters of mission control. I was smart and fairly young, too, at that time. At least young.

Then after the lunar landing, as I said, I went over and spent a few months in preliminary design, and then George Low asked me to come back to Washington, manned space flight, head of manned space flight. At that time I had nothing to do with the unmanned launch vehicles. That came later [when] they were all put together, but at that time it was just manned space flight, which was plenty.

BUTLER: I'm sure.

MYERS: I was responsible for the three centers, von Braun, Gilruth, and [Kurt H.] Debus at the three centers, and all the budget development, all the development of new programs and

things of that nature. The biggest issue at the time besides safe flight of these various vehicles was, "What do we do next?"...The only logical thing out of those three was the shuttle. Couldn't build a space station because you couldn't go support it. They were canceling the Saturn V, and the S1B and all that stuff were gone, so you had to have a launch vehicle. So the shuttle was the only choice we had. With the whole idea of the shuttle followed by a space station, followed by either permanent operations on the moon or temporary operations on the moon leading to Mars, that was the pattern at that time. I don't think it's changed a lot.

BUTLER: I don't think so.

MYERS: But the difference was that as I went into that job, we still had tremendous support from the public. Even though the budget was going down, and logically it should have gone down, because Apollo's huge expenditures were over, we'd built the hardware, we were now just getting into test, and so the industry manpower was really going down fast, which brings up an interesting point. Part of my problem was, "Here's industry cutting down to a third of what it was. Why do we still have the same size centers?" That was an interesting issue. So part of my job was to defend, defend, defend. Even with that, we had to make some cuts down at Marshall, a very difficult thing to do in the government, as you know.

But a lot of fun in the program. We got very good support out of the industry on these various studies of the shuttle. I'm sure you've seen all the different configurations that were developed, triple boosters, and series boosters, and parallel boosters. Max [Maxime A.] Faget had started the program with a straight wing, and my job back there was how am I going to sell the shuttle. I had to go get support from the Air Force. The Air Force came up with this cross-range requirement, which required that you be able to go in one orbit around the Earth back to the original landing site. That meant a 1,500-mile movement of the Earth, so you had to move the vehicle. You had to maneuver the vehicle 1,500 miles. Straight wing

wouldn't do it; a delta wing would. I had had a lot of experience of delta wings in my background, knew that that would do this cross-range maneuver, so we had a big shootout with Max, and since I was the boss, I won. So Max, ever since then he's thought we did it wrong. If you interviewed him, I'm sure he thinks we did it wrong. Fact is, we wouldn't have a shuttle if we hadn't gone to the cross range. I had to have Air Force support, and I had to get Congress to support the idea that this thing would carry other military payloads.

We couldn't prove enough payloads in NASA to defend building it, so that's where we came down. George Low and Jim Fletcher and I all agreed that we had to go to the cross-range requirement and the big payload. So it got big and it got cross range. I think it was exactly the right thing to do, because we wouldn't have had a shuttle otherwise.

I was never very happy with Max's configuration anyway. [Laughter] Because a delta wing with the slope leading edges reduces the temperatures on the leading edge. We didn't know much about temperatures in those days. On the other hand, I give Max all the credit in the world for being one of the world's greatest configuration guys. The way he came up with the Mercury, Gemini, and Apollo was just spectacular, so he still should get all the credit there is in that world. But when we had to move out of NASA as to requirements, Max never connected. He never understood what we were trying to do. But that's the way it goes.

I don't know who sent me this, but I got a cartoon that I had framed and put on the wall, that showed Max and me standing down at the Cape watching the shuttle take off, and the shuttle takes off and then the delta wings pop off, and there's a straight wing underneath it. The caption was, "That's what's called Faget staging." [Laughter] When Max had a birthday, and I can't remember what birthday it was—maybe it was when he retired from NASA—I sent that to him, and I never heard back. [Laughter] So I've kidded Max a couple of times since then. You know, he's helped us up here a couple of times.

BUTLER: Oh, great.

MYERS: So he's still friendly.

So let's see. Where were we? Oh, yes. Finishing the shuttle. We ended up being told by OMB, "Not only do you have to do it for \$5 billion, you have to have a 10 percent return on investment." So we started a study done by a company called Mathematica, that became a really vital part of selling the shuttle. We had a very imaginative guy, whose name I can't remember, that had been at McDonnell-Douglas and came with us there in headquarters, who put together a program that drew on all the centers and drew on industry, on how much would it cost per pound to put payloads in orbit, and how much would it save relative to...expendable launch vehicles.

We became convinced that there were two things you could do. One, because the shuttle could go up and service payloads, you could save money by servicing and extending the life of payloads in orbit. That's part of the money you'd save. You could build simpler payloads. Didn't have to worry so much about weight, so you could build a rugged sort of bus and put different instruments on it, and build many of the buses. So you could save on a learning curve on the payloads. Of course, we thought you could save a lot of money on the reusability of the main part of the shuttle. So all of those elements came into the study, and we became convinced that we could, in fact, meet this 10 percent return on investment.

I'm a pretty good salesman, so I went over and convinced OMB that that could be done, testified to Congress about it, believed the inputs that I got from everybody on what the operational costs would be. How shall I say this? Our people were very optimistic.

BUTLER: A good way to say it.

MYERS: What happened is that I honestly—well, we got blindsided a little bit, too. We hired American Airlines to help us on this study about what would it cost to operate this thing, and

the problem is that we didn't really teach them. We didn't teach them the huge difficulties of dealing with space vehicles as opposed to airplanes. When they thought about checking out the actuators on an aileron, they thought about how you do it on an airplane, and they worked with our people, and I think our people felt, "Gee, we've been through Apollo, we understand space now, we ought to be able to do it more like an airplane." Maybe it even got to where they said, "We can do it like an airplane," but with the American Airlines guys and our people not really having good operational experience, we ended up with way too optimistic an estimate of the operations costs.

Now, there's a little thing that's missing always in the criticism about the operational cost of the shuttle, and that is that we estimated the cost on the same basis that we estimated the Apollo Program, and the Apollo Program never included the costs of the—well, in industry we call it overhead, but it's really the infrastructure that would be there anyway. Okay. Whether or not you're flying, you have an infrastructure there to handle all the maintenance and the equipment, and blah, blah, blah. In the Apollo Program, we didn't include those guys in the costs. They went into a different bucket in the accounting, and so the \$24 billion for Apollo is really not the total cost of the Apollo Program if you included all the other people that are around to support the activity.

We did the same thing on the shuttle. I don't really know what that percentage is, but it was a significant percentage. I wouldn't want to say, but it was a big chunk of money that we left out of our costs when we were estimating the cost of the shuttle. So we did several things too optimistically. We got up to sixty flights a year, and, you know, a reusable vehicle, it is absolutely dependent on how many flights per year you have, because you've got a big original investment in an expensive vehicle, that if you can fly it over and over and over again, you get lower and lower and lower costs. So we had sixty flights a year. We had this terribly optimistic input supported by American Airlines. We included all these ideas like

simplifying payloads, and...[service satellites] and all that caused this thing to look cost-effective. Thank God, it did, because...[then] we were able to sell it.

MYERS: They never should have asked NASA to do 10 percent return on investment. They never have since. I was just one of those things that come out of a sort of a green eyeshade OMB approach that they thought was supporting a President who wasn't very enthusiastic about starting anything new. But we did it, we got it going.

Then OMB double-crossed us because they decided that they had given us 5.25 billion, and they should have really given us only 5, so they gave us the budget in the following year at 5.25, which meant that they did not include inflation for a year. The dirty guys. [Laughter] So that was one of the things that we took away as a great memory of our OMB experiences.

Let's see. Now, let me backtrack a little. Apollo 13, first launch, everything looked great down at the Cape. I got on an airplane to go back to Mission Control to stay at Mission Control during the flight, and when I got off the airplane, my exec was there to meet me. I said, "How are things going?"

He said, "Well, we seem to be having a little problem with the fuel cell."

I said, "Ah-oh. Let's get over to Mission Control."

By the time I got over there, it wasn't a little problem, it was a great big problem. I set up a committee with—let's see. I got Sam Phillips off of vacation. He had left NASA by that time. I got him back. He was in the Bahamas someplace and I got him back to Houston. I can't remember who else was on that committee, but we had about five guys [including the CSM and LM program managers] that met every eight hours through the flight and just kept in touch. We were in the position to be able to talk to the congressmen and the outside people. Still tried to keep it all within Mission Control as far as the activities are concerned,

but we just wanted to stay up to date and bring in any ideas that we could think of that would help in the invention that had to go on during that [flight].

You know the results. It was a very hairy deal. It was almost a death experience. This balancing of all this stuff, and then taking the chance on having not enough battery power to take care of the separation, but it worked. So it was a very educational experience for a first flight and in charge of manned space flight.

BUTLER: What a way to come into a job.

MYERS: We had another one that was just about as challenging technically, and that was Skylab. The write-up on Skylab is not how I remember what happened. It's kind of interesting. The write-up says that the micrometeoroid shield on the Skylab was lifted by the air pressure as the vehicle went up and was torn off. That's not what I remember. What I remember is that McDonnell-Douglas, in their zeal to do things perfectly, had sealed the micrometeoroid shield with tape, and I guess maybe to keep it from lifting off or something, but it was sealed to where as the vehicle lifted, the air pressure inside stayed at 14.7 psi, and the air pressure outside decreased, of course, and that pressure inside just bows the micrometeoroid shield out to where it tore off. If they had left it unsealed, it would have vented the air from inside and not caused that micrometeoroid shield to come off.

Now, that's the interesting difference. I thought that my view was exactly the way everybody thought about it, but I just read the safety report on the Skylab just two or three years ago, and found the safety guys thought it was the...ram air pressure that tore off the heat shield. It's a little detailed difference, but the results are the same. We lost half the solar panel, tangled up the other half. We knew we only had...[twelve] days to fix the problem, because the temperature – this thing was also a heat shield – ...was going up inside the

Skylab, and we figured that once the temperature got above 120 degrees it would wreck all the electronics...so we knew we had to get a flight off quickly.

I went down to Mission Control, worked with the guys down there trying to invent things that would be usable by Pete Conrad and the guys when he went up there. That was one of these twenty-four-hour-a-day deals, too, where everybody's just working until they drop to get stuff fixed and invented.

They invented these two ways to go. One was the umbrella that went out through the scientific airlock that JSC came up with, and one was a kind of a—I call it the awning—that was done by Marshall. We had the two groups come in and present which way to go, and I chose, and convinced Jim Fletcher that we ought to go with the umbrella, because it could be done from inside the vehicle and didn't have all the EVA work to be done. And it worked, thank God. It was not as totally effective as the [awning], so the [awning] did go up later. On the second flight we put it up—the awning, excuse me, the awning was the second one to be put up.

That was a very productive program. I don't think Skylab ever gets the credit it should get. It was just an immensely productive operation. The way JSC responded to that problem of inventing all this stuff and then stowing it in the command module, nobody realizes what a tremendous job was done there, because it used to take us thirty days to change anything in the command module because of all the paperwork and the approvals and the weight changes and all that stuff. We did it all in three days that time. So that was a huge victory for JSC on getting that thing done.

I think the productivity of the program in terms of the instruments and the quick changes in experiments the guys did during that program is a pretty good precursor to what they're going to have to do for the space station. It was a really good experimental program.

Let's see. What else now. Where are we? We're doing pretty well. We're right on schedule.

BUTLER: We're doing pretty well.

MYERS: Let's see. Apollo-Soyuz. I went to—who was the black general in Desert Storm, very personable guy, working with children now? What's his name? They talked about him being President.

BUTLER: Colin Powell.

MYERS: Right. Colin Powell. Colin Powell was head of security—I've forgotten what it's called. It's a security panel for the President when I was there in manned space flight. They were trying to find something that would work to sort of help work with the Russians and cool things down a little bit, and this idea of Apollo-Soyuz came up. I don't know who invented it. But it was kind of tossed into our lap, and that was one I gave lead center to Johnson [Space Center].

A kind of interesting side story on that. The Russians would come to Houston on that program, and go out and buy tennis shoes and spark plugs and all that stuff, and take them home. Our guys would go to Moscow, and the Russians got a little sensitive about that, they said, "You guys are coming to our capital and we're going to Houston. Why don't we go to the capital and have dinner with some high roller up in the capital?" So it came up, floating up to me, I guess, from [Glynn S.] Lunney, who was the project manager down there on the Apollo-Soyuz at that time. I turned it over to Jim Fletcher, and Jim talked to the administration. Nobody up there wanted to have dinner with them, and Jim didn't want to have dinner with them. I said, "Well, [heck], I'll have dinner with them."

So we were going to have the two cosmonauts and their KGB guy, and two or three guys from Johnson. I think we were going to have eight for dinner, and that kind of stressed

us a little bit, because we were in a little house up there in Washington. So the guys came to Washington, they had lunch at the Russian Embassy, and I was invited to the Russian Embassy, and we had a nice lunch over there, a little vodka and all that stuff. As I was leaving, the Russian ambassador, whose name was [Anatoliy Fedorovich] Dobrynin, a very nice guy, the nicest spy I ever met, he stopped me, and he said, "Mr. Myers, I understand you're having the cosmonauts over for dinner tomorrow night." Tomorrow night, remember this.

I said, "Yes, I am."

He said, "Would you mind if I came?"

I said, "No, I'd be delighted."

He said, "I'm an aeronautical engineer, and my wife is an aeronautical engineer, too."

"She's certainly invited."

"May I bring my deputy?"

"Oh, yes. Sure."

So I went rushing back to the headquarters and told Jim Fletcher what was happening. He said, "Oh, boy...I'd better come, and I'd better call [Olin] 'Tiger' Teague," yet another guy who was head of the Authorization Committee over in Congress. So we ended up going from eight to twenty-four.

BUTLER: Oh, my.

MYERS: Because everybody wanted to come once Dobrynin decided to come. Fortunately, we had a recreation room in the basement that was—it wasn't very neat, but it was paneled. I don't think it had anything—I think it was a concrete floor. But we got card tables and big disks, and were able to put like eight people around each one. Marge and I had been taking Russian, my wife and I had been taking Russian for a year, and we were rotten at it, but we

made up place cards for all these guys in Russian. That broke the ice. These guys laughed because we had spelled things wrong, we put Cyrillic letters backwards, you know, and all this stuff. It broke the ice to where they started to try to speak English. They didn't normally speak English. Everybody had a nice time.

Turned out Dobrynin told me that he met his wife in the halls while they were going to school, and she was crying, and he helped her with her mathematics, and later on Mrs. Dobrynin told me she had tutored Mr. Dobrynin. [Laughter] So I don't know which of them was telling the lies, but one of them was.

That was an interesting program. So anyway, I had a great experience at NASA headquarters in that time period. Spent a lot of time at...Houston. I had known all the Houston guys anyway before I went up [to NASA Headquarters], so I had no problems in working with the Houston guys... I got to know the guys down at Marshall [and Kennedy], found they were a terrific bunch of guys, too. So it was a good experience.

The shuttle got under way, and I saw seven years before any flights were going to come along. I'd always felt that I had gone back there partly as a duty, and so I left in 1974.

I really didn't have much contact with NASA from '74 until—see, because I got off in these other things. I was in the airplane business. Even though I was at Rockwell, I never saw the guys at the space activity. I was up in my ears in building B-1s and Sabreliners and things like that, so I didn't see the guys. So I kind of lost track of the guys at that time.

Then I went to the Department of Energy. I don't think I ever saw a guy in NASA while I was in the Department of Energy. Oh, that's not true. We had a couple of committees where we worked together, but it was still very minimal contact with NASA.

Then [after] I went into the consulting business, well, I was in the construction business. That's as far away from NASA as you can get. I was building chemical plants and refineries for petroleum industry and things like that. There's nothing to do with space.

So then let's see. Came out of the construction business and went in the consulting business [again], and there I started getting back with companies like Aerojet and General Dynamics and people like that, where some of the things were military, some were NASA. So I began to connect a little bit with the programs, but very little with the people. So when I was asked after the *Challenger* accident to come back, well, a lot of the guys were the same people. They had moved up [to] higher positions. Arnie Aldridge was up in Washington by that time, the guy I used to spend time in the span room with, so the connection was still there with people in both Marshall and Houston.

That wasn't nearly as much fun, because the problem was that morale was just at the bottom of the barrel. Congress was trying to find somebody to put in jail, and a lot of our time, both Jim Fletcher and my time, was to convince Congress that this was not a premeditated situation, that if they were to choose a guy to put in jail or to indict or something like that, it would just wreck the total future of NASA and probably wreck even any laboratory activities in other parts of the government. So that was part of our problem was to try to—well, we did finally get them to back off of this indictment feeling that they had. We fired a couple of guys in NASA, but at least there was no jail sentence or anything of that nature that was involved. They just were told, "We don't need you anymore." So the job then was to rebuild the operation.

When I got in there, I found that the lead center system had disappeared, I think mostly due to John Yardley, but maybe after that other people that were in there never really understood what we were trying to do, or at least they did not accept the ideas that we were trying to do of focusing management in one place, putting the responsibility in one place, use the other centers as essentially subcontractors to that center, having that center be responsible for the balance of funding for different centers to be able to bring about the project. And that was gone. By the time I got there, funding was going directly to Marshall and directly to JSC. So JSC had really lost their lead responsibility.

Oddly enough, when I talked to J—not J. Eric Thompson, but Bob [Robert F.] Thompson?

BUTLER: Bob Thompson.

MYERS: Yes. I think he would disagree with me. I think he thinks he still had a lead responsibility, and in some sense he did. He had still the technical integration people and had developed the technical part quite well, but the communication between Johnson and Huntsville had fallen apart. All the issues associated with particularly quality control, which no one I remember particularly was—had broken down completely. [When] the problems were developing on the O-ring, they were not ever discussed with the people at JSC, who supposedly were in charge—supposedly. So the system broke down.

One of the first things that we got into when we got back there was, how do we organize the Shuttle Program now, and how do we organize the space station? I had been so shaken by that breakdown of the responsibilities between the two centers that I didn't fight for a single [lead center] set of responsibility. Sam Phillips was brought back in, and he strongly recommended that for both the shuttle and the space station, that we go back to the old manned space flight management system that I had had in '74 on everything else, which was a lead responsibility in headquarters, and funding from headquarters for each of the different centers. I didn't fight that, because that system had broken down so badly. So that's what happened. They went back to the old Apollo-type management system and stayed in that system through the continuation of the Shuttle Program, and the then building-up of the space station.

Space station is an interesting story. I'm probably about where I will end up. Well, I don't know where to start. I think you've probably been all through that stuff of Jim [James M.] Beggs starting the program with \$8 billion, getting all the center directors together and

agreeing that we really ought to spread this stuff out, because that way we can get the support of Congress. So they got—I don't think they got every center into it, but they got almost every center into the program and got the congressmen on board to support the program. When I got there, we had—I don't know—yes, Goddard [Space Flight Center] was involved. I guess every center was involved in the space station. So we had a huge management problem, a huge overhead problem, and we were seeing the cost of the space station going up like crazy.

One of the problems was getting all the centers into it, and then they were finding that all of their constituents and all of their supporting scientific base and so on, were putting inputs into the requirements, and the requirements were being gathered by Washington, DC, and nobody was trying to simplify them because they thought, "Gee, we need that congressman's support, so we can't say we don't want to do his microgravity kind of stuff."

We had a guy in Congress, Dick Mallow, who was the Chief of Staff for the Appropriations Committee, who was very active in his ideas of what the space station ought to be. As far as I'm concerned, the requirements for the space station got out of control. They grew too far too fast, and made too big a space station without clear definition of the requirements. I saw it coming, and I saw that the costs were going to go out of sight.

That was the other thing we were doing. We wanted to get European support like I did on the shuttle. I got European support on the shuttle by getting them to do the...Spacelab for the shuttle, and that was a separable and not fundamental requirement. We could fly without it. So if it didn't work, it would be okay. And that was clearly in our mind. We didn't know whether the Europeans were going to carry through on the Spacelab or not, so we needed something that wasn't fundamental to the shuttle.

The space station went the other way. We got fundamental requirements tied in with the Europeans, so it had to work. Fortunately, the European space programs have gotten mature enough that when I got there and found that was happening, well, there wasn't

anything I could do about it anyway, but I convinced myself that the Europeans were stable enough that they probably would come through on the program. The Japanese were so eager to get into space that we thought they could do it, too, and if they didn't make it, it was not going to kill us. That piece was pretty separable.

But I could just see that we were in big trouble on cost, because the overhead of the centers, the cost of manning-out in the centers, and the subcontract relationship, a huge integration job for headquarters. So part of my activities were trying to simplify the space station. I spent, oh, I bet, 10 or 15 percent of my time working with the space station guys, trying to find ways to simplify it. I failed. I really failed on that. I tried. I got Jim Fletcher to agree that we'd go run a little quite study over in Langley called the KISS Program, where we would try to simplify the space station and simplify its management.

The then program manager for the space station, I can't remember his name, and it's probably just as well I can't, went to Jim Fletcher and said, "Boy, if we carry out that study and it gets out that we're doing that study, we'll get the space station canceled." Jim Fletcher talked to me like a dutch uncle and decided I ought to cancel that program. So I canceled this program that would have simplified the space station. I'm not sure I would have gotten away with it, because the simplification would have also reduced the number of senators involved, and by that time the Center-congressional relationships were so strong that I doubt if we would have been able to do it anyway.

Let's see. Oh, yes. I tried to go to a single center on the space station, which would have been Johnson. Jim Fletcher was wary of it. I kept trying to convince him that if we had plenty of time we could then set up by procedure and regulation, essentially, how the system would work, and how everybody would have to pay attention to Johnson as lead on the program. Jim got Sam Phillips in, and Sam went through this thing again, and we ended up deciding to do it like Apollo. That was really to support the idea of all these congressional supports to the centers that are involved.

So I left NASA feeling very uncomfortable about the space station. I thought it was too big, I thought its requirements were too extensive, I thought that the management system had just terrible overhead problems, and having had all that background in industry, it just was very unsettling for me to see it go that way.

Let's see. What else did [I] do while [I was] there? One of the other big things that was going on while we were there was to try to support commercial space. We had set up an organization to work on commercial space. I remember we had some bad proposals, some good proposals. We ended up supporting Spacehab on a deal where the agreement was that it was going to be a privately financed deal. We would buy half the payloads. We would fill half the Spacehab if they would get half from outside sources. Made that deal. I think they got a few things from outside sources, but the half was always NASA's and we always had half, more than half, NASA payloads. But at least we got [one] commercial system started.

We were going to buy a Titan 3, which was a big launch vehicle, and the price kept going up. It started out at—I've forgotten what it was. I think it was \$70 million they were going to sell it to us for, and as time went on the price went up over 100, so we canceled that program.

We started a lot of microgravity experiments, and we started an upper-stage launch vehicle that was private financed by Orbital Science. I can't remember the name of, but that program went on, and I lost track of it. I think they had one or two launches, but I think the Boeing upper stage, third stage, having been developed with government funds, was cheaper to build, because it had amortized all its development costs. I think it pretty much set aside that Orbital Science system.

But there was a lot of activity on commercial activity at that time. We set up a couple of centers of microgravity experiments. We were trying to establish things that would later produce interest on the part of industry for experiments for the space station. So there was a fair amount of activity in that.

I guess the other thing that we did, that I did at that time, was worked through with Dick [Richard H.] Truly the issues of what kind of launch rates we ought to have for the shuttle, because one of the real troubles with the shuttle was this great pressure to get the higher launch rates to reduce the cost per launch. That got to be almost a rhythm between the media and NASA about, "Why aren't you launching?"

"Well, it rained yesterday."

"Well, why aren't you launching today?"

"Well, we got a little problem with the thing."

And the pressure was on all the time, and we think that probably contributed also to the *Challenger* problem. So the issue was "What do we do?" We finally settled down on about eight launches per year, and that settled the guys down to where we didn't have that kind of pressure. Actually, the media, I think, felt a little embarrassed about the pressure they had been putting on NASA, and they backed off, too. So that was fortunate. We gave them a lot of lectures about that, so they kind of backed off, too.

So what have I missed? I think I've covered everything I dealt with.

BUTLER: I think you've covered pretty much everything. We can always have a chance to look [unclear].

MYERS: Yes, as you go through it, or as you see holes or conflicts with other people's discussions, you can give me a call.

BUTLER: Wonderful.

MYERS: Yes, I'd be glad to help in any way I can.

BUTLER: Wonderful. Well, this has been fascinating.

MYERS: Thank you.

BUTLER: I want to thank you. [Brief interruption]

MYERS: This is part of the interesting things that happened in a program, okay? On the Apollo Program, we had titanium tanks that were used for the fuel for the reaction control system to stabilize the vehicle. They had N_2O_4 in one tank and—I want to say UDMH in the other one. I don't even remember what the chemicals were. But if you stick them together, they burn. We were testing these tanks. We always tested them with fuel out in the back parking lot there in Downey. One morning a guy came in and said, "Hey, one of those tanks popped."

I said, "What do you mean 'popped?'"

He said, "Blew up."

I said, "My God, what caused that?"

Because we had these things, we'd been using them on different vehicles. I think it was before we had a manned flight, but we had used them on some of the earlier unmanned experimental flights. They had a lot of experience with them, and they had been qualified, and they were good tanks, wasn't anything wrong with them.

So the guy started looking into it to see what was wrong. Two days later, another one popped. I think in about three weeks we had lost something like four tanks. We started calling around. The guys back East had been testing these tanks, too, and they weren't having any trouble at all. We kept saying, "What's the difference between what we're doing and what they're doing?" We began to get ideas like, "Is there something in California like smog that's doing it?" We couldn't see what was different between what we were doing and what

was going back East. We found that if we filled our tanks in California and pressurized them, they'd pop in about three days. [This is what we used to call an "Unk-Unk." An unknown, something we don't even know is a threat. When the tanks started popping, the problem became an "unk." We knew what was happening, but we didn't know why. "Unks" are fixable.]

So we finally traced it down to where the Air Force, who supplied the fluid, wanted to be sure that the stuff they sent us was the best that you could have, and they found that they had about a half a percent water in the fuel. So they filtered it and cleaned it and fixed it, so they got all the water out of the stuff. It turned out [that] the water was what was keeping this corrosive material from attacking the titanium. Half a percent of water made the difference. Having cleaned all of that water out, our tanks popped. The guys back East were using an old tank of fuel, so they didn't have any problem at all.

But those are the kind of little subtle things that you get into when you do that early work in space, where nobody has done it before, you try to do it perfect. The Air Force was trying to do their job. There wasn't any criticism of what they were trying to do, but we said, "Add a half a percent." [Laughter]

BUTLER: Put the water back in.

MYERS: Yes, it fixed the problem. But isn't that an interesting part of the—it's kind of a snapshot of the kind of world we dealt with in those days. Wonderful people working the job, all very competent, both sides, NASA and North American. So it was a great experience.

BUTLER: Wonderful. Thank you.

MYERS: Okay.

[End of Interview]