The oral histories on this Website are the transcripts from audio-recorded, personal interviews with many who pioneered outer space and the Moon, and with those who continue the excitement of space exploration. To preserve the integrity of the audio record, the texts are presented with limited revisions and thus reflect the candid conversational style of the oral history format. Brackets and ellipses indicate where the text has been annotated or edited for clarity. The date of each interview is noted on the first page.

If available, the Biographical Data Sheet provided background information for the Oral Historian to prepare for the interview. A project research historian submitted the data sheet on the date listed at the end of the file.

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# ORAL HISTORY TRANSCRIPT

JAMES A. MCDIVITT
INTERVIEWED BY DOUG WARD
ELK LAKE, MICHIGAN – 29 JUNE 1999

WARD: This is our oral history interview with Jim McDivitt, June 29, 1999. Jim, starting back early on, you interrupted your college career early to join the Air Force at the time of the Korean War, then came back to college, pursued it with a real purpose. Do you think that your career would have progressed the same if you'd done it the standard way? Started with college and gone all the way through, and then into the military?

MCDIVITT: Well, I don't really know. I did it that way because I didn't have any money! When I got out of high school, I worked for a year before I even went to junior college. I went to junior college while I got a scholarship to Michigan State, I didn't have enough money to go there. So, I had to go back to work. And since the Korean War started on Sunday and I started my job on Monday, and I was 20 years old, that was—I was prime bait for the draft. And so, I was going to get drafted right away. And, I don't know. It just turned out perfect for me. So, I might add that, you know, that I went into the Air Force—I'd never been in an airplane. Never been off the ground. I'd already joined the Air Force, was in the Air Force, was accepted for pilot training before I had my first ride. So, fortunately I liked it!

WARD: What was your flying career involved with primarily at that time?

MCDIVITT: Well, when I finished up flying school I went to—the Korean War was on, I went to gunnery school; and over in Korea I flew F-86s. Flew 145 combat missions. I flew

my last one 2 hours after the armistice was signed—with a lot of trepidation. Nobody wants to get shot down after the war is over! But anyway, I did it. They allowed us to—they were very generous. They allowed us to fight for another 12 hours. So anyway, when that was over I came back and I was in a fighter squadron in Maine, then another one in New Jersey, and then I went back to school at the University of Michigan.

WARD: To what I think would be a stellar academic career. As I recall, you graduated top of your class.

MCDIVITT: Yes.

WARD: One would get the impression that perhaps the military experience really gave you that sense of purpose.

MCDIVITT: Well, it focused me a lot more. I think probably the thing that really focused me was when I was going through pilot training. If you were an aviation cadet that came into the program as a civilian, if you washed out of flying school you went back to being a civilian. Because the Korean War was on, there were a lot of people trying to join the Air Force and get into pilot training. And in a class—entry time from when you applied to when you got into a class, sort of—you had to stretch out. And my deferment from the draft was fixed, and the class I was going to get into stretched out past that time. So, I was notified by the Air Force I had a choice of either letting that deferment expire and taking my chances on whether the Army would call me before the Air Force did or joining the Air Force as a private. But I elected to do that. And then now I was already in the military, and if I washed out of pilot training I went back to being a private or an enlisted man for four years. And four years to

somebody who's that age is a lifetime! And I really didn't want to do that for four years. So, I got a lot more focused in what I was doing!

WARD: Were you one of these people for whom flying was just instinctive?

MCDIVITT: Well, it turned out it—that's right. It was, really. Having never been in an airplane and no idea what it was all about, and I think I was the first guy to solo in my pilot training class—even though there were guys in there that had 100 hours of flying time before they ever came into the Air Force. So, I did it very quickly. I just took to it.

WARD: After graduation at the top of your class in Michigan, you went in then in Test Pilot School.

MCDIVITT: Right. I went right from school—right from the University of Michigan out to the Test Pilot School, and I went through that in the class of—'59C I think it was.

WARD: What motivated the decision to go that direction as opposed to going off into civilian life?

MCDIVITT: Well, first of all I had a commitment to the Air Force where I would take another two or three years. I was a regular officer. I'd got selected for a regular commission when I graduated from pilot training. I think there were two of us out of all those classes. And so, I didn't have a finite time that I was going to retire or leave or anything like that, unlike the Reserve officers. And as a matter of fact, in those days there were very, very few Regular officers in the Air Force. They were mostly Reserve; probably 90% Reserve. But every time you went to a school or something, you took on another commitment.

And so, I really didn't have much choice. And since I—when I was at school, I thought I'd like to go on and get a Master's degree. I'd been straight A's all the way through school. And I'd read a brochure that the Air Force had put out, or I guess it was a monthly newsletter or something, about somebody who had really good grades and they were going to allow him to go on to school for one more year. The Air Force policy was two years at a time but no more than three years total. And since this other guy—I'd found out the other guy was—another guy was going to do it, I thought, "Well, I'll try that." So, I was really focused on getting a graduate degree; and I applied for that, and all of a sudden it was turned down. And I had an assignment to Wright-Patterson Air Force Base [Ohio] into a Project Office as an engineer, which is about the last thing in the world I wanted to do!

Ed [Edward H.] White [II] and I, the fellow I flew with on Gemini IV, were going to school together. We lived just down the street from each other. And he was going on to the Test Pilot School. He'd applied for it years before and been accepted; and normally it was about a year to two-year process to get the application and get accepted. Well, this was already like April or May. I thought, "Heck, I'll do that!" I had a squadron commander who had been through the Test Pilot School, oh, at one time and I liked the way he flew and stuff, and so I put in my application, I think in either April or May. And I heard back in about two weeks that I'd been accepted, which was a whole different route for my career!

WARD: Was Ed White a big motivation in your going that direction?

MCDIVITT: Well, no, he was going to do that. We were friends, and it was a better alternative than going to Wright-Patterson as an engineer in a Program Office! But it was a non-flying job, and it didn't sound like a good deal to me. So anyway, we went out there. We were in the same Test Pilot School class.

WARD: So often I've heard astronauts asked the question from your sort of background, "How did you happen to go from being a test pilot to being an astronaut?" The standard answer always has been, "Because it's just a natural extension of test piloting." But I get the impression in your case that you may have been a little reluctant to give up the test pilot business to take a shot at being an astronaut.

MCDIVITT: Well, both of those are right. It is a natural extension of flight testing. But after I got out to Edwards and went through the Test Pilot School there, I got selected to stay at Edwards as a test pilot. All the other guys went other places, but I got to stay there. And there are very few fighter test pilots. I think we had nine or ten. And it was a great job. Probably the best job that I've ever had.

And as we were—as I was going along really enjoying the fruits of my labor, so to speak, I'd been there in flight test a couple of years when my boss called me in one day and said, "Jim, we've got this really great opportunity for you. We're going to—the Air Force is starting up a school called, I think it was the Aerospace Research Pilot School or something like that. But the concept was that we'd take guys who were already test pilots and send them through the school and train them to be astronauts, keeping in mind that we didn't—really hadn't flown anything at that time in space, and the Air Force had no space program and a lot of other things.

WARD: Was this, what? 1960, '61?

MCDIVITT: This was 19—about 1960 or—yeah, it was 1960 or '61, I forget exactly the date. And I promptly told him that I was not interested in it whatsoever! And I had—I'd just had enough schooling for a while. I wanted to fly airplanes and continue to do what I was doing.

And so, finally he told me in no uncertain terms that I was going to school! So, I saluted and said, "Yes, sir! I didn't really know you wanted me to!" So, anyway I went down through there. But I was the first student in the Aerospace Research Pilot School.

WARD: Was this in preparation for Dyna-soar?

MCDIVITT: Yeah, it was really to get people in the Air Force qualified to get into space as pilots. And the Air Force was talking Dyna-soar at the time. They didn't really have anybody assigned to it but there was a concept. There was going to be an Air Force space program. Keeping in mind also that, at that time, there wasn't a definition of the roles and missions of all the different military services and NASA. As a matter of fact, the Air Force and the Army were still fighting over who was going to have control of ballistic missiles.

Anyway, I pretty much got sent to the Aerospace Research Pilot School. And I was a student, and Frank Borman was one of the instructors. He'd just graduated from the Test Pilot School and went right in there as an instructor. We had a couple of other guys. And what really happened was that there were let's see, one, two, three—there were about four of us—three pilots and an engineer—that really put the class together. Put the curriculum together. I did most of the flying for the flying curriculum part. We designed—wrote the specs for—we didn't design, but we wrote the specs for simulators. We wrote the specs for changing some of the airplanes; putting a rocket engine on it. If you've seen *The Right Stuff*, that was—that really came out of the Test Pilot School. We taught each other. We just sort of divided up the things that we wanted to—thought we ought to learn, and then one of us would bone up on that and then we'd teach the other guys. And then we went around the country, finding different universities that could support us, and—

WARD: It sounds very similar to what was going on in Mercury at the same time, where spaceflight was being invented.

MCDIVITT: Oh yeah! Yeah. Yeah. We were sort of inventing it in the academic sense. They were inventing it in the operational sense. But anyway, when I got all through with that, which was—I think it was about a six- or eight-month course, I went back to flight testing and had only been there a short time when Bob [Robert M.] White, who was the number one X-15 pilot in the Air Force, was going to leave. And the number two guy was going to move up, and they asked me if I'd like to become the new number two guy for the Air Force. Of course I jumped at that!

And then the F-4 Program—Air Force F-4 Program—was going to start, and my boss called me in and told me I was going to be the project officer—project pilot on that. That was really a cushy, wonderful job. And about the same time, then, I—another one of my bosses called me in and said they'd like to have me—like to assign me to the Dyna-soar Program. Well, by then I knew enough about space that I thought, "Well, I better look into this a little bit more!"

WARD: This might not last.

MCDIVITT: Yes! So, I hopped in a T-33 and flew up to Boeing and spent about three or four days going through the plant, talking to the guys, and my conclusion was that the Dyna-soar Program would never fly. The spacecraft was wrong. They were trying to make it a military weapon system. It wasn't. It was too heavy. There wasn't a rocket that could lift it. And so, I went back and told my boss I really wasn't interested in the Dyna-soar Program.

WARD: Just like the Space Shuttle.

MCDIVITT: Yeah, kind—well, actually it was—no, it was a lot more screwed up than anything else I've ever seen! As a matter of fact, it was kind of funny because a month or two before I was out there, the Secretary of Defense I guess it was, had been out there and looked at it, and told them that they had to make it into a weapon system. And it reminded me of a B-17. About the only thing they didn't have was a side-facing window with a .50-caliber machinegun in it! I think it was really bad.

WARD: But Dyna-soar really did contribute a lot to Shuttle development.

MCDIVITT: Oh yeah. Well, there were a lot of programs that did. You know, it was a lifting body concept and the landing thing, but it never flew. But anyway, when I went back and told him I wasn't interested in that, I was informed that that was the first time that an Air Force test pilot had ever turned down a premier, "premier" program that the Air Force had! I said, "Well, I'm sorry. But it isn't going to fly." And of course, it didn't.

So anyway, there I was, assigned to the X-15 Program, the new project officer on the F-4, and then I'd been selected to go over to France and flight test a bunch of French airplanes for about a month. And just before I left, my boss called me in and said, "Jim, there's going to be a NASA astronaut selection here while you're gone. Do you want us to submit your name?" "No! Absolutely not!" He says, "Why not?" I said, "Well, you know, I want to fly the X-15. I want to stay here and fly airplanes, and that's what I want to do." And he said, "Okay." So, he said, "I was hoping you'd say that."

So anyway, I went over to France and spent a month flight testing a bunch of their fighters and a bomber. Then came back, and I started getting involved in the X-15

Program. And we finally got an F-4 in and we were starting to do a little work on it. And then my conscience began to bother me because I knew I was a good pilot, and the Air Force had sent me to Michigan, the Air Force had sent me to Test Pilot School, the Air Force sent me to Aerospace Research Pilot School, and I had always done well academically. And, "Oh golly, you know. Should I do what I really want to do? Or should I do what I—make the best contribution I think I can to the country?" And I mean, that sounds kind of dorky today but that's the way I felt!

And so, one night—late in the evening I called Bob White up. He was the X-15 pilot that was leaving. And I was pretty sure that he was the guy that had selected me to replace him, and I didn't want to let him down. And so, I went over there.

I called him and asked him if he had some spare time. So, I went over there and we sat around and drank beer for four or five hours and talked the whole thing through. And he told me that I should really do what I thought was best, and that I wouldn't be putting him in a bad light by sort of backing out of the X-15 Program. And so anyway, he said that he'd—but by then the astronaut selection had been closed for about a month, maybe two months. And so, he said he'd see what he could do with respect to the Air Force, because the Air Force was having a selection process in front of the NASA process.

So, we met down at the flight operations the next morning at about five o'clock. He called back to the Pentagon. He was a big deal in the Air Force. Even though he was only a Lieutenant Colonel, he was "the" pilot at the time. Called back and talked to some of his General friends; and they agreed they would accept my application a couple of months late. So, we had to get it out right away. I couldn't type; he could. So, this Lieutenant Colonel sat down and typed the Captain's application! So anyway, we got the application done; and we had to get it out right away. Remember, no faxes in those days. We had to use the mail. So,

I took it up to the instructor of flight test—who was a full Colonel—and left it with his secretary and asked her to have the Colonel sign it and ship it out right away because they were waiting for it. About—and then I went back down to flight test operations.

By then it was about 7:30 or so. And I got a flight coming up. And so, I was in my—in where my desk was. I was going to call it "an office." It really wasn't an office! But anyway, I was in at my desk, filling out a flight test card when the Colonel came storming into my office, looking—he didn't even have his hat on! You never go outside in the Air Force without a hat. But anyway, he came in storming in with no hat, threw my application on the floor, and called me a traitor to the Air Force. Whereupon I jumped up, saluted, and said, "Good morning, sir. How are you?" I knew how he was. He wasn't very good. And he told me that he wanted me to withdraw my application, that he wanted me to stay there, that I was providing a disservice to the Air Force by leaving the Air Force, going to NASA. And I told him I couldn't really do that. I'd already made up my mind. I'd gotten Bob White involved in it. Air Force Headquarters was expecting it. And so, he yanked me off the X-15 Program right there. He said, "You're off that program!" he says. "Your career is over!"

So, I had all my eggs in one basket. And fortunately, I got selected! I might add that many years later, after I'd left the Air Force, I got a letter from that guy. His name was Peterson I think. I got a letter from him that said, "Jim, I'm sitting here on my patio in Albuquerque" I think. "I'm retired, and I was just sitting here thinking about my Air Force career and all the great decisions I made. And," he said, "there was one really bad one I made. I wanted you to know that I realize that I should never have threatened you like that."

WARD: That was a pretty significant group that you joined with. The, I think, first group after the original seven. As I recall, they dubbed you guys "The Original Nine."

MCDIVITT: Yeah.

WARD: And you really became kind of the core, as you look back on it—the management core, the leadership core of the Apollo Program. And also, a lot of the leadership and command responsibilities for Gemini. Did you have much involvement with Mercury at that time? Or was it pretty much straight into Gemini and Apollo?

MCDIVITT: Oh no. See, when we got there the—by the time we got to NASA, it was around the 1st of October of '62. [Alan B.] Shepard [Jr.] , [Virgil I. "Gus"] Grissom, [John H.] Glenn [Jr.] , [M. Scott] Carpenter had already flown. And we got there early in October. We were told we were going to have like a month to sort of get settled in. But the second day we were there, I think, we were told we were going to leave for the Cape [Canaveral, Florida] that night for [Walter M.] Schirra's [Jr.] flight. So, we went out down there and we watched it. But we didn't really contribute anything to it. And then, when [L. Gordon] Cooper [Jr.] flew, we went down about three or four weeks before the flight and just watched the countdowns but we didn't—we made no contribution whatsoever. As a matter of fact, we were probably in everybody's way. But at any rate, we were down there on a learning experience to see what it was like before the flight.

WARD: And of course, Cooper's was the last of the Mercury flights.

MCDIVITT: It was the last of the Mercury Seven.

WARD: So, you focused very early on, on Gemini and, I presume, Apollo.

MCDIVITT: Yeah, yeah. Well, when we got there, we were all—the nine of us were assigned

engineering jobs, engineering responsibilities. And those engineering responsibilities focused on Gemini and Apollo; so you had the same responsibility across both programs. Mine was guidance and navigation, so I looked after the computers, such as they were, in Gemini and the software programs. And then the same thing over in Apollo, all the guidance and navigation stuff—the telescopes, the computers, the software, etc., for the Astronaut Office. I wasn't in charge of it for the Program Office, but it was the astronaut input to these things.

WARD: What kind of a relationship did you guys have with the first group?

MCDIVITT: At that time it was more of a—well, it's really hard to explain. They were involved in what they were doing. Some of them had already flown. Al [Shepard] was sort of he was the head of the Office, as I recall. Maybe Deke [Donald K. Slayton] was; I don't remember how it was at that time. But—

WARD: They—Slayton and Shepard had both been removed from flight status weren't they?

MCDIVITT: No, I don't think so. No.

WARD: They were still on?

MCDIVITT: Shepard hadn't been. Slayton had. So, I guess Slayton was the head of the Astronaut Office, because it was very small in those days. John Glenn was involved in all of the hoopla after his flight, plus his attempt to run at political office, and he got hurt. And so, he was really kind of away from the thing. Although he was—he welcomed—he and Annie welcomed us all and invited us over to dinner and things like that. So, he made a real special

effort. He was really a nice guy. I like John.

The other guys were sort of involved in either flying or getting ready for a flight or having been in a flight, and so it was a—they were kind of over here, and we were kind of over here. There was no animosity. Don't misunderstand me. And they tried to help as best they could; but they had other things going on. And so, we sort of did our thing and they did their thing.

It wasn't until we really got into Gemini that we started working together. Gus was looking after that. So, everybody that had any engineering responsibilities in Gemini always worked with Gus to make sure that it was compatible with the other stuff that was going on.

WARD: How would you characterize Slayton and Shepard as managers at that early point in their career?

MCDIVITT: I'd just as soon not talk about my opinions of those guys.

WARD: Okay.

MCDIVITT: I mean, they're both dead. And—

WARD: Let that go.

MCDIVITT: Yeah.

WARD: Was there any particular thing that stands out in your mind or that you recall about the meshing of the military culture of the astronaut corps with the civilian nature of an agency like NASA?

MCDIVITT: Yeah.

WARD: How did all that go?

MCDIVITT: It didn't mesh and it was very, very awkward. When I was a test pilot, I was an Air Force Captain. I don't remember exactly what I was making, but it was less than $10,000 a year. I had a full set of uniforms: mess dress uniform, a class A uniform, a lot of working uniforms. And so, my wardrobe was a military wardrobe. I think I had one or two obnoxious-looking sport coats and maybe two pairs of slacks. I think I might've had a suit! But I certainly didn't have a wardrobe that that I'd call a civilian wardrobe.

As soon as we got selected, we were told that, "No more uniforms." We were never supposed to be in uniform. And we all of a sudden, you know, here we are, 95% of your wardrobe is extinct! And so, now you have to re-equip. And we didn't have a heck of a lot of money to do that. We had to have tuxedos and suits and all that other stuff. And we were the representatives of our country to the foreign countries and to all the people who were paying for the program. We represented what the program was. So, that was—we really scrambled around. And then to top all that off, we weren't living on base housing.

I moved from a house—a really nice house at Edwards Air Force Base into the civilian community of Houston. Fortunately, things were not too expensive in Houston in those days, and so we could afford to buy a house and things. And I must say that we ended up with a contract, ultimately, with *Life* and World Book for our exclusive stories, which provided a little extra money. Very little extra money! But at least it gave us enough money so we could afford a wardrobe. But it didn't didn't occur until we'd been in the program for a year or two. So, it was kind of tough.

I remember one really stupid thing that we got involved in, where the Air Force guys

were invited to participate in an Air Force dining-in at Patrick Air Force Base, which is the Air Force facility at the Cape. And so, we got out our mess dress uniforms; and we were going to go down there and act like Air Force officers. And just before we left, we got a phone call—NASA got a phone call from the White House instructing us that we were not to go to the dining-in, in our Air Force uniforms. We were going—we were supposed to wear tuxedos.

Well, here we are. I think there were three of us went down; maybe four. But anyway, say, three or four Air Force officers show up at this Air Force dining-in, in tuxedos, and everybody else is in military mess dress uniform. And a dining-in is a very formal, traditional military get-together and you—there are certain things that you do. You have a toast to the President. You have the chairman of the mess, and a whole bunch of things. And so, the four of us looked like real jerks sitting around in our tuxedos! I mean, that part of it was very difficult.

As far as working together, I mean, the Air Force guys and the Navy and all the rest of the people, they blended in very well. We'd worked together in big teams before. So, there wasn't a problem there.

WARD: And the differences in civilian management, chain of command, esprit, all those sorts of things?

MCDIVITT: It was a little—it was a lot looser. The chain of command was a lot looser. There was no rank. I mean, Air Force Captain or Air Force Major, and the Navy Captain, I mean the rank didn't play a part in it. Our rank was what our job was, not what our military rank was. We had civilians, and where would you stick them? Although I guess they were the equivalent of full Colonels! We always used to like to fly around with Elliot [M.] See

[Jr.] and Neil [A.] Armstrong, because we'd get really good treatment when we got to a military base!

WARD: I guess that the civilian emphasis was really a top-level political decision at the time, and—

MCDIVITT: Absolutely. The reason for that was that we had tracking stations all around the world in foreign countries, and if this thing had any—smacked at all of military then there would be political repercussions—or there could be political repercussions in each of those countries. Every one of them had a different political situation, and if it looked like these countries were supporting an American military operation, then there could be a lot of problems, either domestically or with some of their foreign relations. So, this was strictly a civilian project.

WARD: This next question may get into what [Benjamin] Disraeli called "lies, damned lies, and statistics." But one of the things that stands out, and the kind of—stands out in my recollection, very unscientifically, is that early on in the astronaut program, space program, there seemed to be an inordinate number of training accidents and fatalities among the astronaut corps. You lost one out of the first group; two of your group of nine; four out of the next group.

MCDIVITT: Yeah, we lost a lot of people. I think there may even have been more. Yeah, because Gus got killed in that—and Elliot See was killed in an airplane accident. Ed White was killed in that spacecraft fire.

WARD: Yeah. There was a lot of attrition.

MCDIVITT: [Roger B.] Chaffee—was killed in the fire. And [Clifton] C. C. Williams [Jr.] in an airplane accident. And—

WARD: Freeman.

MCDIVITT: —Ted [Theodore] Freeman in an airplane accident. Charlie [Charles A.] Bassett [II] in an airplane accident. Then Ed [Edward G.] Givens [Jr.] was killed in an auto accident. Yeah, we had a lot of guys get killed.

WARD: Is there any explanation for that, that you can—looking back on it? Or is it just the luck of the draw?

MCDIVITT: It was the fire—that was a problem with not knowing enough about what was going on in the world of spaceflight. We were all novices. The airplane accidents were just sort of things that happen. They all came about different ways. Freeman hit a goose in the traffic pattern. Elliot See and Charlie Bassett were—got caught in some bad weather and ran into a building. C. C. Williams just had an airplane accident—airplane problem just was flying from the Cape back to Houston. He was on my backup crew at the time. Givens had an automobile accident, and those things happen. It was just that we had, you know, the loss rate in the group right behind ours was really high. And as a whole, I mean, the 30 guys that we had that flew; we have eight or nine—seven or eight guys got killed. That's quite a bunch.

WARD: Overall the record has been very good. But for the early groups, it seemed to be much more in line with what you expect for test pilots.

MCDIVITT: Yeah. Yeah.

WARD: I think if I remember the statistic on that one. It's 1 in 4 loss rate.

MCDIVITT: Yeah. As a matter of fact, the airplanes they got killed in were all T-38s, which is a pretty reliable airplane. But that's what flying's about!

WARD: Well, I recall after each one of those accidents, there seemed to be a hue and cry from the press and from members of Congress saying, "These things are just too dangerous. We can't afford risking these highly trained, experienced people. And we need—" And then there would be a study and a look at whether we really needed high-performance aircraft as part of the training.

MCDIVITT: I'm trying to remember how that went. When I joined NASA, we had some terrible airplanes. We had a couple of TF-102s, which are side-by-side 102s. The F-102 was a single-seat interceptor; and a TF-102 was a very—it was a difficult airplane. Well, it wasn't difficult to fly. But it was a weird airplane in that they—most training airplanes for fighters are tandem cockpits. You're like this [gestures]. For this airplane, they decided to make them this way [gestures]. And so, the fuselage sort of bulged out there; and the flying characteristics of the TF-102 were kind of weird. And if you flew it alone, you flew it—you were obviously in one side of the airplane; you couldn't see out the other side very well. It had poor performance compared to the regular F-102; and it wasn't a very good airplane.

The T-33s were all very old and—but, you know, they served a purpose. They were reliable and all that, but they didn't have good performance. And so, it was nice to pick up the T-38s. As a matter of fact, I went and got the first one. I'd been on a T-38 test flight run

at Edwards, and when we finally decided—NASA finally decided to get some better airplanes, I was asked to go out and pick the first one up. I hadn't flown one for two or three years! Went out and signed for it, and had a look—run through the tech order a little bit to see—I couldn't remember what the airspeeds were for landing!

And I remember I took off at Palmdale [California] with it and flew—the first flight was across country to El Paso [Texas]. So, when I got to El Paso, they had a big runway and I shot a few landings and sort of did a little flight testing on the way and then brought it back into Ellington [Field, Houston, Texas]. And it was a big day. As a matter of fact, I was down there recently and I saw a picture of me delivering the first airplane. And after that, the airplanes were better. But that's where we had our accidents.

WARD: How important is high-performance jet flying to training people to fly in space?

MCDIVITT: Oh, I think it's absolutely crucial. As a matter of fact, you know, even when I became the Apollo Spacecraft Program Manager, I continued to fly my T-38s. I think when you're making quick decisions, you'll be forced into deciding something right now, that you don't have any extra time, you sort of have to have experience in that. And you have to have current experience. And I used to joke about: I flew the T-38 when I was the Program Manager to just keep my adrenaline level up. In a sense, that was it; because when spacecraft were flying and we had a problem, most of those decisions, long-term decisions, fell to me. And I had to make them quickly, because when you got out to the Moon, it was an hour across the front side and an hour across the back side, and usually that's about all the time we had to make a decision and it wasn't one of those things where I could sit around and mull over for three days whether we should go or not go. I had to make a decision then.

The same thing as it is with an airplane. T-38s never had much fuel, and you

were always, "Should I go to this place? Or should I go to my alternate?" So, I think it was absolutely essential.

WARD: Let's move into Gemini. I'd like to talk with you a little bit about the role that Gemini played in kind of defining the way NASA settled into handling flight operations. One gets the impression that Mercury was kind of "learn it as you go." The process of determining what role the astronauts were going to have, what role the flight control people were going to have. Getting all that worked out. But you really made it solidify, come together, in Gemini.

MCDIVITT: Yeah. Let me jump back a little back to the Mercury. I wasn't there for Mercury, but in talking to guys who were: there was a big battle over who was really going to be in control of the spacecraft when it was in flight. Was it going to be the guys in the spacecraft, the astronauts? Or was it going to be the guys on the ground? And there were a bunch of—you know, you look back on them, you say these guys have got to be kooky to even have thought things like that. But they—there were ideas that—well, maybe the men couldn't think when they were up there. I mean, all the control ought to be on the ground. I mean, don't let them see where they're going; it might scare them. Or whatever the reasoning.

Fortunately, the Mercury guys fought through that in great shape. And by the time we started into Gemini, that battle was over. The concept of men being onboard then, the idea that they ought to be in control was what they had available to them. And some—you know, we didn't have everything available in the spacecraft, so never was the astronaut totally knowledgeable of what was happening. That was probably exemplified more by Apollo 13 than anything in the world! But no matter how good you were and how good

everything was operating, you still didn't know everything in the spacecraft. So, there was the problem that you had to have the ground and you had to have the guidance in flight. And I think by early Gemini, we had worked out pretty well what the relationship was. It varied over time, but pretty much we had that thing behind us.

And Gus—I flew the second Gemini spacecraft. So, I was involved in all—in a lot of the early ground testing of spacecraft at the plant and arguing with the engineers and all that kind of stuff. And before I ever got involved, Gus had sort of laid the groundwork with the McDonnell [Aircraft Corporation] people about what that spacecraft ought to do. It ought to be really controlled by the pilot. And so, we had an attitude controller. We had a translation controller. We had instruments that told us something about what we were doing and where we were going. And I think we were over that philosophical hump probably a year before Gemini ever flew.

And then in flight, the relationship between the flight controllers and the airborne crew had to be much better, because we were maneuvering the spacecraft around now. In Mercury, you couldn't maneuver. You could change its attitude but you couldn't change its flight path. Gemini you could. So, now you had to have the guy in the spacecraft working with the guy on the ground to know what was going on and where they were going, where they were, and what they were going—what was going to happen. So, that worked out pretty well. As a matter of fact, I think if it hadn't been for Gemini, flying Apollo would've been nigh on to impossible.

WARD: I wanted to get into that. [Recorder turned off].

WARD: Jim, we were talking about the contributions of Gemini to Apollo and about the relationship of flight control teams and the astronaut corps. Was there a reluctance early on

to share documentation? A reluctance on the part of the astronaut management to let flight controllers have access to checklists, things like that, or was that pretty well smoothed over and working when you got involved in it?

MCDIVITT: It's an interesting question. I—when you say the Astronaut Office, that implies that there's this homogeneous, uniform opinion which never existed. It may today, but I don't know. It never existed then. So, there was always disagreement amongst the astronauts about what the relationship with the flight controller ought to be. I got along with them great! And I would share anything with them. It didn't make any difference what they wanted. I mean, I didn't have any secrets. And so, I never had a problem like that. But some of the guys—some of the astronauts didn't get along that well with them!

WARD: Do you think—

MCDIVITT: And some of the astronauts didn't get along that well with the contractors, because they were, I thought, overbearing, demanding, idiotic, unreasonable, and I mean, that didn't contribute anything to anybody whatsoever.

WARD: So, in your view, that would have been more of an individual difference with commanders than it was a policy?

MCDIVITT: An individual relationship, yes. My crews always got along great with them. As a matter of fact, I always looked at it as sort of a flight team, whether it was Flight Operations Directorate or Flight Crew Directorate, or whatever we called them in those days. It was sort of a flight team.

WARD: That was one of the things we were talking about earlier, of how that team came together and coalesced, really seemed to have gotten itself on the right track by the time we got into Apollo. And the impression that it may have formed up in Gemini. And I think you said that really this was taken care of before the Gemini Program got rolling.

McDivitt: Yeah. Yeah. I think there were really a couple of milestones along the way. One was the fight for the design of the spacecraft early on in Mercury. Was it going to be—was it always going to be flown by monkeys? Or were we actually going to have somebody with a brain, that had rational powers, that had some experience in flying things, and was that—were they going to utilize that to make the whole thing better? I think the Mercury guys fought that battle very well, and we ended up with a concept that a lot of us, I think in the end—to design spacecraft that were much more flexible than anything the Russians ever put up. Because they were more automated and ours were more manually operated. We had automation, but we had a lot of manual backups though. So, I think that that decision pointed back early in the Mercury days was absolutely essential.

Then we get around to flying, I think the cooperation between the guys on the ground and the guys in space was probably advanced more by Gemini, because you could do different things with Gemini and—things like a rendezvous and the EVAs [Extravehicular Activity] and all that kind of stuff. Maneuvering the spacecraft around. That really took people on both ends of the string to take care of the problem. So, I think that operational stuff really came under Gemini. And that's why I said earlier that if—I don't think we could've done Apollo. I mean, Apollo could—would've been a 30-flight program with a lot of accidents if we started going to the Moon very early because if we didn't have the coordination skills and the reliability of the acceptance of the reliability of the ground or the

space-borne part of it with the other guy. So, it was very important.

WARD: I've heard people say that, in reality, we didn't have three Programs. We had one. That Mercury, Gemini, and Apollo were really all part of the same Program.

MCDIVITT: Yeah, I think so. I think they were really. I think when we went to Skylab, that was a different kind of thing. We went to shuttle, that was a different kind of thing. But I think Gemini, Mercury, and Apollo—or Mercury, Gemini, and Apollo were—really were one Program. You know, the same guys pretty much flew them. And then when we got to the other things, it was a different concept.

And we were—the reason I say they were really in the same Program: they were all exploratory. They were—every flight was an engineering test flight. I mean, there—you were always getting into something that nobody had ever done before. Now as soon as we started Skylab, we—you know, the second flight was pretty much like the first flight. And the shuttle flights, while they do something slightly different, it's not that much different.

WARD: I want to talk to you a little bit about the evolution of the concept of Mission Rules and what they are and what they contribute to a safe and successful spaceflight.

MCDIVITT: Well, you couldn't ad hoc this stuff as you went along, or you shouldn't because it's too dangerous. If you don't have an understanding on the ground and in space of what the other guys are going to do, you don't have any confidence in them. And we used to really argue those Mission Rules hard and long before flights. And when we finally get to a Rule, that was The Rule.

As a matter of fact, as far as I know, the only Mission Rule that I can ever remember

being broken was one on my flight, and Chris [Christopher C.] Kraft [Jr.] did that, and it could've had some serious effects. But we had a back—if this failed, then we were going to do this. And if this failed, we were going to do this. And on Gemini IV, we lost a computer; and the Mission Rule said that we would fly a 90-degree bank, a 90-degree bank, a 90-degree bank, a 90-degree bank, a 90-degree bank [gestures] to make it a zero lift reentry. When the computer failed in flight, Chris wanted to do a rolling reentry like they had done in Mercury. And we were up in space, and there was nothing wrong with the other concept. But he wanted to do that. Well, it wasn't real—there wasn't any time to argue over that. So, we did the rolling reentry.

Unfortunately, the instrumentation of the spacecraft only went to 20 degrees per second roll rate, and that's where it stopped. And we were—and the thing that he ad hoc'ed up was a 20-degree roll rate reentry. Well, you couldn't tell whether you were going 20 degrees per second or 30 or 40 or 50. We had a broken thruster, which wound us up to probably 200 or 300 degrees per second on the way down. And while I could tell that we were going a little faster than 20 degrees per second, I couldn't tell what it was. Didn't have any instrumentation. It turned out that nothing really bad happened out of it, but it just went to show you that you really shouldn't change the Rules in flight.

WARD: Of course the whole purpose of Mission Rules, as I recall them, was to try to second-guess, to anticipate the kinds of things that can happen to you. The kinds of system failures you can get. And to apply the calm group thinking that you can do before a mission to help you make—

MCDIVITT: That's right. Yeah. Absolutely. And in a way, it was like a—there was a thing called failure modes and effects analysis that you do with hardware. If this fails, how will it

affect this? And if it causes that to fail, then how will that failure affect this? And when you find that you have a problem in the hardware, then you go back and redesign the hardware. And the Mission Rules were sort of the same thing applied to the operations, where if you had a hardware problem, how would it affect the mission? And then if the mission—what you're going to do then or what you're going to be able to do is going to affect something else dramatically, then you needed to have another concept on how you're going to get there.

Yeah, I thought they were really good things. And I think that helped to bring the flight crews and the ground crew guys together. Because those were the two groups of people who were working out the Mission Rules. And so, when you got all through with your arguing, you had everybody on board and everybody was supposed to know what they were going to do.

WARD: Was that a more-or-less unique contribution of NASA?

MCDIVITT: Pardon?

WARD: The development, evolution of Mission Rule concepts; is that something that NASA really contributed to spaceflight or to that sort of testing? Or was it something that came out of previous experience with programs like X-15 and the military?

MCDIVITT: Well, the X-15 Program—yeah, I see what you're driving at. I don't really know. But from what I—from my short experience with the X-15, there were Mission Rules there. But that was a NASA program. And I think that probably most experimental kinds of things had to have some rules. At least if I were running them, I'd want some rules associated with them. Now the simpler the vehicle and the simpler the task, the fewer the

rules. So, you don't have to worry, you know, if you can't light the engine, don't drop the spacecraft kind of thing. Or if you drop the spacecraft and you can't light the engine, you've got to have a rule. What are you going to do? Well, you've got to land underneath you or some simple thing like that.

Well, as we got into Mercury, it was more complex. We got into Gemini, and that was more complex. We got into Apollo, it was very, very complex. So, the Mission Rules towards the end were rather comprehensive. But we lived by those Mission Rules. There were a lot of times when I was a Program Manager that we were—we came up against things where we had debated that Mission Rule many, many times and that was the Rule. And that's what we were going to go by. So, if this thing broke then we're going to have to do this. If the other thing broke, we were going to do that. And we weren't going to deviate from that in real time because we'd already fought through, carefully, in the, you know—in a more relaxed manner what—the consequences of all these other alternatives would be.

WARD: Mission Rules really sort of form the basis then for simulation and flight training, don't they?

MCDIVITT: Yes and no. Actually it could be said the other way. Flight training and simulation form the basis for the Mission Rules. I think it was a fluke. You could have a Mission Rule. You're getting into training, and you find out one day you simulate that thing that, that Mission Rule is wrong; you change it in the simulation. You don't change it in flight, but you change it in simulation. And that's why once those Rules were pretty much set, you didn't want to change them in flight because a lot of these consequences weren't obvious to the casual observer. You know, you had to be there and see what would happen.

WARD: One of the things you began to sense in Gemini, and particularly in Apollo and then even more so in shuttle, is the complexity and the integration of systems, interactions, one event affecting another in a way that you really can't intuitively follow or anticipate. And a simulation, it seems, would draw that out for you in ways you might not otherwise appreciate.

MCDIVITT: Yeah. And I remember one case stands out very well in my mind. It was on Apollo 16, when I was the Apollo Spacecraft Program Manager. We were—the lunar module and command module had separated, and the command module [pilot, Thomas K. "Ken" Mattingly II] was supposed to fire his engine on the back side of the Moon and come around in a different orbit. And a certain—and if he had done that, he would have appeared from behind the Moon at a certain time. And that time came up; no spacecraft. So, there's always the thought that, well, maybe he was never going to come around the Moon!

But anyway then, the next time was—some seconds later would've been when he would have come around, had he not fired the engine. And sure enough, it came around at that time. He hadn't fired the engines. And we checked what the problem was, and he said that he had an oscillating actuator on the service module engine; and the Mission Rules were that if you got down to your last system, you came home. It didn't make any difference what it was—as long as it was a critical system. Well, that was a critical system obviously. So, we had to determine whether the oscillating actuator would work.

WARD: Now this is the actuator that moves the engine nozzle that steers the—

MCDIVITT: It moves—that moves the engine back and forth, and it was going like this [gestures]. Fortunately, I had flown a test like that on Apollo 9—it was called a stroking

test—where we actually oscillated the engine while we were firing it, and everything held together. So, I knew then that it was okay; but it had to—we had to make sure that it was steering. If the nozzle or the motion it went through was like—could be like this [gestures]. If it went from side-to-side like that, that meant it wasn't doing any steering at all. But if it went off of an angle over here and just oscillated a little bit about that angle and about this angle and about this angle, it would steer the spacecraft. So, we had to determine that.

And we found after some test and very quick tests that, indeed, it would control even though it was oscillating like that. But if we had found that it wouldn't control, there was no doubt in my mind what my decision would have been. The Mission Rules said "come home," and that's exactly what we would have done, was to come home. And all the testing I had the guys doing was to allow me to find out whether we were going to control or not control. The decision after that was, well, at least the come home decision was easy. Staying there was still a little difficult! But it—but that was how those Mission Rules worked.

WARD: Before we get out of Gemini, I want to ask you a trivia question.

MCDIVITT: Sure.

WARD: What did Jim McDivitt, Frank Borman, and Neil Armstrong all have in common?

MCDIVITT: I have no idea.

WARD: And if my research is correct, you were—in the history of NASA, you were the three rookie commanders. You were given—your first flight assignment was a command assignment.

MCDIVITT: Yeah, I guess so. Well, Frank yeah, Frank was the commander of our backup crew.

WARD: Of course. Yes. And that had to be the case in Mercury because we had all we didn't have flight experience. But beginning with Gemini—

MCDIVITT: Yeah. They were all rookies! Yeah.

WARD: —we had the opportunity to fly an experienced space traveler as a commander, but you, Borman, and Armstrong were all selected for your first flight as a commander. And—

MCDIVITT: Yeah. I hadn't focused on that. I will tell you a funny story about the—getting picked to fly on Gemini IV. I was called in and told I was going to command it, and then some time later it was announced at an astronaut pilots' meeting and then finally they were going to make the public announcement. And so, I thought I'd tell my kids about it.

So, one Saturday morning we were sitting at our—sitting there having breakfast at a long table we had. And so, we finally got to this dramatic moment and I said, "Kids, I'm going to tell you something really important." And, let's see, this was in about '64 or so. I think they were, like, eight and seven and five or so. And so, I tell them that, you know, "You know that dad's an astronaut and the astronauts fly in space. I just want to let you know that I'm going to fly in space soon." And my older boy, Mike, who was probably seven or eight, says, "Oh yeah, dad, I heard that at school." And then my daughter Ann said, "Oh yeah, dad, I heard that at school, too." And my son Patrick said, "Dad, there's a fly in the milk bottle." He was really a—!

WARD: Do you have any inkling as to how the decision was made to put you on that flight?

MCDIVITT: Well, I was the best-looking astronaut there was, and so they picked me on looks in there. Personality! No, I have no idea.

WARD: It was one of those mysteries of how the how the crew assignments were made.

MCDIVITT: Yeah. Yeah.

WARD: Something that Deke and Al kind of kept to themselves, I guess.

MCDIVITT: Yeah.

WARD: Was there any discussion within the—in your group at the time as to why one person would be singled out for a—there wasn't so much a basis in seniority to make that sort of thing. In other words, Ed White had about the same seniority that you did. But—

MCDIVITT: Yeah. Well, I think it goes back to what I said earlier. I had the—I was the best-looking guy and I had the greatest personality, and so how do you go wrong?

WARD: Probably as good an answer as any. What was—well, you talked a bit about your relationship with Ed White and the fact that you had known each other in college, gone through selection together in that group. How was Ed's selection for that mission handled? Was that something that you were selected as commander and then asked who do you want on your crew? Or were you selected as a group? As a pair?

MCDIVITT: No. We were told together that we were going to fly together. Yeah, my relationship with Ed was—couldn't have been better. He was the best friend I ever had. We lived, like I said, a block and a half or so apart on Saunders Crescent in Ann Arbor

[Michigan]. He was getting a Master's degree in aeronautical engineering, but he didn't have an aeronautical engineering undergraduate degree. So, we took a lot of classes together. We started flying together. We had a—there were a lot of Air Force pilots assigned to the University of Michigan—probably about 150, 200 I would guess at the peak. There was a program there called the Guided Missile Program where the guys came in and got a couple of normal academic degrees; but they—it covered all the background you needed to get in the missile business. So, we had a lot of people there.

I ended up being the scheduling officer for all the jet pilots. So, I did the scheduling; and we'd get all the pilots together from time to time and lay out the schedule for the next month or two. And Ed and I, since I did the scheduling, I just scheduled us together a lot. And we—so, we flew together. Then we both went to the Test Pilot School and after we graduated, he went to Wright-Patterson as a test pilot and I stayed at Edwards. And I remember when I—when the Air Force had its pre-astronaut—pre-NASA astronaut selection, I walked in the room in the Pentagon and Ed was already there. And I walked in the door and he says, "I knew you'd be there!" And I said, "I knew you'd be here, too!" So, we had that.

And then we first joined NASA, we were given, like I mentioned earlier, we were given engineering assignments. And mine was guidance and navigation; his was something about control, flight controls or something like that. From an engineering standpoint, those two things are kind of like this [gestures]. And we also shared an office when we worked in downtown Houston. When we finally went out to the Manned Spacecraft Center, we didn't share an office at that time. But anyway, we had a very close career all through that time.

WARD: Of course, one of the highlights, the thing that is so clearly remembered for today, is

that your Gemini IV mission also had the first U.S. spacewalk. At what point did that get added to the flight plan for that mission?

MCDIVITT: It was quite late. The flight was originally set up to be a—pretty much of a medical experiment. Long-duration flight. We'd never had a flight longer than 30 hours, or whatever it was, that Gordo [Cooper] flew. And there weren't any Russian flights up till that time that were very long either. So, it was—there was a lot of medical experimentation on it. Tests and other assorted junk. And then a few scientific experiments. But mostly it was the four days, whether we were going to make it or not. And then there was—then there started being more and more talk about going outside the spacecraft. So probably, maybe two months or so before the flight we finally made a decision—well, we did a little fiddling around first to see if we could fit things in and what was it that we needed.

And so, finally about two months or maybe even less, we decided we'd actually do it. And so, we started working on all the things we needed. I'm out of a very tall sitting height, 99 percentile or something. So, when we all of a sudden had to close the hatch in a pressurized condition, we had to redesign the seats. As a matter of fact, they had to redesign the seat in the Gemini so I could fit in it on the ground prior to launch. They had a big seat pan that we sat on. And it was okay for little guys like Gus, but it wasn't any good for tall people! And so, we had already redesigned the seat pack once. And then when we were going to have to close the hatch in an inflated condition, then we had to redesign it again. Because we weren't sure who was going to go out and a few things like that.

Then we started working on the air table down in a locked-up room in the—I think on the first floor of the astronaut building, Building 4. And we worked out the little handgun and how we'd use that and stuff. And unfortunately, we were beaten by the Russians by,

what? oh, a couple of weeks I guess.

WARD: But you kept all the preparations pretty quiet.

MCDIVITT: Yeah, they were quiet up until a few days before the flight.

WARD: Do you think the primary motivation was to score a first with the spacewalk? Or was it to click off that objective because you knew you would need EVA [extravehicular activity] in Apollo?

McDivitt: Oh, I think originally it was to score the first! But then as we—and it probably wasn't until after the flight that we really began to appreciate the fact that working outside a spacecraft was a lot different than working inside the spacecraft. And then we had—I think we had an EVA on almost every other flight, other than—I guess [Gemini] V, VI, and VII didn't have EVA. VIII didn't have one because it—we had to bring it down too early. But the rest of them all did. And that again was a part of the experience that you had to gain to be able to do the Apollo stuff. It—you know, no EVA experience going into Apollo would have been a serious problem.

WARD: How did you know what to train for, for that first one?

MCDIVITT: Well, this is one of those ad hoc things. You sort of made it up as you went along. The gun—that little maneuvering gun that we used fortunately didn't have much thrust, because it was a hopeless device! I mean, there was no way you could really control yourself. You could control yourself on the air table in two axes; but unfortunately when you're in space, you're in three axes in six degrees of freedom. So, it would have been

hopeless to try to maneuver around much with just it. But we didn't have much gas in it and the tether wasn't too long, and we couldn't get in a lot of trouble. But the things that were important were getting the hatch open, getting the hatch closed, getting out, getting back in, the equipment that you needed, what the thermal protection was going to be, what the micrometeorite protection was going to be. Just the fact that we could go out and do that stuff was very important.

And then probably the hairiest thing that happened to me in space was on that—on the EVA with our hatch. We'd had a problem with the hatch in the altitude chamber at McDonnell. We'd done this chamber test and, because we were going to open and close the hatch in vacuum, well, we thought, we'll put that into the chamber test. So, right at the end of the test, we depressurized the spacecraft. You know, the altitude chamber's just a big metal box; you can suck all the air out of it. So, we were in this vacuum, and we depressurized the spacecraft. The suits—we went through all the suit checks and stuff like that. Then we opened up the hatch.

It was very heavy on the ground, so then we had some additional things that helped us get it open. Got it open, did some—oh, whatever. I don't know. Went through some routine. Then we brought the hatch back down. And we went to lock it, and it wouldn't lock. And we were towards the end of the test. We'd been in it, like, probably 10 or 12 hours by then; 14 hours. I don't know what; it was a long, long time. And we were at—near the end of the whole test; and we just said, "Oh, we'll just go through and do the rest of it in our suits," pressurized in our suits. So, we did. And so, 30 or 40 minutes, the test was over; and we went in and they re-pressurized the chamber. We went on in and took a shower and did our debriefing; and then I went out to see the technician who was working on the hatch because it was a little concerning that you—when you moved the handle nothing happened to

the latches.

WARD: Well, if you can't get the hatch closed, you have a hard time reentering.

MCDIVITT: You're dead. You're dead.

WARD: Yeah.

MCDIVITT: Yeah. You'll either burn up—well, you'll burn up on the way down for sure. And the spacecraft would sink as soon as it hit, too, because the hatch would be open. So anyway, I went down there and fiddled around with him while we were trying to figure out what was wrong it. And there was a handle and a bunch of little gears about yea big [gestures] around and teeth on them. And then they had to engage some of the little gears. And there were some other little gears. And so, it was a fairly complex mechanism. And it had to be set up so that you could disengage the handle so you wouldn't inadvertently do something with it in flight. And those gears weren't really going together properly. So, he did something to them and, you know, it worked. But fortunately, I saw what they look like.

And then when we got around to doing the EVA, when we—when Ed went to open up the hatch, it wouldn't open. I said, "Oh my God," you know, "it's not opening!" And so, we chatted about that for a minute or two. And I said, "Well, I think I can get it closed if it won't close." But I wasn't too sure about it. I thought I could. But remember, then I would be pressurized. I wouldn't be in my sports clothes, leaning over the top of the thing with a screwdriver. I'd be there pressurized. In the dark. So anyway, we elected to go ahead and open it up.

And we didn't bother telling the ground about that. I mean, there was nothing they

could do. They would've said, "No," I'm sure. Anyway, we went ahead and opened it up; and Ed went out and did his thing. And that was one of the reasons I was kind of anxious to have him get back inside the spacecraft, because I'd like to do this in the daylight, not in the dark. But by the time he got back in, it was dark. So, when we went to close the hatch, it wouldn't close. It wouldn't lock. And so, in the dark I was trying to fiddle around over on the side where I couldn't see anything, trying to get my glove down in this little slot to push the gears together. And finally, we got that done and got it latched.

And the next part of the plan was to get Ed to re-pressurize the spacecraft and get all this junk off Ed, open up the hatch, and throw all this out. And there was no way I was going to do that! So, we carried all that stuff through the rest of the flight.

WARD: Well, even messing around with a pressurized glove in a gear frame would've given flight controllers a heart attack, I think, if they had known about it.

MCDIVITT: Oh yeah, yeah. I mean, this was one of those things where we didn't have a Mission Rule for this. And you just had to make it up as you went along. And it wasn't anything that if I talked to the guys on the ground they wouldn't have had a clue what I was talking about. I knew more about that hatch than probably anybody in the world, other than the technicians who'd built it. There wasn't anybody in that Mission Control Center who knew anything about it, so there was no sense in me talking to them. Well, I made the decision to open it. And fortunately, I got it closed!

WARD: There was a bit of speculation at the time, I guess based primarily on the air-to-ground conversations between you and White and the ground, that you were having some difficulty talking Ed into getting back in the spacecraft. Is that all a misconception?

MCDIVITT: Oh that was all a misconception. I mean, people made a big deal about that. It was no big deal at all. He was just having a ball out there. He didn't want to come back in. I wanted him to come back in because I didn't want to have to work on that hatch in the dark. But, even if he'd have come back in when I told him to come back in, we would've still been working on the hatch in the dark—because it took him a lot longer to get back in and get back down in it and buckled down. Fortunately, Ed was the same height as I was; but he was much shorter in the sitting height. I mean, I would be up here and he'd be down here sitting down. So, we didn't have a problem of trying to get the hatch closed. Our problem was getting it latched and locked. And so, he wasn't in the way when I was trying to do that stuff. But then there was euphoria. The press got a hold of that and created something great out of absolutely nothing. As usual!

WARD: Was there any sense of space motion sickness at that time? Later crews, once they had the latitude to move—

MCDIVITT: No. None. None. And Ed had a very weak stomach. He had a weak stomach. Every time we went up in a zero-g airplane, he got sick. As soon as we landed in the water, he was sick. I mean, he was—he had a very, very sensitive stomach to that. You know, he never got sick flying airplanes and the crazy motions that we did. And we were short on fuel, so the spacecraft was just tumbling for a couple of days. Just around like this [gestures]. And it didn't bother him at all.

WARD: Did the relative ease of your EVA perhaps mislead NASA, for the later ones into thinking that we really understood that process when we didn't?

MCDIVITT: Oh, I think so, yeah.

WARD: You mentioned—

MCDIVITT: I think that we overreached a lot in the EVA thing to start with. We didn't do anything. Like I told you, that gun was utterly useless. I'd practiced with it enough and I could run around the air table with it flying, but that was a two-dimensional thing. I could either go this way or that way, and there was no—there were six degrees of freedom. There's three in motion and three in attitude. We had no attitude freedom whatsoever standing on that table. We were upright. And while you could rotate around this way, you couldn't go back and forth this way or the other way [McDivitt demonstrates].

So, we really were lacking a lot of the degrees of freedom. As soon as we got up in space, the only way you could make that gun work is if you fired it exactly through your center of gravity. And trying to find your center of gravity—we didn't know where our center of gravity was; so there was no way we could've done it accurately. Yeah, that was a oversimplified thing. And fortunately, we didn't have much gas in the gun and didn't put out much thrust; so it couldn't hurt us much.

WARD: But EVAs, spacewalks on the later flights, [Gemini] IX, X, XI, we had some really serious problems on them.

MCDIVITT: Yeah. Yeah. Yeah, because they were trying to do things. And I think we got carried away. But you know, there's nothing wrong with that. I mean, we would've never gotten to the Moon when we did if we'd taken baby steps all the way. I mean, we could've gone from the Gemini IV EVA to a little bit more, a little bit more, and then we'd never have

gotten there. I think when the President said, "we're going to get there in that decade," he provided the best management tool ever known to man. Because you could say, "We've got to stop fooling around and make a decision. Take a big step." And so, we did.

WARD: Your flight—your Gemini IV mission—was also the first flight where Mission Control was located, prime, in Houston.

MCDIVITT: Right, right.

WARD: Did that change anything?

MCDIVITT: Not really. We had a backup—the Control Center down at the Cape was in operation. And I believe Glynn [S.] Lunney was the flight director at the Cape. He never got involved in the mission, because the one in the Mission Control Center in Houston operated fine. But we had a backup, and that wasn't a big deal. And the tracking and things like that were all independent of what flight Control Center you used. So, they were getting the same tracking data at the Cape as they were getting in Houston. So, that really didn't affect anything.

The thing that—probably the biggest issue we had with respect to—other than the people flying the spacecraft, was with the doctors. As I mentioned earlier, this thing started out as a medical experiment; and it still was. That was still a primary function of the mission, was finding out what kind of shape we were going to be in when we landed. And about a week or so before the flight, there was a big medical uproar about whether we were going to die or not when we landed, because we were going to land in the sitting position, like this [gestures]. Up until that time all the people who landed were in the prone position—

except Gus and John Young, who landed and sat up vertically in the spacecraft the same way we would. But they only flew a four and a half hour flight, and we were going to fly over a four-day flight.

And the medical profession was concerned about whether you could pump blood from your heart to your brain, a distance of that far when you're vertical as opposed to a distance of about that far [gestures] when you're lying on your back. And so, we had a lot of medical input that we didn't need about, oh, "They're going to die." "Maybe we ought to put them in the spacecraft and let them sit there for four days and nights in the simulator, four days and nights, to see if we can separate the effect of confinement and the effect of weightlessness," and a whole bunch of junk like that. Well, we would have died sitting in the simulator for four days because it—the seats weren't vertical. They were tilted like this [gestures]. So, one of us would have been like that; and the other one like this [gestures]. And it wouldn't have proved a thing anyway. But fortunately, Chuck [Dr. Charles A.] Berry, the NASA physician, and some of the cooler heads prevailed; and we just went ahead and flew.

I do remember when we landed. We hit the water and we checked around for leaks. And I said to Ed, "How are you feeling?" He says, "I'm feeling great. How are you feeling?" "I'm feeling great, too. Guess we aren't going to die!" As a matter of fact, the one concession that NASA made to these medical nitwits was to try to show us how to put our head down between our legs. Because that way we'd get our head below our heart, and blood would flow to our brain normally.

So, we went through the motions of trying to learn how to our head down between our legs. But the fact is that the instrument panel was about here [gestures]. And one would have had to have a joint about here and another one here and another one here [points] to get

around there. So, we went through the motions, but there was no practical way of doing that!

WARD: You bring up the issue of landing. Of course, early on Gemini was conceived as a land-landing spacecraft.

MCDIVITT: Yeah.

WARD: As the Russians did. All Russian spacecraft landed on the land, as you know. And the Americans had always landed in the water. When did you get involved in that engineering part of the problem where we concluded that Gemini wasn't going to land on the land after all?

MCDIVITT: Well, fortunately I didn't get involved in the flight testing because I guess every one of them crashed! I got in sort of at the tail end of that. The decision was sort of being made as I got involved in the Gemini Program as a pilot, not in my engineering role. But as someone who was going to fly it. And after the decision was made to not land on the land but land in the water, we then got to evaluating the spacecraft in the water. And the hatches would've been like this [gestures] if we'd just landed in the water normally. But then when we opened up the hatches, the water would've come in both hatches

That didn't sound like a very good idea. So, we ballasted the spacecraft around this way, so the commander's hatch was as far out of the water as you could get it. And the copilot's hatch was under water. And then we put some canvas pieces across it so when you opened it up, we had as much freeboard as you could possibly get. To do that, they ballasted it, I think with ping pong balls to get it to float differently than the center of gravity would.

WARD: Okay, I guess [Recorder turned off].

WARD: Jim, we were talking about the inability to design Gemini to land on land. The fact that we stuck with the water-landing system. That also, as I recall, led to another change; and that was the addition of ejection seats. What was the—

MCDIVITT: Yes. Actually, I think the ejection seats were in there all the time. We had to have some way to get out on the pad. And Mercury had an escape tower tied on to the spacecraft, so that if the rocket was going to blow up you could move one of the handles and it would blow the spacecraft—separate the spacecraft from the rocket. And this escape rocket on top would pull it up to a few thousand feet, fall off, parachutes would come out, and you'd land.

In Gemini, because we had all these other things, we ended up with no escape tower; and we had ejection seats in it because of the airplane-like characteristics of it. Which meant that, on the pad, you ejected. If you wanted to get out, you didn't—the whole spacecraft didn't get taken up in the air a few thousand feet. You just ejected sideways, right out of there at 200 feet, or whatever it was. And the theory was that it was going to come out—you were going to come out, the parachute would open up, and you'd kind of hit the ground. Fortunately, we never had to try that!

WARD: Do you think the nature of the ejection system might've had as much to do with Wally Schirra's cool decision to sit on the pad [during the Gemini VI-A launch abort] as anything? Just the reluctance to use it?

MCDIVITT: No, I don't think I would've liked to use an escape tower either! No, I think that was just good judgment. I mean, you had to make the best judgment you could. It goes back to flying airplanes, like I mentioned. You know, you sometimes you just have a split-second

to make a judgment, and flying airplanes keeps that sharpness I think, when that's what you need to do. When it happens, you've got to decide right then what you're going to do.

WARD: And of course, the event we're talking was ignition of the engines without liftoff and the fear that the vehicle might have lifted off a few inches and set back down—

MCDIVITT: Yeah. Yeah. Fallen back down.

WARD: —and exploded.

MCDIVITT: Yeah. Yeah. I don't like heights. And on Gemini IV, they couldn't get the umbilical tower down. It was pivoted at the bottom; and instead of moving back like this, it laid down like that [gestures]. And it would go down partway and then it would stop. And then they would bring it back up, and I could—and if you're looking straight up, through the window, and I could see it over the back of my head I could see what was left of the White Room, which was a big U-shaped thing that would come up around the rocket. And if this were the rocket and this U-shaped thing were coming up like this, it was coming up sideways like that [gestures], where it was going to hit the spacecraft. And right at the last second, it would jump over and do this [gestures]. Then I had visions of this thing coming up and hitting the spacecraft and us tumbling off! I don't think that ejection seat would've worked then! I sure got tired of that!

It did give us an opportunity, though, to sit there for a while. As a matter of fact, Ed and I both fell asleep up on top of the rocket. And they finally had to wake us up and ask us if we'd like to talk to our wives. We had a chance to talk to our wives from the spacecraft just before launch, while they were fiddling around, getting that thing down.

WARD: Your Gemini IV flight had one other occurrence that is remembered by some. And that is a report, from you I believe, that you had encountered an object in orbit whose origins you were not certain of. And of course, the UFO [Unidentified Flying Object] buffs immediately thought you had seen an alien spacecraft.

MCDIVITT: The story of how I became a UFO expert! Well, what happened was that we were low on fuel and the spacecraft was just tumbling through space, end over end and sideways and all over. Ed was asleep. We were taking turns sleeping. And Ed was asleep, and I was doing something in the spacecraft. I looked outside, just glanced up, and there was something out there. It had a geometrical shape similar to a beer can or a pop can, and with a little thing like maybe like a pencil or something sticking out of it. That relative size, dimensionally. It was all white.

And I'd—we had all of our rocket engines shut off. I mean, we had the electronics form shut off. We were a battery-powered spacecraft, so we were trying to save electrical energy. And I immediately reached up and turned on the—pushed in the circuit breakers, because I thought I might have to maneuver around this thing, whatever it was. I couldn't tell how close it was, how big it was. I grabbed a camera and took a picture. It was just floating there. I grabbed it and took it a picture. I grabbed another one and took a picture. And then the spacecraft rotated around where I couldn't see it.

Finally the rockets warmed up. The electronics warmed up. Remember, these were the Dark Ages. It takes a while to warm up! And so, by the time they got to where they'd worked, I didn't have any attitude indicators. We had all the instrumentation shut off, too. So—and we were looking at the black sky; I had no reference whatsoever. So, I tried to fly the spacecraft back down to where I thought it was. And I never did see it again.

The fact that I could see it was—pretty much meant to me that it was in our orbit. If it was in a different orbit, we would've—going 18,000 miles an hour, it would've went by us so fast that we'd have never seen it at all. I had no idea whether it was a little thing up close to the window or it was a big thing out a little bit further. It could've been the size of the Empire State Building for all I knew way out there. But I'm sure it was in the—in our orbit and it probably was a piece of ice that had fallen off the spacecraft someplace. Or maybe a piece of Mylar that had come out from behind the thing and come up in front.

Nothing ever showed up on the photographs. I reviewed them all. They were probably out of focus and I didn't have time to adjust anything. I didn't—I couldn't adjust the F-stops or the range or anything. I just grabbed the cameras and took a picture. So, anyway, that was it. And—but I got to be a world-renowned UFO expert over that!

The thing that really exacerbated the problem was when we got back to—when the film got back to Houston, we were still out on an aircraft carrier. They printed up all the EVA film, which was of great interest because nobody had ever seen an EVA before, and had a huge press conference. All that stuff was shown at the press conference. Some reporter wanted to know about the UFO. NASA said they hadn't printed all of the photos. They would print them later that night. He hung around and eventually they got them all printed. And I understand—many years later I figured this out, or at least I think I figured it out, this guy and a photo tech went through all the photos; and they picked out one that looked like a bunch of spacecraft from some foreign planet. They were disc-shaped things with a tail. I think there were three or four of them in an echelon formation. And then that got printed someplace. I never did see it until years and years later, when I started getting all these requests to appear on UFO shows.

I went back and then I saw what the thing was. And really what it was, was a

reflection of the bolts in the windows. The windows were made up of about three or four or five panes of glass, so that if one got broken we still had some pressure integrity. And these little things, when the Sun shined on them right, they'd multiply the images off the different panes. And I'm quite sure that that's what this thing was. But anyway, I became a world-renowned expert in UFOs. Unfortunately.

WARD: So, to the best of your knowledge at the time and years later, there's nothing abnormal or unusual—

MCDIVITT: No. There's nothing unusual about this at all. It was just—it's sort of like John Glenn talking about the fireflies. I mean, those were just pieces of ice crystals that were falling off the spacecraft. And the same thing with this. It was just something that I'm sure came off the spacecraft.

WARD: Well, one of the things that with increasing experience in spaceflight and the extreme lighting conditions and so on that has come clear over the years is that a lot of times things that you might think are large objects far away really are, as you point out, small objects that are very close—

MCDIVITT: Oh yeah. They could be right up here in front of you. They could be right on the outside of the window.

WARD: —and, therefore, would be out of focus in any camera picture you tried to take and wouldn't show up.

MCDIVITT: Absolutely. Yeah. As a matter of fact later on, on Apollo 9, there was a big

Mylar balloon up there, I forget what they called it, *Echo*, I think it was. They wanted to know if we wanted to see *Echo*. It was out at, like, 800 or 900 miles. And we said, "Oh yeah, let's look at that." So, we got the spacecraft oriented around in a certain direction, and I had a six-power telescope in the left-hand window of the spacecraft. And Dave [David R.] Scott went down in the lower equipment bay. He had to use a 28-power telescope down there. And so, they finally said, "Okay, it's coming up in the sight now." And Dave said, "Oh yeah, I've got it." He had the telescope tracking it with the computer. And so, I looked out there and, "Oh yeah," I said, "I can see it." And Rusty was sitting over in the other window and he didn't have anything, and he said, "Oh yeah, I can see it, too!" So, we were looking at this thing probably near 1,000 miles.

And later on in the flight, they wanted to know if we could—if we wanted to see the ascent stage, which we put in this huge orbit around the Earth. And it was coming down, and it was some thousands of miles away. They wanted to know if we wanted to see it. "Oh yeah, let's see if we can find it." So, we put the orbit into our computer and had our telescope track it. And we could see it. Now, we were using a 28-powered telescope, but we could see it out at some number of thousand of miles.

WARD: This was your Apollo booster?

MCDIVITT: Yeah. It actually was the ascent stage of the lunar module.

WARD: Oh, okay.

MCDIVITT: Which was not very large.

WARD: When you were on your Gemini flight, one of the other objectives was to rendezvous

with the upper stage.

MCDIVITT: Right.

WARD: That didn't really work out.

MCDIVITT: No. That was a—we didn't use our head on that ahead of time! That was sort of an ad hoc thing that we put on when we did the—when we were going to do the EVA, we wanted to have something to EVA around. And so, we were going to have Ed fly over there and take a couple of pieces of metal off of it. But we made two fatal mistakes: one is that we put two lights on it—two flashing lights instead of three. If you take a cylinder and put two lights on it, you can see both those lights only in one position, when you're perpendicular to the lights. As soon as it shifts around a little bit, one of the lights is obscured. So, you never see more than one light, or hardly ever see more than one light. And it's very difficult to fly formation with one flashing bright light. So, as soon as we got into the dark, we had no depth perception on it whatsoever.

The thing that really caused the problem, though, was the fact that the upper stage had a—when it shut down, they left a vent open on it to vent the propellant on it, which acted like a small rocket engine. And when we backed away from it and did our inertial measurement unit alignment, the rocket started maneuvering away from us. So, I had to curtail the alignment to get back down close to the rocket. And then as we went into the dark, it continued to maneuver around. And it didn't have any stabilization anymore, so it could be going this way at one time and this way—some other way some other time.

And so, I had to chase it around in the dark with only one light visible. And it just—I mean, there was no way to tell how far away we were. So, we finally gave up on that. I was

concerned that we were going to have a collision between our spacecraft and the rocket. And since it wasn't that vital a part of the mission, I just let it go.

WARD: Well, let's talk a little bit about the transition now from Gemini to Apollo. You mentioned that you don't think we could've flown Apollo successfully without the experience that we gained in Gemini. If you would, just kind of recapitulate for us what those essential elements were that came out of Gemini that we had to apply to Apollo.

MCDIVITT: Well, one was the coordination between the ground people and the people in flight. That was one thing. We developed a rendezvous technique, understood what we had to do there. We developed some EVA experience, not a lot, but we figured out that it wasn't a piece of cake. And although we didn't have—on a normal Apollo mission, we didn't have to do anything outside the spacecraft other than walk around on the Moon—I mean, we didn't have to float around up in space and do things—there was the potential of a stuck hatch and we might have to go extravehicular to get from the lunar module back to the command module. So, we got enough expertise in that.

And then I think that designing the Gemini spacecraft so that it could be used by the pilot allowed us to design Apollo spacecraft so that it could be used by the pilot. And there were a lot of problems that we had with things failing that, when I was a Program Manager, we hardly ever had a flight where we didn't have 40 or 50 failures between the two spacecraft. And we were able to overcome those on all the flights except Apollo 13.

And so, by just having all these alternate paths, of electrical paths or hydraulic paths or fuel paths where we could manipulate things, we were able to overcome these problems and never get down to where we were on our last system, which would have caused us to come home. I think those are the main things that we did.

WARD: At what point in Gemini did you begin transitioning to Apollo? Was that immediately after your flight?

MCDIVITT: Well, yeah. After Gemini IV, I Capcomed Gemini V. That was pretty quickly for six or eight weeks probably. And then as soon as that was over, I went over to Apollo and I took over the overall engineering for Apollo for the Astronaut Office. So, I left the guidance and navigation business that I had been doing earlier on; I just took over the whole thing. Then we had—by that time we had more astronauts, and they were working some of these other issues.

And then I started spending a awful lot of time out in California, working on the command module, because the lunar module wasn't far enough along yet—although I did do some work there. But mostly it was on the command module. And then after—I don't remember the timeframe a year or six months—we put together the first Apollo crew. And I was the commander of the backup crew on that. So, we had Gus Grissom, Ed White, and Roger Chaffee as the prime crime; and I was the commander of the backup crew with Dave Scott and Rusty [Russell L.] Schweickart.

WARD: And of course, the transition to Apollo also meant a transition to a new contractor, a new team of industry partners in North American [Rockwell Corporation] and Grumman [Aircraft Engineering Corporation]. How was that perceived within NASA? What level of confidence did the astronaut corps have in this new industry team?

MCDIVITT: Yeah, well, the McDonnell guys were already experienced when they got to Gemini. They had done Mercury. They'd learned a lot of things from a management, a manufacturing standpoint in Mercury that they tried to avoid in Gemini. I understand that

some of the Mercury spacecraft were sort of sent down to the Cape in a basket of parts, and then they sort of put them together down there. And that really got the manufacturing flow pretty well messed up.

So, when we did Gemini, there was a major effort to try to get the spacecraft built at the factory, shipped down to the Cape where all you had to do was test it, and then put it on a rocket and then you're ready to go. Much more—much easier to manufacture something in the manufacturing facility than it is to manufacture something in a test facility. So, I think they learned that. And Gemini was 50% bigger than the Mercury. It looked like Mercury in the dimensional relationships, and the systems weren't too much different. They were more sophisticated, but they would—so, it was just a, sort of the B-model of the Mercury. Whereas Apollo is an entirely different spacecraft.

And quite frankly, North American had a lot of troubles trying to get this thing going. They were going from being an airplane company to a spacecraft company—a transition that McDonnell had done on Mercury on a much, much simpler vehicle. So, we had a lot of difficulties in design, in testing, and it just took a lot of time. When we finally got the first Apollo crew together, we used to work eight-hour days during the normal day doing normal kinds of things, but we tested the spacecraft 24-hours a day. So, you'd work during the day and then you'd have shifts at night, probably four- to six-hours shifts to test the spacecraft. Because the testing just took interminably long.

And we were testing at the factory, but we were also manufacturing at the factory. So, we'd get part of it—you'd get part of it manufactured, and we'd test it. And you'd get some more manufactured, and we'd test it. It just took an awfully long time. And we didn't have good test procedures, and we didn't have any flight procedures either. So, that first crew—the prime crew and the backup crew—we had to write our in-flight procedures

and we had to write—help write a lot of the test procedures to make sure we were testing the thing that we knew we needed in flight.

WARD: So, how did all that stack up with the astronaut corps and their—and the level of confidence with this new contractor? Was there a lack of confidence as you went into the program?

MCDIVITT: Well, not really. I don't think the astronaut corps was involved in it. I think there were six of us involved in it. It was a prime and backup crew on their first spacecraft. We were the ones doing all the work. And remember, Gemini was still going on. The second crew really wasn't involved in it much to start with. And so, there was just the six of us. And when I was on Gemini IV with just a prime crew and a backup crew, when we got into the EVA stuff and we had a lot of other things going on [Telephone rings, recorder turned off].

MCDIVITT: Let's see. We were talking about—

WARD: We were talking about the level of confidence that you as crewmembers had with this new contractor, North American.

MCDIVITT: Yeah. Yeah. When we were the Gemini stuff, the test procedures we used in the Mercury were not significantly different than in Gemini. And when we got into Apollo, we were doing all these other things. And on Gemini, in Gemini IV, when we got around to flying this EVA thing and all the rush that we had right at the end, we just didn't have enough guys. There were four people. So, I asked Deke and whoever was running the Flight Crew Support Division at the time to see if they couldn't dig up some engineers to help us,

because four guys weren't enough. And so, we had a lead guy and two or three helpers right towards the end of Gemini IV. So, that's how the support team came about for specific flights.

Well, we had something like that on Apollo; but we were getting to the point where six astronauts and these other guys really weren't quite enough. And so, we were really running out of gas as far as having only 24 hours of daytime, six to all this stuff. And but we went pretty far along. We went all the way through the first one. As soon as I got into the next one, Apollo 9, with the lunar module, there was no way we could do that with six guys. So, we then came up with this concept of a support, I don't remember what we called it, but we had another crew of astronauts, three astronauts, that sort of did the same things that the primaries and backup crews did except they were never going to fly. So, they helped us test there. But we didn't have that on that first one, and it was just overwhelming.

But I think that the six of us were disappointed that the testing wasn't going better, that we were finding so many problems. But I think in—you know, in the real world that that was what we should have expected. Gus had worked on the first Gemini. I worked on the second one. So, we both knew how many problems you could get into in a new spacecraft. We were just getting into a lot of them on Apollo, but it was a much, much more sophisticated system.

For instance, I remember one day I was going to check the lighting. I was just turning the lights back and forth. I was doing that, and all of a sudden the technician on the outside says, "Hey, the rocket engine out here is firing!" I mean, it didn't have any fuel in it, but you could hear the solenoids going click-click, click-click, click-click. So, oh my, you know. We fired the rockets by moving the lights! So, we had what we called electromagnetic interference, and we had to go back and do that.

We didn't have anything like that in Gemini. It was too small, and we didn't have the sensitivity that we did. But it was a very complicated problem.

WARD: But it was just part of the process of bringing a new vehicle on line.

MCDIVITT: Yeah, it was. And then we had—because there was such a rush to get to the Moon in a certain time that they put together a design on the Block I spacecraft that we realized early on wasn't going to make it to the Moon. We were going to have to do certain things to it that were going to change the configuration. Not the exterior aerodynamic shape, but things like the hatch. It was extremely difficult to get the hatch on or open. We actually had to take it off. So, we redesigned the hatch. The contraption that opened up the door on the telescope didn't work well. It was prone to failure, and we didn't want it to fail open. So, we had to design that. I think we changed that even for the Block I spacecraft.

Some of the instrumentation had to be changed, because you didn't—you weren't going to be making a lunar return reentry at Earth. You were going to be just doing an Earth orbital reentry, and you could get by with the instrumentation we had. The fuel tanks were sized a certain way, and then we decided that that wasn't going to be enough fuel in them to do the trip to the Moon and the rendezvouses and getting back and all that. So, there were a significant number of changes that were going to go in between Block I and Block II.

WARD: And Block I was perceived as the Earth orbital test vehicle.

MCDIVITT: It was really going to be the Earth orbital. What we wanted to do was to get that thing in flight for a ten-day mission or so to see if it was—how the systems operated. We

didn't expect them all to operate perfectly well. There were some fairly sophisticated cooling systems, where the coolant in the tubes froze up. It was sort of like a selective freezing process. And as these froze up, then the fluid went through different tubes; and it would heat up more and then thaw them out. I mean, this was a very, very complicated thermal control system.

And we had other problems like that. There were internal—environmental control system was complicated. All the electronics were cooled by cooling plates. They would put the electronic box under a plate that had fluid going through it, and you had to seal these two together with something like grease. And so, it was a very complicated thing. And we didn't expect it to go flawlessly. Unfortunately, as you well know, it got burned up on the pad. So—

WARD: Right. At the Apollo 204 fire, as it was known at that time, and the loss of Grissom, White, and Chaffee.

MCDIVITT: Right. Yeah.

WARD: In those accidents, as it was with the *Challenger* [51-L] accident years later, the causes seem so clear in 20/20 hindsight. Things, as you mention, the hatch that was very difficult to open, that opened inward and made it impossible for the crew to get out when the fire started. The single-gas oxygen system that provided pure oxygen at a very high pressure on the launch pad. Those—

MCDIVITT: Yeah. See, we were doing those same things in Gemini and Mercury. We could've had exactly the same problem with Gemini and Mercury. We were pressurizing the

spacecraft at five psi over atmospheric, which was 20 psi. We had a 100% oxygen environment. I did the same test on top of the Gemini that they were doing at the time that the fire occurred. And we did it on every Gemini spacecraft. I think we did it on every Mercury spacecraft, too.

WARD: Do you think the reason for that, and the reason that it appeared so obvious in 20/20 hindsight but was not really apparent at the time, was that we might have been concentrating so heavily on the environment we knew was going to be dangerous, i.e., space, and overlooked the dangers while they were still on the launch pad?

MCDIVITT: Well, this was a—no, I think it was a—I don't think it was—that was not a single reason for it. It was a myriad of reasons. First, we were designing a new spacecraft. We had all kinds of stowage problems in the spacecraft. We had all kinds of things that we were going to have to carry. We had webbing and netting in there that we knew was a problem, a fire problem. I talked to Joe [Joseph F.] Shea, the [Apollo] Program Manager, about it and we knew that that was a problem. And we had plans to change all that stuff out before this flight. They didn't quite get to it. And we didn't have any idea how fast it would burn.

To this day, nobody knows how the fire started. But we just had a lot of bad circumstances come together. And some of the North American people maintain to this day that they were never told that the spacecraft would ever be tested in this configuration. If they didn't know it, they were the only people in the whole world that didn't know it. But, you know, everybody had their own idea how this was going to work, I guess. But it was one of those circumstances. You had all this flammable material in there and a 100% oxygen environment at 20 psi. That's seven times more oxygen than we have in this room right now.

And a lot of things will burn very quickly like that.

WARD: Joe Shea, you alluded to, is the Apollo Spacecraft Program Manager at the time. And Joe ended up, along with his counterpart at North American, receiving a lot of the criticism for the accident and ultimately being replaced. Do you think that was really justified?

MCDIVITT: No, not at all. Not at all. No, I think the criticism of both the North American Program Manager and the NASA Program Manager was totally unjustified. If other people were so smart, why didn't they say something? I mean, we had the best engineers that we could find. We had good crewmembers. We had everybody who knew anything about space working on this thing. And nobody said anything about it. So, for them to then focus on just a couple of people and say that they were at fault was, I think, really idiotic and, well, possibly looking for scapegoats. But it wasn't warranted.

WARD: There was another countercurrent going amidst all of this. And it was the same kind of a current that was flowing at the time of the *Challenger* accident, and that was in the press corps, where the attitude that prevailed was that: if the press had been a little more vigilant, since it was so clear to everybody following the accident what the cause was, the press should have been able to figure this out and alert the world—and NASA—to the fact that they had a problem.

MCDIVITT: Well, I think that there's a—I think that the press does *some* good things. I think they do a lot of bad things, too. And I tend to deal with the press on an individual basis. There are some good guys, and there are some bad guys. And that was the way I dealt with

them when I was a NASA employee. Of course we had to, by edict from the Federal Government, deal with them in some way.

But, you know—and I recall one incident where Ted Freeman got killed in an airplane accident. The first guy that went over to see his wife was a newsman from one of the Houston newspapers. I'll not say which one, because I can't remember and I don't want to accuse one of them of the wrong thing. But he was the first guy over there; and he figured out that there were so many NASA people flying; and he could—he went around and he knew who they were. And he identified just about everybody; and he didn't see Ted. So, he came over—so, he went over to his wife's house, or to his house, and asked his wife if she knew if Ted had been killed in an airplane accident. And some time later, Deke and a minister and I think Dr. [Robert R.] Gilruth showed up; and Faith already knew that Ted had been killed. Or was suspicious of it.

Well, I dealt with that guy by, at my Gemini IV press conference, refusing to talk while he was in the room. And—which created a gigantic stink, as you probably would guess, Doug! And Dr. Gilruth came over to see me and said, "Jim, we've got to talk with the press." I said, "I'll be more than happy to talk with the press. But I'm not going to talk with that son of a bitch there," and you can leave that one in there! And I wouldn't!

So, finally we started getting calls from the—Mrs. Hobby, whoever—whatever paper she owns. Is it *The Post*? Anyway, she was calling out there, "You know you're keeping us out of the press conference?" and stuff. I said, "Well, if you want to send somebody else out here, we'll have another press conference with just them." But I wouldn't deal with him. I—maybe we were at an impasse for three or four hours, and finally he left. And then I never dealt with him again; and finally he got fired. So, I don't go with that kind of stuff.

But there are a lot of newsmen, I think, that do a good job. There was a little Irish

guy who used to come out and give us a hard time. I think he was probably gone before you got there.

WARD: Jim Maloney.

MCDIVITT: Maloney! Right. Maloney was giving us a hard time about the flagpole. And on Fridays we used to have press days. And one day—one time I was scheduled to have a interview with Mr. Maloney for a half hour. And so, I told the schedulers to make sure Maloney had a half hour at the end of his press conference with me. So, we went through the press conference, and I was watching my watch. And we finally got to the half-hour mark, and I said, "Okay, the—," you know, "it's over." And we had a NASA PA [Public Affairs] guy there, and he said, "Yeah, the interview's over, Jim."

And so—Jim Maloney. And so, we stopped and I said, "Do you want to get a cup of coffee or do you want to start the next one?" And he said, "Well, what next one?" I said, "Well, I've got you scheduled for an interview with me." He said, "Well, what are you talking about?" I said, "But, Jim, you're here interviewing us all the time. I have scheduled an interview between the two of us where I'm the questioner and you're the—going to do the answering." "Well, I—" I said, "Jim, it was scheduled. Now, do you want a cup of coffee or not?" "No, I don't want a drink." We sat down, so I said, "Okay, now why the hell are you going after us on the flagpole?" "Well, what do you mean? I—"

So, we had a half hour press conference with Mr. Maloney. We were finally told that he had been instructed by his boss to just raise hell out there because he wasn't—they weren't getting something they wanted!

So, anyway—I had good relationships with some guys than others. But quite frankly, when you get back to this, Should the press have known something about the problem with

the solid rocket? No, there wasn't anybody smart enough to know anything about that! And I think the press does the country a terrible disservice on a lot of occasions. A good service at other times. But sometimes they just got out of control.

WARD: Getting back to the effects of the fire. It—you mentioned that you were the backup crew to Grissom, White, and Chaffee. After the fire, a lot of changes were made in crew assignments. There were hardware problems that changed that. Talk a little bit about what happened to the flow, the assignment of the crews, and how you ended up next on Apollo 9.

MCDIVITT: Okay. Well, you know, there was even a—[Recorder turned off].

WARD: Jim, we were talking about the effect that the Apollo fire had and some of the hardware problems with—the vehicle had and crew assignments and the juggling of crew assignments, and how you ended up then next on the Apollo 9 mission.

MCDIVITT: Sure. Yeah. Well, it's kind of complicated. You know, when I was the backup commander of the first Apollo mission, there was a second Block I Apollo mission scheduled also. It was crewed by Wally and his crew as a prime crew, and I don't even remember who the backup crew was. And one day they were doing a pressure test on the service module for that vehicle, and—unmanned, of course, it was done in a pit—and it blew up! So, all of a sudden we found ourselves without two Block I spacecraft. Just one Block I spacecraft.

At that time, I was taken off of being commander of the backup crew and put on as prime crew on the first lunar module flight. Wally Schirra's crew was moved from being prime crew on this Block I spacecraft over to backup crew on Gus's flight. That was the first

crew shift. And we didn't have any numbers for these flights. They were all lettered in those days. There was a C, D, E, F, G, H, I, J, L—and—

The C flight was a Earth orbital flight. The D flight was a Earth orbital flight with the lunar module. The E flight was a deeper space flight with the lunar module. The F flight was the fly out to the Moon, practice going down, but don't land and come back. And then the—I guess G was the landing flight. Then H was the flights that we flew in exploratory mode. So, we—the C flights went from two to one. Then I was on the back—then I was the prime on the lunar module thing.

So, it took us a while to figure out what all the problems were that had caused the fire; and when we got that sort of sorted out, I moved from the command module that would've been the command module for the first lunar module flight over to the next command module. And that first command module then became the command module that Wally and his crew flew for the first time. So, now I was on the second Block II command module, but the first lunar module. Then we started having a lot of trouble getting the lunar module through tests. The same problem that we had on the command module; the same problem that we had on Mercury and Gemini.

We got to the point where we decided that the wiring in the lunar module, LM-2, was not safe to be flown. They were using an ultra-lightweight concept where they had a wire coming out of a black box; and instead of putting it into a plug, we were soldering it together using shrink sleeve. Shrink sleeving is a plastic tube that you put over a wire, put the two wires together, you solder them, you move the shrink sleeving down over the soldered joint as insulation heat—using heat, kind of like on a hair dryer, and it shrinks down and grabs a hold of it. Well, if you have a solder joint that's not a good solder joint, the shrink sleeving will hold it together and you'll have an intermittent electrical contact. We had intermittent

electrical contacts throughout the lunar module. And they'd work one day and wouldn't work the next day.

So, finally we decided we had to go back to plugs. And they—at that time, the lunar module was pretty far through testing. We'd been testing it for a year or so. Decided to send it down to the Cape, run it through the flow down there, and then put it in the Smithsonian [National Air and Space Museum, Washington, D.C.], which is where it is now. So, then I went over to the LM-3 vehicle. At that time, that put a gap in the flight; and they—NASA management just decided to fly another flight that wasn't in the plan, that would be out around the Moon and they'd come back down. And so—

WARD: That became Apollo 8.

MCDIVITT: —that became Apollo 8. And that wasn't a lettered mission. When that got stuck in there, we then—and that would've been the E mission that that crew was the—came down there. So, then we combined all the D and E mission objectives into the flight I was flying, which we still called D. We then just eliminated E. So, we took one out and put one in, and went on with that. So, then after that the crew assignments stayed pretty much the same. And no more jockeying around on the spacecraft either.

WARD: And, of course, all of that was going on, at the same time, or at least in part in parallel with the recovery from the fire—

MCDIVITT: That's correct.

WARD: —and you and Frank Borman, along with George [M.] Low who had been named the Apollo Program Manager after Shea left really carried a tremendous amount of that

burden of getting the confidence back in the contractor and the vehicle back in operation.

MCDIVITT: Yes. Yeah. Yeah. You know, in support of Joe Shea and some of his ideas and what he was doing—a lot of that stuff was already in work. I mean, this wasn't something that we genned up after the fire. There was a Block II spacecraft. As a matter of fact, I was testing it at the time that the fire occurred. So, there was a Block II spacecraft that was significantly different than the Block I spacecraft.

We still didn't have all of the flammable material out. And so, we had to go back and do—redo that. And then we started looking for spark initiators that could have caused this problem. We never did find them. You know, we never knew exactly what caused the fire; so, we didn't know exactly what we were trying to fix. But we—that spacecraft was a lot different—the remodeled Block II was a lot different than the original Block II. But the original Block II was a lot different than the Block I spacecraft.

WARD: You alluded to the fact that we added a mission, which became Apollo 8, the first manned flight to the Moon. What was your reaction at the time when you became aware that they were—on just the first flight of the Saturn V with a crew on it, then only the second flight with the Apollo spacecraft, were contemplating sending it to the Moon?

MCDIVITT: Remember we talked earlier about, you can't go—you can get there going—using little itty-bitty steps, but it takes you a couple of centuries. And so, we were going big steps. And that didn't seem like any bigger step than any other of the big steps. It didn't seem illogical. We had—there were a lot of things that we had to do.

When we sat down early in the Apollo Program and laid out what the C mission ought to do, what the D mission ought to do, what the E mission, the F mission, the G

mission, what all those things had to do, they weren't assigned a flight number. People were assigned a mission letter. And we would've flown C five times if we'd had to, to get the spacecraft to where we could go on to the next mission. C turned out to be okay, so we could do this other one. And the same thing with the lunar module.

If we had flown a first lunar module and it wouldn't have worked, the next mission would not have been F. It would have been C or D all over again, or whatever it was that we needed. We might've made some modifications, but it turned out that the only modification we made in the whole plan, from the way it was laid out originally, was that we eliminated E and put [Apollo] 8 in there, which didn't have a letter.

I mean, it's marvelous to think back on it! That we were—you know, that we were that farsighted and that it all worked out that way. Because I know a lot of times I'd come home from work and say to my wife, "There's no way we're ever going to get to the Moon. It's just impossible!" We were never going to get the weight on the lunar module down low enough, and I just never thought we were going to get it light enough to do what it needed to do.

WARD: Were you surprised that that mission went as relatively smoothly as it did?

MCDIVITT: Which mission?

WARD: Apollo 8.

MCDIVITT: No. No, I thought it would go that way. The one I thought—the one I was most concerned about was Apollo 11, because you had to have so many things in a serial path that had to work. Apollo 8 was much simpler. It had just a command module and a service

module. And it went—once it went, it was either going to work or it wasn't going to work. But when you add the lunar module in there, you had all that stuff together, that was a—you know, that string of things that had to all be correct to make it get to the proper ending was pretty difficult. I thought that would be the most difficult mission.

WARD: Well, and that's where your flight, Apollo 9, comes in. Because you had to put all those elements together and prove that they work.

MCDIVITT: Yeah. Yeah. As a matter of fact, I think it was quite fortuitous that I had a chance to fly on Apollo 9 and then became the Apollo Spacecraft Program Manager. Because the things I did on 9, which was really an engineering test flight, that stuff came into play so much more for me as the Program Manager, later on, when we were running into difficulties in the—when we had problems with the spacecraft when we were at the Moon or doing some other things that I had done all those tests myself. Personally. And so, I knew the difficulty of doing something. Like on Apollo 13, when we had to get it back. The star alignments and stuff like that, I had already done that myself. Rusty and I had done it.

On Apollo 16, they had a—we had a problem with a actuator for the service module engine. It was oscillating. I'd already flown this whole stack where we deliberately oscillated an engine to gimbal like that. And I knew what it felt like inside the spacecraft. And fortunately, it had—and so, all that stuff that it—it was fortunate I had done it myself. So, when I got around to making—having to make decisions on those later Apollo landings, it made me more confident that the decision I was making to go forward was really right.

WARD: In some respects, in comparison with other Apollo missions, Apollo 9 sometimes gets overlooked as being a rather mundane flight. And yet there are those who believe it may

have been one of the more dangerous missions we flew, and certainly one of the most important to the program. Kind of run through for us what you accomplished on that flight.

MCDIVITT: Okay. Well, you know, I don't have any problem with how it's looked at by other people. I really don't care! And I could see why they would; you know, it didn't land on the Moon. And so, it's hardly part of Apollo. But the lunar module was, as I mentioned earlier, key to the whole program. And trying to get it light enough to fly was a real challenge. We got to the point where we were filing little blousons off of castings and things like that to get the weight down.

So, the main thing was that we got a chance to fly the lunar module to see if it really worked. We had a few minor glitches on the descent engine, as I recall, when we first started it up. And, oh, it worked fine. And the fact that the rendezvous worked okay. The computers worked. The radar worked. I mean, the—we did a damn good job of engineering it, because we really didn't have very many big problems with the spacecraft. It all went together well. But we had to make sure that it went together well and that it would work, because it was really a flimsy little spacecraft.

The first time—I've seen a lot of models. And they had solid sides to them and all that stuff. The first time Rusty and I went up to Grumman to do a storage review—a storage review is something you do before you really solidify where you're going to put everything, and it's so you can still make some changes—and I hadn't been up there for a while. I was busy on the command modules at the time. And so, I went back up there and we went in the White Room. And we had hundreds of people, like NASA normally has. And we went over to this vehicle sitting there in the corner, and we had two different kinds of vehicles. We had non-flight vehicles that were heavy construction; we had the flight-weight vehicles. And we

go over there, and we get in the spacecraft, and we crawl in. And I can remember the first thing we did is we knocked off the shield around the environmental control system, which was a thing about as thick as a piece of paper and made out of plastic.

And so, we get in there and we start checking the stowage. We weren't checking the spacecraft. We were just checking to see if everything fit. Every time we turned around, something else broke! And I'm pretty mild-mannered and I don't get excited when things aren't going right. But after we were doing this for about five or six hours, and everything we touched fell off the wall or broke or it did something! Finally I got on the radio and I said, "Damn it, you guys! We've got—" you know, "we've got 200 people here. We're all out here. We've been here all day long. We're—and we've got this crappy training vehicle out here that, you know, we ought to get something that more resembles what the heck we're going to fly with in space instead of this junk that we've got here! And, you know, this—"

I went on and—went on like that. And then I shut up, and there's this long pause. And finally somebody comes on the intercom and says, "Jim, that is the flight vehicle." I looked at Rusty and he looked at me, and we said, "Oh my God! We're actually going to fly something like this?" So, it was really chintzy. I mean the outside is Mylar; and, I mean, it was like cellophane and tin foil put together with Scotch tape and staples! I mean, it really is built like that.

WARD: Of course, a lot of that's a reflection of the fact that it doesn't have to fly in the atmosphere.

MCDIVITT: Yeah, it doesn't have to fly in the atmosphere. They did go and beef up stuff on the inside though, because it was just really falling apart. But anyway, the lunar module worked out great. We made very few changes to it for the original missions. We made a lot

of changes to it later on for the longer mission. And the command module worked out well, too. You know, we flew one flight—Earth orbital—then we flew it to the Moon. So, it—while we had a lot of trouble up front in getting these things designed, built, and tested, when we actually got them into flight they worked just the way they were supposed to.

WARD: You did a—one other thing on your mission, Apollo 9, that ended up having some very important significance later on. That was the docked DIPS burn as it was called at the time. Docking with the lunar module docked to the command module and proving that you could control that whole stack while thrusting with the lunar module engine.

MCDIVITT: Oh. Right. Yeah, that was like—that was what I was saying earlier. We did a bunch of tests that we—that helped me a lot when we were—when I was the Program Manager. Right. We did a dock burn with the lunar module. We did a bunch of oscillating tests with the command module. We did an EVA. We checked all the alternative methods of doing star alignments. We had multiple burns on the descent stage. Throttled the engine up and down through regimes it probably was never throttled at when it landed in the Moon. And it worked out really great.

WARD: And in particular on Apollo 13, after the oxygen tank exploded enroute to the Moon and suddenly the lunar module had to take over a lot of the command module's role, where would we have been if you had not done the things that you did on 9?

MCDIVITT: Yeah. We'd have been a lot—it would have been a lot dicier! Yeah, because we had to work out those procedures for 9. And we worked them out and we knew they were going to work. I mean, they weren't easy. It wasn't easy to do. The guys flying the

spacecraft had a tough time doing that, but we knew they were going to work because we had done them. Yeah, that was a interesting time.

WARD: Of course after 9, instead of getting back in line for another Apollo mission, you moved into management, into the Apollo Program Management Office. How did you make that decision to get out of being an active astronaut and going into program management?

MCDIVITT: Yeah. After I flew Apollo 9, it was apparent to me that I wasn't going to be the first guy to land on the Moon, which was important to me. And being the second or third guy wasn't that important to me. Now I say it, "It was apparent." I mean, it looked like we were going to be successful. I mean, things were really going along well. Much better than we expected. And I thought that lunar module was kind of the key to the whole thing. If it worked, we had a chance. If it didn't work, you know, we'd be at it for another two or three decades.

And so, I had people calling me and asking me to do different things. I think the Air Force wanted me to come back and run a big space program they had. I forget what it was. The MOL [Manned Orbiting Laboratory] Program, I think it was. Maybe it was something else. I don't remember it. And like I was telling you earlier, when I was asked to do the Dyna-soar thing, I went and looked. So, I remember General Phillips said—I'd just gone back to the Air Force and he was running the MOL Program, and he called me and asked if I would—he was running all of Research and Development for the Air Force. He asked me if I'd run the MOL Program. "I don't know. Let me think." So, I flew out to California and talked to a bunch of Second Lieutenants who would tell me the truth! And I concluded that that bugger wasn't going to make it either! So, I went back and told him, "No." And he said, "Now, Jim, I *know* that that's going to fly. I just talked to the Secretary of the Air Force

today. That's the number one priority program." Anyway, a couple of months later it was canceled.

And then I had an opportunity to go be the Secretary of the Space Council, and the Air Force wanted me to come back and do some other things. And then I had an opportunity to fly command Apollo 13. And then George Low called me up and said, "Jim, I'd like to talk to you." So, I went over to talk to him. And he said, "I'm only going to be the Program Manager for one more flight. And after that—" or the lunar landing. "As soon as the lunar landing takes place," he says, "I'm going to leave here." He said, "I've been offered a job as the [NASA] Deputy Administrator. And we can't talk about that now, because it's a political appointee job" and all that junk. "But," he said, "I'd like to have you replace me as the Program Manager." Hmm. I said, "Well, let me think about that. That's more interesting than some of these other things."

And so, I went home and talked to my wife about it. She suggested I fly the Apollo 13 flight. And anyway, I thought about it for a long time. And finally I decided that that's what I wanted to do. So, I went and told him, "Yeah, I'd do that." And so—

WARD: Be the Program Manager.

MCDIVITT: Yeah, I'd be the Program Manager. But we couldn't—but we had to disguise it in a way that it wasn't obvious. And so, I took a job which we created called the Deputy Program Manager for Lunar Exploration, or something like that. So, in that job then I led the team that sort of redesigned the command module and lunar module to do the lunar exploration stuff that we did on 15, 16, and 17. And then as soon as we landed on Apollo 11, we were going to make the transition.

And then because of the political appointee stuff, it took—it dragged on and on and

on; and finally George and I decided that, "Look, you know, if I'm going to do this job, I've got to do it now! I'm not going to do it—I'm not going to start it last." So, he said, "Yeah," so he went and did something else on a temp—on an interim basis and I took over the Program for 12 through 16.

WARD: What was your impression or recollection of George Low?

MCDIVITT: A great guy. A really great guy. Well, he was the right guy at the right time. We were—there was a lot of unrest, uncertainty, finger-pointing, and things like that after the fire. Unfortunately. You know, like I said earlier, I don't think it was anybody's fault. I think it was part of the ballgame, and I'm surprised we didn't kill more guys. But he came in and pulled the NASA team together and solidified the relationship between the contractors and NASA. And we got back on—got going again.

WARD: Did you consciously follow his style when you left? Or were your own person? I'm sure you had your own approach to managing that was different from his.

MCDIVITT: Well—yeah! It sure was! I believe nobody does things like I do and other people don't do things like other people do. As a matter of fact, when I took over his—I moved into his office and I had a executive assistant, secretary, assistant secretary, technical assistant, and an administrative assistant. Well, hell, it took me all day long to figure out what to tell them to do to keep them busy! So, you know, finally I decided: "I don't need an executive assistant." So, I didn't talk to her anymore. And after a while, she got the message, and she applied for another job and she left. She was a very nice lady. I don't even remember her name anymore. But she was a very nice lady. But I couldn't cope with all

those people hanging around. And so, she left.

And then I had this technical assistant, who was a—whose name was Ron Kobiche. I didn't need a technical assistant. I didn't want a technical assistant. So, the guy who was running the Systems Division, whatever we called it, left and I moved Ron down there. He had a real job, and he was—I still used him as my technical assistant. When I needed some technical information, I went to him and he got it for me.

I had this administrative guy. We had a lot of administration. But he didn't need to be *my* administration guy, so we sort of put him over running all the administration, which was sort of—he was supporting George and then when he did the other stuff, and I had—my part went to zero and the rest of it went out. So, I got rid of them.

Then I had a secretary, an assistant secretary. That's how I ran it. And I think my secretary was 23 years old, and my assistant was 18! But we—and as a matter of fact, when I got—we had a different management structure on Apollo than we did on Gemini, and I used to have management consultants from all over the world come over to try to figure out how we ran this thing. And they always wanted to know: Who were my key people? And I told them, well, I had the Command Module Deputy Program Manager, the Lunar Module Deputy Program Manager, a Systems Engineering Chief, and my secretary. "And your secretary?" I said, "Yeah! My secretary." Her name was Suzie, and she ran the office like an iron fist.

And we really needed to. It was tough to get everything done in 24 hours. And like I said, I had a great Command Module Program Manager, Aaron Cohen, and a great Lunar Module Program Manager, Owen [E.] Maynard—or Owen—

WARD: Owen [G.] Morris. Owen Morris.

MCDIVITT: Owen Morris. Yeah. And Ron Kobiche. And Suzie Cardenas. Those four people supported me and made it easy for me.

WARD: One of the things that happened during your tenure as Program Manager was the solidification of the evolution of the science program. And I recall early in Apollo, you really were very reticent to put a scientist up in a press conference because you could almost expect that they would criticize the Program and the science as much as support it. Toward the end of the program, that very much changed. And I think—

MCDIVITT: Yeah. Yeah. Well, that was never my attitude. That was never my attitude. As a matter of fact, we had—I had one other Deputy Program Manager—the Deputy Program Manager for Science—and I did that myself for most of the Program. Dick [Richard S.] Johnston did it for a short period of time; and then when he left to take over his other job, I did it myself. And so, I was never opposed to the science, but I was always very strongly in favor of it. Now some of the scientists were nuts! But as far as the—you know, why we were going to the Moon? It was really a scientific expedition. It wasn't a "gee whiz!" expedition. And so, I got vitally involved in site selection; and when we redesigned the spacecraft, I led that team. Guys that put the stuff in there.

And I remember one time asking everybody about the TV camera on the rover. I said, "Well, we're going to have an opportunity to put this TV camera on it. Who would like to support that?" And the R&D [research and development] guys are—R&E [research and engineering], or whatever they called it, they didn't want to support it. And flight controllers didn't want it. And the scientists, they were kind of lukewarm. And the Public Affairs [PA] guys didn't even support it! I mean, I said, "To hell with all of you! I'm going to put it on there anyway!" And then, of course, PA was up to here with it. Engineering was up to here

with it. Scientists were up to here with it. Everybody was fighting for it! But it was a—you know, I always thought that, you know, that was the reason we were doing it.

WARD: Well, you really took some concrete steps, did you not, to improve the relationship with the scientific community?

MCDIVITT: Yeah. Yeah, I did. You know, they were—they used to get as excited in some of their things like site selections and other things like that. I mean, those generated as much heat as the battles that we used to have between the flight controllers and the astronauts, or the engineering guys and the flight controllers, the engineering guys and the astronauts, or the program guys and the astronauts.

As a matter of fact, I remember one meeting—as a matter of fact, it was the only time I did it at NASA—we were involved in a site selection. And some of the scientists would like to land on this four-inch square on top of a mountain peak. And of course, we weren't going to try anything like that. One of the guys, whose name will go unmentioned, got so obnoxious at the meeting I finally said to him, "Okay,"—his name wasn't Charlie, but let's call him Charlie—I said, "Okay, Charlie, we don't do that in here. You go outside and sit. When you feel that you can talk like a normal human being, you can come back in here and join in with the rest of it."

And so, he thought I was kidding. And I said, "I'm not joking. Get out of here!" "You can't get me out of here. I'm from Headquarters!" And I said, "Get out of here!" So, he left. And 20 minutes later, he came back in; and we conducted—we continued the meeting without him. And then when he got back, we continued the meeting with him. And we finally came to a reasonable compromise on what we'd do. And—

WARD: Even though—

MCDIVITT: I had to do that with the accident investigation team on Apollo 13 one time, too. When we got Apollo 13 back, we'd all been up—not all of us, but almost all of us had been up for, what? four or five days. And so, I sent everybody home and said we'd reconvene, I think, on Monday. I think we landed on Saturday or Friday. I don't remember which. "Everybody go home and get rested, and we'll start the accident investigation." I got a call from NASA Headquarters in my office just before I left, saying, "Well, we've got to reconvene—we've got to convene that accident board right now!" I said, "You guys got to be out of your minds! You know, some of us haven't had any sleep for three or four days!" "Well, we've got to do it. You know, politically, we can't put this thing off. We've got to get on top of it." And so on. Anyway, I brought the guys back.

And then a few days later, we got this super team that came down that was headed up by a fellow who was the NASA Center Director at Lewis [Research Center, Cleveland, Ohio], I forget his name now [Bruce T. Lundin]. And they came down and with a bunch of Center Directors and Air Force Generals and—I was still a Colonel at that time. And so, this was going to be the big super investigating team. Well, we had our own investigating team of hundreds of people. And so, I used to have a senior management accident review meeting once a day. And then the guys led by Don [Donald D.] Arabian were—had a meeting all the time. And they would get together once a day, and then—and the RCS [Reaction Control System] guys would talk to the electrical guys, and the electrical guys would talk to the inertial guidance, and they'd all be at the same meeting.

They'd get up and make a report. Everybody then got caught up to date. And this Center Director wanted to know if—or told me he was going to have his team sit in on those

other meetings. I said, "Well, you can sit in there under one set of rules; and that is, you don't ask any questions. You don't make a peep! You sit there. This is a meeting of the workers; and if you're going to start talking, you're going to interrupt it." So, he said, "That sounds fair enough." And so, I'd go over there and I'd sit and listen. And we got in there one day and one of the Air Force Generals started asking a question, and then another NASA Center Director started asking questions. I got up and I went over and got this guy from Lewis. We went outside, and I said, "Get your damn team out of there! I told you what the rules were. You're interrupting it." "You can't tell me what to do." I said, "Like hell I can't! Now you get them out of there!"

So, anyway, he went and got his team out. And I said, "You're welcome to come to my management team meeting and ask all the questions you want." But in crucial times like that, you can't have a bunch of interlopers interrupting what the hell's really going on. So, anyway, that was this—we had a different management style. George [Low] was not quite so bad!

WARD: More diplomatic.

MCDIVITT: He was more diplomatic, I guess. Well, we had a lot to do and we needed to get it done.

WARD: Getting back to the Apollo science program: At least my own perception is that Apollo didn't begin as a scientific program the way [President John F.] Kennedy outlined it, sold it to the public, to the Congress. It was not perceived as a science program. And yet after Apollo 11, that really became the strong thrust of it.

MCDIVITT: Yeah. I remember sitting down at the Cape with General [Samuel C.] Phillips, who was the [NASA Headquarters Apollo] Program Director, and somebody else, I don't remember who it was, I think it was near the time that we were flying Apollo 10. And the subject came up that, if we landed Apollo 11 where we thought we were going to land it, where should we land Apollo 12? Nobody had ever focused on the second landing! And so, we started talking about that. And we already had this ALSEP [Apollo Lunar Surface Experiment Package] thing. It was being designed, but it wasn't really included much in the Apollo Program. It was sort of being designed over here on the side. And the stuff that was going to go on the lunar surface and what we were going to do with it was sort of a big question mark.

And so, as he and I were chatting about that—I was already the Deputy Program Manager, or whatever we called it, for Lunar Surface Exploration—he said, "You know, we'd better start figuring out how we're going to do this stuff and what comes next!" And so, that's—we really were sort of getting our wheels ground up, rotating. But up until Apollo 11, the mission was, as the President said, it was to land a man on the Moon and return him safely to Earth. And that didn't say anything about science.

WARD: So, it really was impressive the way that whole science program came together.

MCDIVITT: Indeed. Yeah. The scientists really, as a group, were really good guys. And, you know, they knew what they wanted. Gene Shoemaker headed up most of the geology stuff, although there were a lot of individual principal investigators. Some of those guys were a pain in the neck once in a while; but by and large, they were a good group of guys, trying to get the job done. I remember we had one guy who was very outspoken about the dust problem on the Moon. How we were going to have 200 or 300 ft of dust. And after we

landed there, I saw him one day and I said, "Hey, kind of missed that one, didn't you?" "No, no, no! I was right! I was right!" I said, "Right, like hell!" I said, "The dust was only about like that." "Yeah, but there was dust there," he said. "I just missed it by a little bit!" He had the dust—he had the lunar module disappearing in the dust! 200 ft of it!

WARD: Was there any concern he might have been right when [Edwin E. "Buzz"] Aldrin [Jr.] I think it was, called out, as they were about 10 or 20 ft above the Moon, that they were kicking up some dust before landing?

MCDIVITT: Well, everybody—I mean, you know, we weren't exactly in the dark about what the Moon looked like because we had, I think it was the *Surveyor* spacecraft that took pretty good photos of it. And we had this other spacecraft that flew right straight into the Moon. I remember being out at JPL [Jet Propulsion Laboratory; Pasadena, California] the first crash that they had on the Moon, where the [*Ranger*] spacecraft flew right straight in the Moon. It took a picture, transmitted it; took another picture, transmitted it; took another picture and transmitted it. And the last picture, you know, was only half a picture because it hit the Moon. And you could—I mean, you could guess that it wasn't really deep. And then we had this other one that actually landed on the Moon that had a scoop on it [*Surveyor*]. So, we knew that there wasn't a lot of dust.

WARD: You were pretty confident the lunar module wasn't going to get buried in it.

MCDIVITT: Yeah. That was not one of my big concerns.

WARD: Do you think people today remember or appreciate just how difficult and dangerous Apollo really was?

MCDIVITT: Well, people in those days didn't appreciate how difficult and dangerous it was! I mean, we made it look way too easy. When I got into the program, I figured we'd try five, six, eight, ten times before we ever had a successful one. I had no idea in the world it would run as smoothly as it did. You know, that's why we had the lettered missions. We had—we were going to go on C until we got C done. And then we were going to go on D until we got it done. Then to E. And then F. And then G. The fact that we didn't even do one of them, I mean, yeah, it was extremely successful.

WARD: At the time the crews were assigned, do you think that Deke Slayton, NASA management had a strong inkling that Neil Armstrong's crew would be the one to land on the Moon?

MCDIVITT: I don't think so. I think there was a—I think when Joe Shea was there—I don't know this as a fact, but I think when Joe Shea was there, there was a certain alignment of who was going to fly what, when, that might have been different than what Deke thought. I'm not sure Deke ever knew that. And we can't ask them today, can we? Then after the fire and Joe left, I think George Low—we can't ask him either, can we?—didn't have—didn't want to take on that responsibility.

And it sort of went over to Deke. And then I think he just put those crews together, and they were just going to spring up and it was going to be more happenstance than anything else. And, you know, and if we tried these flights a number of times and they weren't working, we wouldn't—we might not have landed until Apollo 20! And so, nobody knew until we got started getting close.

And that's why I said after I flew on Apollo 9, it looked like I wasn't going to get a shot at that because we were being too successful! I should have screwed up Apollo 9, hunh?

No, that's my impression of it. And the guys you'd have to ask are Deke and George Low and Joe Shea and Dr. Gilruth maybe. And, you know, most of those people you can't talk to anymore.

WARD: None of them are—

MCDIVITT: And I was 70 last week!

WARD: Were you involved in the decision at the end of Apollo, at the end of the program, to end the mission at 17 rather than continue on with the hardware we had 18, 19, and 20?

MCDIVITT: No, I was adamantly opposed to that. And everybody knew it. And nobody asked me. And I think it was unfortunate. You know, we had this tremendous investment. We had probably $30 billion plus of 1962 dollars invested in Apollo at that time. We had the command modules built. We had a number of the lunar modules under construction. I think we had lunar modules up through Apollo 25 under construction. Some of them were just a few pieces, you know; but then as you got closer back down to 17, there were more and more of them. And we had—let's see—yeah, we had 20—up through 20 all in, contracted for, and everything was ready to go.

We were even looking at reusing the command modules after we dumped them in the ocean. I spent six months trying to figure out how to do that, and I finally decided it was totally unsafe, so that we could continue the program. And we even looked at landing on the back side of the Moon, putting satellites up in orbit, and that was too hairy. I don't think we should have ever done that. But we had all these other things. And it was—you know, it was all there. I mean, it didn't cost much to fly one more flight. And then we chickened out.

I think that NASA top management just ran out of adrenaline, and they—you know, NASA's been accused of this a lot, and I think it's true, is that they want to get on with the next program. But I think that there were certain people who got the manned space program going who were afraid we were going to kill somebody and it would jeopardize the rest of the program.

Killing somebody on that—in that program was something that was so very highly likely that we, you know—you had to sort of accept that at the beginning. And to start worrying about it at the end, I think, was a abdication of your responsibility. And they did cut it from, you know, it went up to 20. And they cut 19 and 20 out I think it was, at one time. And then we had an 18 programmed. Then we cut the 18 out. I think a lot of people would have liked to cut— [Recorder turned off.]

MCDIVITT: The contracted spacecraft on the lunar module went out to 25. The—one of the conceptual spacecraft went out to 25. The contracted for went out through Apollo 20. And when we started cutting the programs back, they didn't cut from 20 back to 17. They cut either 20 to 19 out at one time, and then later 18. Or we cut 20 out and then 18 and 19. I don't remember the order. But we cut two out at one time, and one out at another time to get us back to where we were. And quite frankly, I think that a lot of people would have just as soon seen us end the program in the 12, 13, 14 area and not do any of the other ones, because it was very dangerous.

They didn't want to lose a spacecraft. They didn't want lose a crew. And they were afraid that it would jeopardize the future of the whole space program. But I don't—I personally don't think it would have. I think that a lot of people were—most of the people in

the program were—would have easily accepted, this sounds kind of hard but would have easily accepted a loss of a crew and still continued on with the program because I think when we all got into it, we expected something like that. It never occurred except for the fire, but I know I personally expected a lot of failures, maybe losing crews, along the way. And if you didn't think that was going to happen, you shouldn't even have been in the program.

So, it was really unfortunate that we didn't continue on. I think we could have gained really great scientific knowledge up through 25. I mean, you look at a face—look at the picture of the Moon and there's a few little dots on it. That's hardly—just think what that would have looked like if we had two times that many, or even more than two times that many, which would have been easy to do.

WARD: And so, what you're saying is that: the public perception today that the Apollo Program was curtailed at the point it was because Congress cut the funding really isn't the total story.

MCDIVITT: No. I don't think so at all. I think it was a lack of drive on the part of NASA management and a concern over killing somebody.

WARD: And the damage—

MCDIVITT: It shouldn't have been a concern, because that should have been a concern the whole way through.

WARD: So, you think the desire to get on with the Shuttle Program and Space Station were factors?

MCDIVITT: You know, I think so. Yeah, I think so. I had a lot of difficulties keeping the Apollo money in Apollo. I really got crosswise with the Manned Spacecraft Center management on a number of occasions over spending Apollo money. In those days, before I took over the program, every dollar I think that was spent at the Manned Spacecraft Center was Apollo money. And when I took over the program, we were already—that budget had already been set for the year. And so, I didn't have to deal with setting the budget.

My first budget exercise, I found that three-quarters of the Engineering and Development Directorate's money was Apollo money, and it wasn't being used on Apollo. That the Flight Operations money was being diverted to shuttle and Skylab. The same thing with the Flight Crew money was being diverted out of Apollo. I think we even mowed the lawn with Apollo money. And I got in a lot of very heated arguments with everybody else on the Center who wanted the Apollo money; and it seemed to me that it was very shortsighted planning where you didn't have—because Apollo was going to end. And when it ended were we going to shut the Center down? And I didn't think we would, and I didn't think that we should.

And it seemed to me that we ought to have an institutional budget for the institution of the Manned Spacecraft Center, which took care of the facilities, mowing the lawn, paying the electric bill, you know, the salaries for the administrative people, and the infrastructure of the Center. And then if we were going to have a Skylab Program, we ought to have a Skylab budget. If we're going to have a Shuttle Program, we ought to have a shuttle budget.

And quite frankly, I think that the people pushing shuttle were not telling the truth about what shuttle was really going to cost. They didn't have approval for it. They were being overly optimistic on how often it could fly; overly optimistic on what it would cost. I think they deceived themselves, significantly; deceived Congress. And they totally screwed

up the Shuttle Program because it was years late. It was billions and billions of dollars overrun. And they didn't have the guts to go forward with a budget that dealt with shuttle!

The same thing, they didn't have a budget that went forward with the Skylab Program. And so, we got into some very, very heated arguments. And to the point where the Chief Financial Officer—I don't know what the heck we called him in those days—from Engineering and Development came down to me in my first budget review and presented this budget to me of what was in Apollo and what was in the other things.

And I wasn't as stupid as he thought I was, and I said to—looked at it for about 15 minutes and finally I said, "Look, this is a total fabricated lie. Now take it back upstairs. I'm giving you one more chance. You take it back upstairs"—or downstairs, wherever it was—"and do an honest budget." And he said, "Well, you know, [mumbles]." I said, "You've got one more chance." And so, he says, "Okay." So, he went. He came back a week or so later, presented another budget to me, and it was a lie also. I threw him out of my office and I said, "You are never, ever to come back into the Apollo Spacecraft Program Office again! You are an out-and-out liar!" And so, he left. And Max [Maxime A.] Faget [Director of Engineering and Development] called me and said, "You know, Jim, this is a budget." I said, "Max, it's a goddamn lie! And so, I won't accept it." And so, we had a big donnybrook over that, and finally I got back the Apollo budget.

And so, we did that, you know. But it was unfortunate that we had to go through all this other really deception. You know, when the guy I think that probably is most responsible for the whole space program is a guy named Jim [James E.] Webb, who was totally disliked by almost all the astronauts because he asked them to do politically correct things, like going to the Raspberry Festival and talking to Senator So-and-so. But if it hadn't been for Jim Webb and his approach to spaceflight, there would've never been a space

program.

Because when Congress asked Webb how much it was going to cost to do the Apollo Program, the numbers I'm not sure about but I think the engineering estimate was $20 billion. Now NASA management might have today come in with $10 billion. What Webb did was he went in with $40 billion. He doubled it instead of cutting it in half. He went there, he told them it was going to be $40 billion, they approved it, and the entire time I ran the Apollo Spacecraft Program I never had a problem with money. We were always on time. We were always willing to run things. And we were able to run the program in a way that got things done.

WARD: And in reality, that's probably a cheaper way to run a program.

MCDIVITT: Oh, much cheaper! Much cheaper. I think it cost $23 billion to do the program that he said would cost $40 billion. And when we needed money, we had it. I remember one day Rocco called me up. Rocco Petrone was the [NASA Headquarters Apollo] Program Director. And this sort of has to do with the whole management concept and the flexibility we had in those days versus what it is today.

Rocco called me up one day and said, "Jim, have you got any extra money?" I said, "Well, yeah, probably I do. What do you need?" He said, "Well, Dick Smith's having a problem with the Saturn. He's got an engine problem and he needs some money." I said, "Well, how much do you need?" He said, "Well, what have you got?" So, I said—I put him on hold. I didn't even hang up!

I put him on hold, and I called my Program Control guy, and I said, "Do we have any extra money?" He said, "Well, you know, I know we have $50 million, but I don't—" You know, we might've had—remember, these are '69, '70 dollars. He said, "I know we've got

$50 million." I said, "Well, hang on a minute." So, I put him on hold. And I got Rocco, and I said, "Rocco, I know we got $50 million." He says, "I think that'll do it." I said, "Okay, we'll transfer it over to you this afternoon." We hung up. I called the other guy and I said, "Transfer it to Marshall [Space Flight Center, Huntsville, Alabama] this afternoon." We did. And we got things done.

Now, you know, if you tried to do that today, Rocco would've been in jail. I would've been in jail. Our—my Controller would've been in jail. Dick Smith would've been in jail. And their—his Program Control guy would've been in jail, too, because we were moving money around. It wasn't authorized exactly in the right way.

WARD: But by doing that, you kept 300,000 people productively employed and moving on schedule.

MCDIVITT: Oh yeah. And I think that we saved $500 million. I mean—but, see, this—they don't do it like that today. And the relationship between the contractors and NASA was really quite good. I remember after the fire, people were really down in the mouth out at North American. I mean, they were really, really—they really took that to heart. I don't think the people at NASA felt that way. I mean, thought that North American was going to have—but those people were really, really upset. So, we got involved in a baseball game.

Dick [Richard F.] Gordon [Jr.], who was on my backup crew, got that damn thing started. But anyway, the Vice President of Manufacturing for Rockwell—for North American in those days and Dick were always challenging each other to sports. So, finally we decided we were going to have a baseball game. Well, we had nine guys. We had the prime crew, backup crew, and the support crew. I mean, that's a baseball team. And then they had—I thought they could gen up a few guys. And I'd never played baseball in my life!

I'd played softball. And we had a couple of guys who'd played baseball.

Well, anyway, Al [Alan L.] Bean then had a operation on his gall bladder or something. So, we only had eight guys. And so, we got one of the support engineers to fill in for us; and we went out and practiced once, I think at the Harris County Boys Home. I don't know if you know where that is. They had a baseball field out there that looked like a pasture. It had rocks all over it. And so, we went out there and practiced one day; and Al [Alfred M.] Worden was going for a grounder and he bumps off a clump of dirt, hit him in the chin, and it knocked him out! That's how—you know, to get knocked out as a pilot, it's really bad news. Al's not going to fly anymore, so I can tell the story. So, Al got knocked out. "Holy hell! You know, we've got to be careful about this. We'd better not practice much." So, we threw the ball around a little bit; and we didn't have anybody to pitch to us to hit or anything. So, that was our baseball team.

And I went over to see the Vice President of Manufacturing one day at lunchtime, and his secretary says, "Oh, he's out practicing with the team." "Oh, really?" She said, "Yeah, they practice every day from twelve to one." I said, "When do they eat?" "Well, they eat around it." You know, so I said, "Where are they?" "Well, they're out at the Rockwell—at the North American sports field." They had a field. So, I go over there. He's got about 200 guys out there running around! He's got all these ex-Major League pitchers and stuff like that! And so, I said, "Man, this isn't fair!" "Why, yeah, it is fair."

So, anyway, we had this baseball game scheduled at one of the junior colleges. We got a big stadium, had a couple of umpires in black suits and the inflated things. And North American gave us all sweatshirts. Now today we'd go to jail if we took a sweatshirt. But we had a sweatshirt that said, "Spacecraft-103 Flight Crew" or whatever it was. And then they had sweatshirts a little different color. And we went out there and we played a—I think we

ended up playing 7 innings.

They didn't have any lights at the field. But Dick Gordon was our pitcher. He'd pitched for the University of Washington. He pitched the whole game. [Charles "Pete"] Conrad [Jr.] was the catcher. Conrad's arm got so sore after a couple of innings, he was rolling the ball out! They went through—the North American guys went through a couple of Major League—ex-Major League pitchers. Anyway, at the end of 6 innings I think it was, they were only ahead by one run and it was getting dark. I figured we had a better chance in the dark than they did! So, the Vice President of Manufacturing wanted to stop the game. I said, "No, let's play one more inning." And we scored one run. We lost by a run.

But the stands were, like, 5,000 or 6,000 or 7,000 people, who all came out to see us play this baseball game. And they were all North American employees. And they were—and you know, we were all out there as a team of people, working together to do what was the right thing. And you couldn't do that today. I mean, you know, there are too damn many rules. You can't have a cup of coffee, and, you know—so, you know, you guys work for NASA. I don't. But I guess you don't anymore either. But those are the rules.

I think it was a terrible, terrible setback. Terrible setback. I got more done over a cup of coffee or a hamburger, talking to the engineers and stuff, than you could possibly get done in a meeting. I mean, we just—too bad we don't do it like that anymore. I bet you that got you off the page.

WARD: Yeah, it did. It really did! One thing I did want to ask you, it takes you back a ways, but you mentioned that we were going to have the hardware to do 20, 25 Apollo missions as opposed to the 17 we actually flew. Do you think that we could've maintained public and Congressional support for that many flights if we'd kept going with them?

MCDIVITT: I think the news media interest was waning as we got deeper into the program. And could we have done 25 lunar-landing flights? I think we could have. We're doing shuttle flights today, which are a hell of a lot less exciting than landing on the Moon. But still, you know, the enthusiasm for spaceflight in the United States today has waned a lot. And a lot of people don't even know when there's a flight up there, including me sometimes. So, it's—you don't have this "wow!" enthusiasm that we had early on.

I remember on Apollo 14 I think it was, after the fire, Apollo 14's on its way to the Moon; and they're having trouble docking the command module back on the lunar module when the lunar module's still in the S-IVB. They're on translunar flight. And we had live TV of this stuff, and you could see the—I'm sitting down at the Launch Control Center, and you can see the probe come in and bounce around the drogue. And it's coming down a live feed. And I'm looking at the three big channels. There's a golf match on one, there was a baseball game on the other, and there was a soap opera on the other one. And nobody was getting this live feed of us possibly losing an Apollo mission. And when I saw that, I— "Um-hmm, I think the bloom's off the rose!"

But we went ahead and flew—I'm quite sure that was 14. Because 15, 16, 17, you know, we were still doing it. And I think that we could've done it.

WARD: Maybe it's a mistake to equate public interest with public support.

MCDIVITT: Yeah. I think—well, no. I think it's a mistake to equate *press interest* with public support. You know, public interest can be significantly different than press interest. You know, it—the press wants sensationalism. If it's not blowing up or dying or something else like that, it's—sometimes they lose it.

WARD: While we're on the subject of the press, during your tenure as Program Manager NASA made a couple of very significant decisions with regard to media relations. One of which was to allow the reporters in Mission Control with access to the flight director's loop. That went into effect on Apollo 13. And another management decision, and both of these, I think, went all the way to [NASA] Headquarters, was to permit the press to hold in-flight press conferences with crews. What was your reaction to both of those decisions at the time they went?

MCDIVITT: Well, I supported them. I thought that we should never interfere in any way with the flight crews on a lunar-landing mission until they were in the command module transearth flight. And, you know, we didn't do anything up until that time to distract them one iota from it. I even had them, you know, they were a lot of really good scientific ideas going around at NASA.

And I put out a letter to all of NASA Centers, "If you guys can come up with an experiment that has no interface with the spacecraft other than the 28 bolts and you can write the directions on how to use this thing on a simple sheet of paper, we'll carry them, because we have enough extra weight capacity,"—in those days— "we will carry it in a thing. And if the crew gets around to it, they can do the experiment on the way home. But no training involved. None!" Unfortunately, the crews would cheat on me and go train a little bit.

And the same thing applied to the public relations aspect of it. Until they had landed on the Moon and come back off and their mind was clear of all that stuff, and then on the way home, I didn't have any problem with it. And I didn't have any problem with guys listening to the flight controller's loop. I mean, they got it delayed anyway sometimes, and there's no—

I must say, though, that probably the toughest press conference I ever did in my life was when we did the Apollo 13 press conference right after the explosion. And we had made a decision to—you know, they were on a non-free return trajectory. To put them back on a free return trajectory by doing a lunar module burn. I don't think we'd done that yet. But we'd made the decision, so Chris and Sig [Sigurd A.] Sjoberg and I went out and did this press conference. It was right at that time I thought the probability of getting them back was pretty slim. I knew their wives and—I knew their wives and all their kids. And I knew they were watching. And I knew most of their parents. I knew they were watching.

And I thought, "What am I going to say here? I'm not going to say anything that's not the truth, but how do I say this?" I don't know what I said, but apparently it was all right. I didn't get into trouble. But anyway, that was a tough press conference.

WARD: Brian Duff, whom I think you remember at the time—

MCDIVITT: Oh yeah, I remember Brian well.

WARD: —he passed away a few years ago—

MCDIVITT: Did he?

WARD: Yes. Yeah.

MCDIVITT: Oh my God, I didn't know that! Yeah. I used to run into Brian in Washington a lot.

WARD: Yeah. Yeah, Brian died of cancer a year or so ago.

MCDIVITT: Oh my God! That's terrible. You know, he wrote a really great article about mothering the astronauts after their flights. I've got it around here someplace. I don't even know what magazine it was in. But a great, great article. A good guy. I'm sorry. Well, go ahead.

WARD: Well, Brian recalled going to a press conference, and it may've been the one that you were reflecting on, and he said that it was so beneficial in his view that the press had been in the Control Center when this happened, had been listening to the flight director's loop, because he said it allowed one of the participants, and he couldn't remember which one to begin his remarks by saying, "Ladies and gentlemen, you know everything we know. The only thing you don't know is what we're going to do about it. And that's what we're here to tell you." And it, in his view, had a tremendous amount to do with garnering public support at the time.

MCDIVITT: Yeah, yeah. Well, it was an open program. And you know, sometimes the—you didn't want to get the press involved in the decision-making process. You wanted them to know the decision but not the decision-making process, because everybody wasn't always in agreement to start with on what should we do about what you should do. And so, you know, we had to coalesce this thing and then either—one of the flight directors had to make the decision or I had to make the decision, depending on whose bailiwick it fell into. But we had to do that.

I remember one time I had made a decision. It had to do with a hatch. I don't remember what it was. And Rocco [Petrone] said, "I just got a phone call from the White House; and the President wants a memo or something on that." "Oh my God!" You know, it was like two or three in the morning. So, I called my secretary up and said, "Suzie,

you've got to come over here. We've got to put something together for the President, and I don't have the time to do all of this stuff." So, she grumbled and moaned and quit complaining and came over. And I told her generally what the outline was. And she put together a letter, and then I went ahead and corrected it. And in between other things we were doing, we got this letter out to the President. And I don't know what the President was going to do with it, because he sure wasn't going to second-guess me!

You know, speaking of this second-guessing. I don't know if you've talked to Rocco Petrone yet or not, or whether you will. But, you know, Rocco was the toughest—he was the toughest gorilla in the valley! And he just scared the living daylights out of everybody in NASA. And I think that we would've never had an Apollo Program if Rocco hadn't been down at the Cape, got that thing built the way he did, and then—and he had this reputation as being so hard-nosed!

And then he became the Program Director when I became the Apollo Spacecraft Program Manager. And in the three or four years we worked together, he never raised his voice to me one single time. We got along just like this. He used to still terrorize the guys down at the Cape and the guys at Marshall. But he and I got along so wonderfully. And I had so many tough decisions to make, and Rocco never second-guessed me. You know, "What's your decision in this, Jim?" And, "Should we go or should we not go?" And if we were going to go, he endorsed it. And, well, it was a real pleasure working with him. He was a topnotch guy. He was a real bulldog.

When we had an engineering problem, he'd get on the teleconference sometimes, we didn't have videoconferences in those days, and we'd discuss a scratch in the tank for maybe eight hours. And we would go over every aspect that any human being could think of, and then we would do it ten more times. Because he was a great guy to work for. I just wanted

to mention that as we go.

WARD: Yeah. Yeah. When you look back at your own career, what other things that really stand out that you remember most fondly, or that you got the greatest sense of accomplishment from?

MCDIVITT: Well, let me do the military career, because that was—we touched on that a little bit earlier. When I—when the Air Force—when Colonel Peterson I think his name was, threw me off the X-15 Program and then we got on with it anyway. Well, when I went to Washington for the Air Force screening of astronauts, there were, I don't know 100-some guys there probably. And they screened it down to nine people that they submitted to NASA. And out of that nine, they selected four—Borman and White and [Thomas P.] Stafford and myself.

Then when they selected us, they brought us back to Washington and we got a Charm School course. You know, keep your socks pulled up. Be nice to the secretaries. Don't cough in somebody's face. How to use the knives and the spoons are over here. The forks are over here. But anyway, they looked after us, were extremely supportive of us—at the General level. General being, that's a capital G, you know; one star, two star. Very, very supportive of us at that level. And so, we—and they said, "You know, you guys are always part of the Air Force and don't ever forget it. And we're here. And if you need any help, call us," and all that kind of stuff. And so, then we went off to NASA; and I felt that when I went there, that I had 100% support from the Air Force, other than my Colonel.

When I was in Korea, I got promoted quickly from Second Lieutenant to First Lieutenant. And then when I came back, I got promoted very quickly to Captain. So, I was a Captain two or three years before my contemporaries were. And in those days, you

were promoted based upon your time and grade. And so, as I was coming up on my time and grade as a Captain to be eligible for promotion to Major, they changed the rules so that I was—the next promotion I would have been eligible for promotion to Major. And they changed the rules where now it was length of time as a commissioned officer. So, instead of becoming eligible here, based upon when I became a Captain, it had to go back to when I became an officer. And that length of time moved it way out to here [gestures].

So, I was a Captain for a long time. It went—and just as I was leaving Edwards Air Force Base and becoming a NASA astronaut, I would've been—well, a little bit after that, I came up for consideration for a promotion to Major, below the zone. And I'd made all these other things below the zone. And I didn't make it. I thought, "Hmm, that's really odd," because I knew what my officer efficiency reporting for ratings were. They were all as good as you can get. And so, then the next year came up and I didn't get promoted again.

Now Ed White was in the—he went and graduated from West Point when I was commissioned, within a month or two. So, we were in the same group. So, I went up to the Pentagon one time to look at my efficiency ratings to make sure that they were what I thought they were. And I was looking at them, and they were as good as you could get. They couldn't be any better. And so, there was a guy standing there, an officer, and I said, "Could you tell me, do you have any clue as to why I didn't get promoted this last time?" I'd been—I'd probably been a Captain longer than anybody in the below zone thing. And he said, "Well," he looked at it, "wow," you know, "I don't know. But," he says, "why don't you talk to that guy over there? That Colonel right there is the Colonel who was in charge of the Selection Board." I was in civilian clothes, because—being in NASA, I couldn't wear my uniform.

So, I walk over there and I say to him, "You know, Colonel, I was just going through

my records here. And I've been a Captain for quite a long time and I didn't get promoted in the first time below the zone nor the second time below the zone." And then you come up for promotion in the regular zone. And he looks at, "Wow!" you know, "Wow! wow! wow! wow! wow!" He finally gets to the last page, and he looks up and he says—he sees my assignment: Manned Spacecraft Center.

His face clouds over and he said, "What are you?" I said, "I'm a Captain." He says, "Captain, I don't think you have any career in the Air Force. You ought to get out." I said, "What?" He says, "You're undereducated. You don't have any flying experience." He says, "You're not the kind of officer we want." I said, "Thank you, sir," and turned my back and came back.

At the same time, Ed White's father was a retired Major General, and he knew—he just happened to be a friend of the Secretary of the Air Force at the time, whose name I forget. And so, he called on behalf of Ed and said, "You know, what's going on?" And the Secretary said, "Well, you know I can't interfere." He said, "Yeah," he said, "yeah, I know that. But can't you find out what's going on?" So, he called Ed's dad back and said, "You know, there's a whole mass of Air Force officers who are out to drive all these guys out of the Air Force because they think they're traitors."

We were right at the height of the rules and mission. Who was become the dominant player in space, in manned space? And so much so that there was even a time when they were thinking about having Air Force officers fly in Gemini and they were going to fly as copilots and I, as a NASA guy, not as an Air Force, as a NASA guy, would be the commander of this other Air Force guy, who was no different than me but in reality—but was perceived to be different would have to be my subordinate no matter who he was.

So anyway, the—General White called in and said, "You know, the Air Force is out

to get you guys. You, you know, you've pretty much had it." So, I submitted my resignation from the Air Force and into NASA. I had to send it to Deke, and then Deke had to send it to Dr. Gilruth, I guess. And anyway, by the time we got through with all that kind of stuff, it took a while and I was getting close to flying on Gemini IV, and I thought, "Well, you know, this is getting too close. It's going to look like sour grapes if I let this thing go forward." Because by the time it went through the Air Force, it would be like I was resigning two days before I was going to fly on Gemini IV. So, I thought, "Ah, I'll pull the resignation out and I'll submit it after the flight!"

So, I pulled the resignation, and then we go fly our flight. And after the flight President [Lyndon B.] Johnson called us out on the aircraft carrier. And so, we chatted with him. And then when we got back to Houston, we had just landed at Ellington and we'd only been there on the ground for 15 or 20 minutes, when somebody runs out from the operations shack and says, "Hey, the President's on the phone and wants to talk to you two guys." So, we go in there and get on the phone. And he says, "Boys, I would like to have you all come down to the ranch and spend the weekend here." So, we chatted. And he said, "I got to give you a medal, you know. Come on down here. We'll have a good time."

And so, Ed and I looked at each other; and we—by that time, we'd been together so long we could read each other's mind. And I'm thinking, "I think Ed wants to go to the White House. I know I don't." He said, "Well, Mr. President, you know, we'd really like to go to the White House." He said, "Oh, hell man! If you want to go to the White House, yeah, that'd be great. We'll go to the White House! I just thought we'd have a hell of a good time down here." I said, "Well, I got another idea. Why don't you come here and visit us?" I said, "We'll go to the White House if you'll invite us, and you can come here to the Manned Spacecraft Center." I said, "You know, it wasn't just Ed and me that did all this. It

was all of us did it. Come on down here and see all of us." He said, "Goddamn, Jim, that's a great idea! I'm going to do that!"

So, I went out and talked to—I said, "Dr. Gilruth, I just invited the President to come visit us here, and he's going to come." Gilruth almost died on the spot! So, anyway, pretty soon the President comes, you know, a month later, three weeks later, whatever it was—comes down to the Manned Spacecraft Center. And we went and had a little welcoming ceremony. And so, we're all standing around there and he's at this podium. My mom and dad are there. Ed's mom and dad are there. And all the dignitaries.

And he gets all through with the formal stuff, and finally he says, "Jim, come up here." So, I walk—oh, by then I'd made Major. I'd made Major, like, a couple of weeks before the flight. So, I walk up there and he says, "Jim, I've got a surprise for you." He says, "You know, I think you boys are doing a hell of a good job here. And I'm the Commander-in-Chief of this outfit. And," he says, "I decided that I'm going to promote you all. And you're now a Lieutenant Colonel!" He gave me my silver oak leaves, and I was only a Major for a couple of months. I never did get my Major's on my shoulders. He called Ed up, promoted Ed right there. And then he says—I don't remember whether Gus was there or not. He says, "I got one for Gus." Those were the first Presidential promotions.

Well, when that happened, I think the attitude in the Air Force changed. And what it—what really was happening was that the Second Lieutenants, First Lieutenants, and Captains were—they usually thought being an astronaut would be great. I think the Generals did, too. But these middle guys—the Majors, Lieutenant Colonels, and the Colonels—were doing the day-to-day battling over rules and missions. They hated our guts! But I think the President turned that around. And so, ultimately, I ended up becoming a General. So—

WARD: I think all your best answers have come to questions I didn't ask. I'll ask you if you have any more good answers then.

MCDIVITT: Well, let's see. There was one other thing I wanted to talk to you a little bit about. What the heck was it now? Well, let's see. Anyway, I'll tell you what I thought was the best thing and the most fun thing and probably the best decisions that we made—

WARD: Yeah.

MCDIVITT: —when I worked for NASA, that were NASA-related decisions. Probably opening up the hatch on Gemini IV was a damn good decision. Because if we hadn't done that, we would have delayed all the EVA stuff and we might not have found out what we needed to find out early enough to affect us on the later missions. When we were flying Apollo 9 and Rusty got sick, he was supposed to do the EVA. And it was obvious that he couldn't even lie still, let alone do an EVA in the first early days. And so, I had called down and told them that we were going to scrub the EVA, with Rusty at least. And that I—if I thought he was well enough to get in a pressure suit and just stay stationary, that I'd do the EVA. An abbreviated part of it.

And so, we just sort of decided that's what we'd do. And then the next day, when we got around to doing it and I was watching him getting dressed and getting ready, he looked better. And I kept watching him. He looked like he was getting a little bit better. And so, finally I asked him how he felt. He said, "I—"he didn't feel perfect, but he felt a lot better than he had been feeling. And so, I watched him for another while and finally said, "You think you can do that EVA?" And he said, "Yeah, I think I can." I said, "Okay. It's back on. We'll do it." So, I called down and said, "We're going to do the EVA with Rusty." And

I think that was a good decision.

Then every one of the big flights we had, we had a major problem, you know. My first effort as a Program Manager was Apollo 12, when we launched it and then it got struck by lightning twice. Then I had to decide whether it was okay to send it to the Moon or not. And I did. Then 13 was—it was probably the greatest spaceflight anybody has ever flown. And that worked out fine. Then—I think it was 14, we had solder balls flying around and sending "I'm going to shut off"—engine shut off signals to the engine. And in 15 we had a major problem. I don't remember what they were. 16 we had the gimbal thing. And we were able to go forward with all of those except 13.

And the philosophy that I used I think is important. Because I always thought when the guys are on the ground and we hadn't launched anything, we had no investment of risk. So that it would be easy to stop. A little thing could go wrong, we could stop it. The only risk that we would have, we'd have another month on the pad if it was going to take another month, which did increase the risk. So, I was always weighing the risk that we had invested or the risks that we were going to get into, against the gain that we were going to have.

Now if we'd launch and something happened, then I'd have to—if something went wrong, you already had the risk of the launch. So, I would be more aggressive on a individual problem. It'd be the same problem if we were airborne or on the ground. If we were airborne, I would go forward a lot more than I would have on the ground. And if we were at the Moon, where we'd made the risk of getting—taken the risk of getting there, I would be more aggressive in the decisions I made at the Moon than I would be back at the Earth. And if we were separated and were about to do the lunar landing or something like that, I would be more aggressive in the decisions I made there than if we were anyplace on the way.

So, I always based my decisions on how much risk that we had already invested in the mission up to that point. So that, towards the end, I got pretty aggressive in going forward. And it turned out, fortunately, I was right. I remember after Apollo 16, when I decided that we should go on and land on the Moon, I came home. I had already announced that I wasn't going to be the Program Manager anymore. I came home and my wife said, "Why did you ever do that?" She said, "You could've brought them home and had a successful career. Now you've got your neck stuck out as far as it goes." But we'd already made that risk, and it turned out it was a good decision. [Recorder turned off.]

WARD: Jim, a lot of credit has been given to the technical success of Apollo. But the management of Apollo may have been an even greater success story. Let's talk a little bit about how you managed that program during your stint as Program Manager. And in particular, how did you make the transition from becoming an astronaut to becoming a Program Manager?

MCDIVITT: Yeah. Let's talk about the management structure first. The Mercury Program was done as a Project. There was a Project Office and everybody who worked on Mercury was in that Office. It was just a—it was a small program really by today's standards. And so, they all worked together.

Gemini, we had exactly the same thing. We had the Gemini Project Office, I think it was called, and all the people who worked on Gemini were there. It wasn't a very complex thing, but they were all there. We had a rocket guy. Of course that was different. We sort of got that thing from the Air Force by way of Martin. But all these people had a boss that was in the program. So if you were down here in the program, you worked for a guy who was in the Program Office, and he worked for a guy in the Program Office, he worked for a guy in

the Program Office, and finally got to the Program Manager. So, everybody was sort of a self-contained thing.

When we got into Apollo, it was so gigantic that we would have had half the world in the Program Office, and there was really no way to manage anything like that. And a guy named Jim Elks, I believe, came into NASA from someplace, I have no idea where, and he put in the matrix management system and really a different concept on how to manage things. And so, we had an Apollo Program Office that wasn't really any different in size than the Gemini Program Office; but we "matrixed" with all the people.

And so that, almost the entire Engineering and Development Directorate at the Manned Spacecraft Center worked on Apollo. But they reported—they were broken down into small groups; like maybe the reaction, the attitude control rockets. The guys who did that, who looked after that little rocket, were in Engineering and Development. And when that sort of came together at a little higher level, we had a guy in the Program Office who sort of supervised that group of people in Engineering and Development. The people in there reported or worked for Max Faget. But their product was my product. And it came to me through a group of Subsystem Managers, then it went to a System Manager, who then went to the Program Manager. And so, at one time I think we had 600,000 people working on the program, counting all the contractors and things like that. To make that manageable, of course, we had to have a number of layers of management.

And so, within NASA we had this matrix management system. And for me, from the top, I had a Deputy Program Manager for Experiments, I did that job myself quite a lot, I had a Deputy Program Manager for the Lunar Module, a Deputy Program Manager for the Command Module, and then I had a Systems Engineering Office. And in the Systems Engineering Office people provided technical assistant across these Program Offices. But in

each Program Office—the Command Module Program Office under its Deputy Program Manager—we had Systems Managers. And they dealt then with contractors, under a loose system, or the people in NASA who looked after it. Some of them weren't even at the Manned Spacecraft Center.

And so, we had this very complicated management system. But I had only a few direct reports that I had to worry about. I had Aaron Cohen as the Command Module Program, Deputy Program Manager; Owen Morris as the Lunar Module; and anything that needed to be done within those programs, they were responsible for. And so, I had complete faith in what they did. Then I had this technical assistance over here, and I had some administrative assistance over here. A very simple thing for me to manage.

Now there was a limited authority that they had, where they could do things by themselves. They could make recommendations; but the limited authority was such that they couldn't authorize anything over $10,000. They couldn't authorize anything which changed the weight of the vehicles. And they couldn't authorize anything that changed the schedule.

We took those kinds of things to an organization we called the Configuration Change Board or Configuration Control Board, which met every Friday afternoon at 1:00. Sometimes it went to Saturday morning at 1:00. Sometimes it went to 8:00 in the morning, and sometimes it was through in just a few hours. But every change that changed the schedule, changed the weight, or changed anything over $10,000 came through the Change Board. And at that Change Board we had a representative from North American; we had a representative from Grumman; and we had a representative from every major organization at the Manned Spacecraft Center.

Safety, Engineering and Development, Flight Crew Operations, Flight Operations, Safety, all those people. And they sat on the Board. And we'd bring up an issue and we'd

discuss it, and everybody would get their chance to say what they thought, and usually it was a divided opinion. And then I had the opportunity to make the decision, "Yes, we would do it," or "We wouldn't," "Yes, we would," or "No, we wouldn't."

And one of the innovations that I finally had to put in was that we had a long table with all the members of the Board there, and we had a—sort of a gallery in the back. A lot of people in the gallery were very emotionally involved in these decisions, and they would get involved in the discussion. And finally I had them paint a white line across the room. And if you were on that side of the line, you couldn't talk. If you were on this side of the line, you could talk. And the other innovative thing that I finally had to do was that whenever these Changes came up, we always said who was recommending it but they never said who was opposed to it. So, we had them add that to it; and then we just argued through these things until we got support.

And when we got to a conclusion, we got the support that we always needed. Just an aside: I think a fellow whose name was Wes Hjornevik went to HUD [Housing and Urban Development] when the President decided he ought to have some of our great NASA managers there. He went there and he found that he had something similar to that. When they'd make the decision, he couldn't find anybody to implement it. Even the guy who wanted to make the change wouldn't do it! And the next day, everybody was arguing about what the decision was! I think Wes had a heart attack and left the HUD very quickly. But that was the key to the thing.

We had—everybody got the chance to speak their piece. And when the decision was made, everybody got behind it. And I think that's what separated NASA, at least the Apollo Program, from all the other stuff. That it was unique in that everybody supported it. And we had some tough, knockdown, drag-out fights in there.

WARD: Would it be correct to say that the Change Board was a mechanism that allowed the Program Manager to assure that important details didn't slip by unnoticed, but that the Program at the same time didn't get bogged down by things that were less important?

MCDIVITT: Absolutely. The Deputy Program Managers took care of every detail. They were very—Owen Morris and Aaron Cohen are detail nuts. And they took care of all that little stuff. I had total confidence in them that nothing would slip by. But at the same token, I just couldn't release the program to everybody making changes that weren't coordinated. So, we had this other super board that took care of the meatier things. And I always had confidence that everything was there.

Now you asked another question about, how did I get to be—how did I make that transition from astronaut to Program Manager.

WARD: Yeah.

MCDIVITT: Well, I've always been interested in business; and when I first got assigned to NASA I was busy just learning what space was. But then when I got assigned to the Gemini flight crew, I used to go up to all the program reviews at McDonnell. This wasn't an astronaut job. I'd go up there and sit in on the discussions, review the contracts, see what the schedules were, how they were changing. Sit in on a lot of the manufacturing scheduling stuff. And even worked with them when they did the first incentive contract. We had a great, big three-dimensional model of performance versus dollars versus schedule. And so, I spent a lot of time doing that.

Then when I took over my—the astronaut job of looking after Apollo, I spent a tremendous amount of time working with the contractors and working with the Program

Office, trying to make schedules and do a lot of this other stuff. So, I was spending all my spare time—all my spare working time—working sort of in the Program Office.

I even got to the point where we were having difficulty one time getting a clock, a digital clock, that would do what I thought the astronauts needed; and so, I talked to Joe Shea about, "Why don't I go design the clock and get the thing all approved and everything?" And "Be my guest." So, I went up to someplace in Boston [Massachusetts] with the guys where there were clockmakers and figured out, you know, how we could get two or three more digits on this rotating clock, and came back and negotiated price with them. Came back and told the program control guys what the price was and what we wanted—needed to do, and told them what the specs were. And we got it done.

So, I spent a lot of time doing program control, program management, the financial aspects of it, the scheduling part, and even some of the manufacturing parts.

WARD: So, if I understand you correctly, what you're really saying is that being an astronaut doesn't automatically qualify you to be a manager.

MCDIVITT: No.

WARD: You have to—you've got to train yourself and have the instincts that would lead you in that direction.

MCDIVITT: Yeah. A lot of my astronaut buddies were—have been criticized for not doing well in business. And you've got to remember that we were picked as pilots, not as businessmen. And sometimes you can be good at one and not at the other. And the same thing goes along with program management. You know, you can be a good pilot and not

necessarily be a good Program Manager.

WARD: …Jim, one of the things that managers face is that you have to make a lot of decisions. And you have to have a lot of confidence in your decision-making ability. How did you handle that? And how did you keep from having your—the decisions you made second-guessed and turned around?

MCDIVITT: Well, I think one of the things that made NASA so successful back in the '60s, early '70s was the fact that I think we all knew where the buck stopped and which part of the buck that you owned. And I think that there's a lot to be learned from those old days.

Because when I made a decision that had to do with a spacecraft and its hardware, I had a boss. The Program Director. He never second-guessed me. He had a boss. The Associate Administrator for Manned Spaceflight and the NASA Administrator. They never second-guessed him. And I think that there was no way that we could have ever done the things that we did, in real time, with somebody making a decision and then as it came—as you made the decision, somebody getting you to justify it and review it. And then somebody above them asking to do the same thing. It just wouldn't work.

One of the things that I learned when we were flying was that there's this thing called real-time engineering. And when you're on to launch, it's ten minutes and then you're there. And then you do the translunar, and it's three days until we get there. Or if you're in lunar orbit, it's an hour in the front and an hour in back. And you've got to make those decisions within those timeframes.

In fact, I remember a lot of times we had 2 hours and 31 minutes to make this decision, you know. And at that time, you've got to make the decision. And you need as much data as you can. So, when you got to 2 hours and 20 minutes, somebody had to make

the decision. And if it was my decision to make, I made it. And fortunately, my bosses were such that they never second-guessed what I did. They just said, "Okay. That's the decision. That's what we're going to do." And I think you have to be very, very careful that you don't get yourself into things like the *Challenger* accident, where everybody's second-guessing every damn decision that anybody made along the line.

It's easy to go back and say, "Oh yeah," you know, "If I'd have done that, I'd have done it this way." There are going to be losses in this business, and you've got to give the guys who are making the decision the support they need.

WARD: Yeah. Of course, you also have to have a pretty good batting average on those decisions to keep having people trust you. So—

MCDIVITT: Oh yeah. And having even batted once. But things go wrong in space that you don't know anything about.

WARD: Yeah. Do you think there's an intuitive aspect to decision-making? That good decision-makers are the ones who trust their intuition, but who have pretty good—

MCDIVITT: No, I don't think so. I don't think this is an intuition thing. I think we did all of our decision-making on the best engineering facts we could get. So, sometimes we couldn't get as good as you wanted. And then maybe you had to apply a little intuition there. But you had to get as much as you could.

For instance, when we had the oscillating actuator. The only thing we could do was pick up quickly two or three tests that we could ask the guy in the spacecraft to do, and then he was back behind the Moon again. Then we had to do something on the ground to see if

we could replicate that. And then if we could, take a quick look; and when he came around the lunar edge again, then we'd look for five minutes. Then we had 30 minutes or so to think about it. And then once we made that decision, that was it. But we couldn't keep doing these tests. Now, if we'd had three days to do the test, I'm sure we could have figured it out to a higher degree of confidence than what we had done. But at least we were lucky enough to figure out the right answer.

WARD: Okay.

[End of Interview]