

U.S. AIR FORCE ORAL HISTORY INTERVIEW

BRIG GEN JAMES A. McDIVITT

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BRIG GEN JAMES A. McDIVITT

UNITED STATES AIR FORCE  
HISTORICAL RESEARCH AGENCY

OFFICE OF AIR FORCE HISTORY  
HEADQUARTERS USAF

Maxwell Air Force Base, Alabama

01105309

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INTERVIEW  
OF  
BRIGADIER GENERAL JAMES A. McDIVITT

Conducted  
by  
Dr. James C. Hasdorff

Date: 16-17 April 1987  
Location: Anaheim, California

Transcribed and Edited by Peggy Brown

01105309

## FOREWORD

One of the oldest and oft-used sources for reconstructing the past is the personal recollections of the individuals who were involved. While of great value, memoirs and oral interviews are primary source documents rather than finished history. The following pages are the personal remembrances of the interviewee and not the official opinion of the United States Air Force Historical Program or of the Department of the Air Force. The Air Force has not verified the statements contained herein and does not assume any responsibility for their accuracy.

These pages are a transcript of an oral interview recorded on magnetic tape. Editorial notes and additions made by United States Air Force historians have been enclosed in brackets. When feasible, first names, ranks, or titles have been provided. Only minor changes for the sake of clarity were made before the transcript was returned to the interviewee for final editing and approval. Readers must therefore remember that this is a transcript of the spoken, rather than the written, word.

KNOW ALL MEN BY THESE PRESENTS:

That I, Brigadier General James A. McDivitt, USAF, Retired,  
have on (date) 17 April 1987, participated in an  
oral-magnetic-taped interview with

Dr. James C. Hasdorff

covering my best recollections of events and experiences which may  
be of historical significance to the United States Air Force.

I understand that the tape(s) and the transcribed manuscript  
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James A. McDivitt  
4/17/87  
James C. Hasdorff  
17 April 1987

BIOGRAPHY  
OF  
BRIGADIER GENERAL JAMES A. McDIVITT

Brigadier General James A. McDivitt was born on 10 June 1929 in Chicago, Illinois. He graduated from Central High School in Kalamazoo, Michigan, and received his bachelor of science degree in aeronautical engineering from the University of Michigan in 1959. He entered the Air Force as an aviation cadet in January 1951, received his pilot wings and commission as second lieutenant in May 1952 at Williams AFB, Arizona, and completed combat crew training in November 1952.

He then went to Korea where he flew 145 combat missions in F-80 and F-86 aircraft with the 35th Bombardment Squadron during the Korean War. He returned to the United States in September 1953 and served as pilot and assistant operations officer with the 19th Fighter Interceptor Squadron at Dow AFB, Maine. In November 1954 General McDivitt entered advanced flying school at Tyndall AFB, Florida, and in July 1955 went to McGuire AFB, New Jersey, where he served as pilot, operations officer, and later as flight commander with the 332d Fighter Interceptor Squadron. He returned to school in June 1957 at the University of Michigan under the Air Force Institute of Technology program and received his bachelor of science degree.

General McDivitt went to Edwards AFB, California, as a student test pilot in June 1959. He remained there with the Air Force Flight Test Center as an experimental flight test pilot, completed the USAF Aerospace Research Pilot School, and joined the Manned Spacecraft Operations Branch in July 1962. He has logged over 4,500 hours flying time, over 3,500 hours in jet aircraft.

General McDivitt was selected as an astronaut by NASA in September 1962. He was command pilot for Gemini IV, a 66-orbit, 4-day mission in June 1965. Highlights of the mission included opening of the spacecraft cabin doors, an extravehicular activity period performed by pilot Ed White, and the completion of 12 scientific and medical experiments.

During March 1969 he was also commander of Apollo 9, an earth orbital mission, which was the first demonstration of the entire set of Apollo flight hardware. The highlights of this mission include the first flight of the lunar module (LM), the first rendezvous between the LM and the command and service module (CSM), and first joint operation of two manned spacecraft in flight, and an extravehicular activity period.

In June 1969 he left the Astronaut Office and became Manager for Lunar Landing Operations in the Apollo Spacecraft Program Office. In this position he was responsible for planning the lunar landing missions subsequent to the first landing and redesigning the Apollo spacecraft to extend their lunar exploration capability.

In September 1969 he became Manager, Apollo Spacecraft Program, with overall responsibility for the entire Apollo Spacecraft Program. General McDivitt retired in September 1972.

General McDivitt is married to the former Patricia A. Haas of Cleveland, Ohio. They have four children: Michael A.; Ann L.; Patrick W.; and Kathleen M.



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Taped Interview with Brig Gen James A. McDivitt  
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H: To begin the interview, General McDivitt, I would like to ask you a little bit about your family. What profession was your father in?

M: My dad spent a good part of his life as an administrative worker for the Railway Express Company up until about 1939 or 1940. I was in the fifth grade, I remember, when we moved from Chicago to a small town in Berlin, Wisconsin. At that time because his job had been--by the way, within Chicago we went up there and he was a truck driver and delivered packages for the Railway Express Company. When the Second World War started, he went back to Chicago and tried to get in the technical end of the business. He was only a high school graduate, but he had spent a lot of time with correspondence courses and things like that. He used to repair radios to earn a little extra money in the Depression and went through two or three jobs early on in the war and finally ended up with Ingersoll Company building amphibious tanks in Kalamazoo, Michigan. He did the electrical design and things like that. During the war they weren't so special about whether he had a degree or not. Mostly they wanted to know if you could produce. So he ended up there. When the war was over he moved over to Consumers Power Company in Jackson, Michigan, as an acting engineer without a degree. So he spent from 1947 until he retired in 1975 or so working as an engineer in the utility company. Maybe he retired a little early. I think it was in 1970 or so. Anyway, he worked as an engineer most of the time that I knew him.

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H: Do you kind of consider yourself a migrant farm worker being in all these places?

M: (laughter) No. As a matter of fact, I was born in Chicago. Like I said, I left in the fifth grade and moved back at the end of the seventh grade to Chicago from Berlin. Did my eighth and ninth grades in Chicago. Then I went to Kalamazoo for my 10th, 11th, and 12th grades. I worked a year after I got out of high school because I didn't have enough money to go to college. In the meantime my father moved to Jackson and my mother did, too. So when it was time to go back to school and I had a little money, I went over there to live with them since I still didn't have enough money to pay for dorm and stuff. I went to Jackson Community College.

H: Where is this at?

M: In Jackson, Michigan. I spent 2 years there. Although I had a scholarship to Michigan State University, I'd run out of money again, so I went back to work for the Dow Chemical Company in Midland, Michigan. As a matter of fact, the day I started there was the day the Korean War started, and that's sort of how I got into the Air Force.

H: How large a family do you come from?

M: I had one sister. She was 7 years younger than me. So it was my father, my mother, and the two of us. My dad had one sister, and my mother had three sisters and four brothers that I knew who were still alive. So she came from a large family, my dad from a small one.

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H: What did your sister wind up doing? A housewife?

M: Well, she went through nurse's training and became a registered nurse and then married a dentist and was a housewife. They were subsequently divorced, and he's dead now, so she's a widow and lives in Chicago. She has four children.

H: Was there any particular reason why you aimed toward an aeronautical engineering degree?

M: Well, I was already in the Air Force when I went back to school. I probably ought to tell you how I got into the Air Force and that probably would lead more to that. Like I said, when I went to work for the Dow Chemical Company, the Korean War started that day. Quite frankly, I'd never even heard of Korea. I figured North Korea had to be pretty small. It was only half of Korea. I figured the war would be over within a couple of weeks. Well, it turned out it wasn't. That was in 1950 and I was 21 years old, ripe for the draft. I had registered 2 or 3 years earlier. One day my dad called me and said I had this letter from the Government. I said, "Open it up." He opened it up and read it to me. It said something like my draft board loved me and that I ought to go take my physical for the Army. Well, I thought, my God, they're really serious about this. I like to hunt. I like to fish. I like to camp out. I like to hike in the woods. So I thought being in the Infantry would probably be a pretty good idea. Little did I know what that meant. (laughter) Anyway, after I thought about that and told other people, everybody was interested in me doing something different. My mother thought I ought to get in the Navy because they had a nice place to sleep and good



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meals and wore those nice white uniforms. I worked with a guy who had been a bombardier during the Second World War, and he thought I ought to get in the Air Force. Everybody was advising me. Everybody thought I ought to be an officer. Most people suggested that. What really made up my mind, I guess, was that I used to read prolifically. When I was small, well from about the time I was in the fourth or fifth grade, I used to read an awful lot. I read a lot about flying, just about every book that had been written about flying, I think. So I thought flying would be a lot of fun. I'd never been in an airplane. So I thought, maybe I ought to see what I could do about getting into flying. Well, the time was moving on while I was going through all this. I talked to a bunch of recruiters, Army, Navy, Air Force recruiters. It looked like if I took my physical for the draft I'd no longer be eligible to join the Air Force because things would have progressed too far, and once you took your physical, you couldn't.

I sort of resigned myself to going into the Army as an enlisted man when I woke up in the middle of the night, just out of a dead sleep, and I'd remembered reading in the paper a couple days earlier that people from Midland where I worked during the week were going to take their physicals on a certain date, and the ones in Jackson where I was registered for the draft and where I got my notice were going to take theirs the following day. I also remembered that I'd read someplace that you could shift from where you registered to where you lived for your physical. You couldn't from a draft selection standpoint, but you could from your physical. I woke up in the middle of the night, just like a bolt came to me. I never even thought about this before. I said, "Well, gee whiz." It was early in the

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morning of the day when the people from Midland were going to take their physicals. I waited until about 10 o'clock in the morning when I knew that they had already left, and I went down and told the people there in Midland that I'd like to shift my physical from Jackson to Midland, and they agreed and said I could do that, but they said, "Gee, it's too bad. You know, our boys just left today. It won't be for another month before we have another physical." I said, "Gee, that was too bad." Anyway, what it did is it brought me a month delay in getting my draft physical.

In the meantime, I went down and applied for the aviation cadet training. Fortunately, the day I applied they were having a pre-interview board, and I went and met the board, took some tests and all those things. Then I went back and took my physical and went to final board all in a period of about 2 weeks. So at the end of that I was accepted for aviation cadet training before I got into the Army. Anyway, that's how I got into the Air Force. Since I was in the Air Force, then I'd been through Korea and things, and so I ended up going to school and became an aeronautical engineer.

H: You didn't have any college at the time?

M: I had 2 years of junior college.

H: When you went in?

M: When I went in, right. I'd gone through 2 years of junior college, and I was working in a research lab for the Dow Chemical Company in metallurgical research in magnesium as a lab technician. I figured I could work there a year or two

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and get enough money to go back to college. It would have been a tough thing to do to save up that much money. It turned out the Korean War, for me at least, was the best thing that could have ever happened. (laughter) It changed my whole life.

H: Did you enjoy that kind of work at Dow?

M: Yes, I did. I like working in the technical areas. It was a lot of fun. It was what I had studied in school. It was a lot of physics and testing of different kinds of magnesium materials to see what their strength was under different circumstances. I enjoyed that. I don't think I would have gone and made a career of it, but at that time in my life it was a lot of fun.

H: Do you think that put you in good stead later when you did get into the testing business?

M: No. I think it was too basic. It was too low a level. After I went and got my aeronautical engineering degree and then went into flight testing, it was really a lot different level. I skipped one thing.

When I was over in Korea, we had a squadron commander named Bob Scott [Col David R.], who was a lieutenant colonel, who could really fly very well. He had gotten into the Air Force through the aviation cadet program also and had gone back to school in the Air Force Institute of Technology program and then had become a test pilot. We were talking one time and he suggested that might be something I'd like to think about doing, so I did. When I finally applied to go back to school, after I decided I wanted to stay in the



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Air Force instead of getting out, I went to school, got my degree, and then went to test pilot school. He was sort of influential in me doing that.

H: Let's talk about your flying training before we get into these things. Where did you take your training?

M: First of all, when I got accepted for aviation cadet training, I got a deferment from the draft for 3 or 4 months. At the end of that period of time, I still hadn't been selected for an aviation cadet program because everybody was trying to get in the Air Force in those days. I got this great, big, long telegram from the Air Force that said my deferment was expiring and I was again eligible for the draft. I could do one of two things. I could either take my chances with the draft, so if I got drafted I'd go in the Army as an enlisted man, or if I wanted to I could join the Air Force as an enlisted man, that I would just be put in in sort of a waiting status, waiting for my aviation cadet training to start. That was really what I wanted to do, so I went ahead and joined the Air Force as a private. I went through Lackland AFB [TX] for about 3 weeks to learn how to march and a few other things and was issued most of my uniforms and things. It was absolute chaos down there then. They had the trainees living in tents. They'd wake us up in the middle of the night. We'd stand in line for 4 hours, and they would issue us our dog tag chains. Then we'd go back to bed. One night I stood up all night long to get my field jacket hood, except I didn't have a field jacket. All I had was this little piece of cloth that it was supposed to button on, but I didn't have a field jacket. (laughter) Anyway, it was really pretty chaotic.

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Finally, after about 3 weeks, a group of about 50 or 60 of us who were in the same situation that I was--while we were enlisted men but we were going to wait for our aviation cadet training. When we got in, they said we wouldn't be sent to any schools, we'd just be put in an OJT, on-the-job training status. Anyway, they gathered us all together, put us on a couple of buses, and shipped us up to Connally AFB [TX], which was one of the basic training schools in those days. We were assigned to a maintenance squadron, and we worked out on a flight line, gassing and changing tires on T-6s and putting oil into them. A few of the guys learned how to start them. I never learned how to start them. I still hadn't been on an airplane by this time.

During the time I was at Waco, Connally AFB, I finally got my first ride. It was in the back end of the B-25. I just went down to base operations and asked if they had an airplane that was going to fly that I could ride in. They said, "Yes." My first ride was a flight from Connally AFB to a little gravel strip, I don't even remember the name of it now, down to Randolph AFB [TX] to pick up a bass fiddle for the base band, and back to Connally AFB. It was in the back end; it was the noisiest thing I've ever heard in my life. (laughter) Anyway, we spent a few months there in the maintenance squadron. Then I was given my notification that I had been selected for class which was going to be starting at Connally AFB. So I went through my preflight there. We were in the last class that was to go through pilot training at Connally. It was going to be switched over to navigator's training. They started our preflight class with, as I recall, about 200 aviation cadets. About 70 of them were supposed to stay at Connally, and 130 went to Moultrie Airfield [SC] which was an old World War II

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training base that was going to be converted to pilot training. After a month of preflight there at Connally, I elected to go to Moultrie, so I went down there and did my basic pilot training there.

I think probably the most interesting part of the whole thing was my introduction into the aviation cadet training. The street that I lived on had the maintenance barracks on one side of the street, and preflight barracks for aviation cadet training were on the other side of the street, and the street was closed. The aviation cadets used to come out and march up and down the street with upperclassmen harassing them. We used to sit out on the front porch and harass all of them, saying nasty things to them. Of course, we didn't exactly endear ourselves to the aviation cadets, either the underclassmen, the preflight guys, or the upperclassmen. So when we got our orders to report to Connally, we almost all died because we were hoping to go someplace else. We were supposed to report between 8 and 5 o'clock, and we didn't want to get over any too early, so we just sat around and waited until it got to be about a quarter to 5. There were about 10 or 15 of us that were assigned to that class. We finally loaded up our duffel bags and started carrying them across the street, started carrying them out to the front. These aviation cadets came over and said, "May we help you with your bags?" We said, "Oh, yes, you guys are really being nice." They got hold of our bags and carried them out until they got to the street which was aviation cadet territory, and they dropped them on the ground, put us in a brace, chewed our ass unmercifully. We picked those bags up, and they marched us across the street and stood us in front of a pole. Each one of us got a pole in the barracks. We stood there at attention while they chewed on us for

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hours. They sort of caught up with all the harassing that we were giving them. (laughter) Anyway, I went through preflight there, and I went through basic pilot training at Moultrie, Georgia.

H: Backing up a moment, were you at Lackland when they had that terrible winter there?

M: I was at Lackland when it snowed, and the guys were out in the tents. They had snow all over the parade grounds, and a lot of the guys had pneumonia. It was the winter of 1950-1951. I joined the Air Force on January 10th or 11th in 1951. That was really cold.

H: They had a Congressional investigation of that.

M: Right. Matter of fact I was down there. We used to get the world's worst food, and we had this bunch of Congressmen coming along one day, and all of a sudden we had turkey. Oh my God, this is really great! Unfortunately, they never got it cooked enough to really be cooked. We had a different menu that day. But we really had a lot of guys that were sick because they just weren't equipped to handle the tremendous influx of new guys that came in. If you were there for 3 or 4 days, you were sort of an old head. I remember going through there, and the guy was trying to do blood type. He had been in the Air Force about 3 or 4 days longer than me. He had this needle. He was trying to find a vein. He stuck the needle in my arm and then wiggled it back and forth. He never could find--I had this lump about the size of a quarter and about three-quarters of an inch high. I don't know what they called it, hematoma or something. Finally when they got my blood type done, it was

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wrong. I wore a dog tag with the wrong blood type on it for about 2 months or 3 months.

H: Thank heavens, you didn't need a transfusion.

M: That's right. (laughter) Those were pretty rugged days, but they were fun to look back on at least.

H: You say you went to Moultrie, Georgia, then.

M: We went to Moultrie, Georgia. We were the first class in there. It had been a pilot training base during the Second World War. Then they had shut it down. They had used the barracks as chicken coops. They raised chickens there. This was in Georgia, and it was in the summertime. We had two barracks for our class. They cleaned those two barracks and washed them up as best they could. They had 2 by 4s on the inside, didn't have any walls, no plasterboard, wood floors, pretty primitive, but what was really bad was the smell of all the chicken crap in there. It had accumulated over the previous 4 or 5 years. Now they had scrubbed it all out, but they couldn't get rid of the smell, and it was so humid down there. Finally after about 5 or 6 months there, they had a lot of sand and tracking sand back and forth on the floor, we sort of ground it out. We were the first class there. When the second class came, they had two more barracks cleaned up, so we finally got eight barracks that we used for the guys. It was a lot of fun. We had a great bunch of instructors. They were all civilian instructors. Most of them had flown some way in the Second World War. The instructor I had that checked me out had made something like 120 crossings in the Atlantic, ferrying B-17s to Europe during the war. He had a lot of experience.



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I don't even remember his name though right now. Anyway, we started out flying T-6s there. I soloed after I had 18 hours and 10 minutes in them and went on and completed my basic pilot training there and went to Williams AFB [AZ] where I started into jets.

H: Did you have any problems with flying training at all?

M: No. I just took to flying like a duck to water. Like I said, I'd never even been in an airplane until I got my B-25 ride. As a matter of fact, that was the only ride I ever had in an airplane by the time I got assigned into an aviation cadet class. So my first ride in a T-6 at Moultrie was the first time at the controls of an airplane. It just came naturally to me. I checked out very quickly. I soloed very quickly. I was the first guy in our class to go down and take his 40-hour check which was the big thing getting through basic pilot training. I learned how to fly instruments very easily. It just came to me very quickly.

H: You had good rapport with your instructors then.

M: Most of them, yes. As more and more cadets came in, they took all of our instructors and split them in half when the second class got there. Then when the third class got there, they split these up again. When the fourth class got there, they split them up again. So the instructor that checked me out, who was really a very, very good instructor, became the flight commander for the next class. Then I got another instructor, whose name was T. Cossart. We used to call him "Silent T," because he never said a word. You could fly with him a week and he'd never say you were good, bad, or indifferent. Fortunately, I guess, I picked it up

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instinctively. He'd say a few words like "Push the rudder in." (laughter) "Do a chandelle," which is a climbing left-hand turn, or something like that, but he was very uncommunicative. But we all managed to learn.

H: Then you say you went to Williams?

M: Right. I went to Williams AFB.

H: This was with the idea in mind of getting into jets?

M: Right. At that time I think Williams was probably the only jet fighter base. They were opening up another one. I don't remember if it opened up a class ahead of ours, our class, or a class behind ours. But the real place to go for fighters was Williams, and that's where I wanted to go. I don't know why. I guess I read more flying stories about fighter pilots than I did about bomber pilots. Anyway I went to Williams. Everybody said, "Oh, that's going to be a lot tougher," but I went there anyway. I really enjoyed it. I had a great time there.

H: F-80s?

M: Yes. The program was split in half. What it was supposed to be was T-6s in basic, and then when you got to advanced, you flew T-28s, and then you flew F-80s. The T-28s were losing their propellers, or there was something wrong with the engine, I've forgotten which. So when we got to Williams, they grounded all the T-28s, and they gathered up all of the old, old T-6s that they could find. They weren't near as good as the ones we had in basic pilot training. We did our next increment of flying in those things instead of

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the T-28s. We learned how to fly formation and more instruments. Then again I took to formation very well too. I guess it just came instinctively to me. I rode on my checkout in T-6s there.

We were out at a little auxiliary field called Rittenhouse, I think. I was just sitting around. I had an instructor, but he was checking the other guys out. We were out there maybe the third or fourth day, and I still hadn't had a ride. But during that period of time I had watched to see what the style of flying was at Williams. It wasn't anything like it had been in basic pilot training. In basic pilot training we did them in sort of low bank angles and very gradually. At Williams it was steep bank angles and jerk on the stick, just throw the airplane around. I figured that out; I wasn't stupid. (laughter) A guy named O'Hara, who was a flight commander of another flight, walked into the tent one day and said, "Is there anyone in here who hasn't been checked out yet?" Well, there wasn't anybody in there except me and about three or four other guys. The other two or three guys said, "We are in the process of getting checked out." So finally I cautiously put up my hand because I wasn't really interested in riding with a flight commander. He said, "Okay, come on. I'll check you out." So I said, "Oh, great," because I'd heard that he was really a tough guy. I told him my name was McDivitt, and he told me his name was O'Hara. He said, "We've got to get along okay." We got in the airplane. Normally it took a minimum of two flights. Some of our guys never did get checked out although they had over 130 hours on board. They washed them out right then. I knew by then that a couple of guys were having difficulties getting checked out, so I thought, "My God, I'd better do some good flying," so I took



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off. Whenever we did anything, I just jerked that airplane all over the sky just like I'd never done it before in my life, but I figured that was the time to start. Anyway, things seemed to be going pretty well. We came in and shot two or three landings. I remember the last landing we came in I bounced terribly. The thing went way up in the air, the nose high, the wing high, terrible bank. I thought, "Oh my God, we all are going to get killed." I remember pushing the rudder all the way to the stops and the stick all the way over to the side, and the thing came down and landed straight point. I remember O'Hara saying, "Goddamn it, if you can recover from that you can recover from anything." He said, "You're checked out." So I was the only guy in our class that got checked out in one ride. I guess all the jerking and yanking paid off. (laughter)

H: How long were you at Williams then?

M: I was there for 6 months. I got into pilot training I think in about April, and about May I went to Moultrie, and 6 months later I went to Williams. Then I graduated on 10 May or 12 May from pilot training, got my wings and my commission.

H: Did you have any classmates that later wound up with any distinction?

M: Well, almost my entire class went to Korea. We were all young guys, all second lieutenants. As a matter of fact, I'm going to my class reunion on 2 May. I'm going to be the speaker there. We've had two previous ones, one last year and one the year before that. I was supposed to be the speaker at the first one and I couldn't make it right at the

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last minute, and last year I couldn't make it again although I'd planned on going. This year I'm going to go. The hell with business, I'm going to go to the thing. A few guys made general. Most of the guys didn't stay in because we all sort of got in as--we were all aviation cadets. In our class there were no student officers. There were no OCS guys, no West Pointers. They were all just aviation cadets. When we graduated from pilot training, in fighters there were two of us that got Regular commissions. A guy named Chappie McDonald and myself. I think there might have been a couple from the bomber guys.

H: How did you manage to do that?

M: Well, there were a number of us who were selected to be interviewed by the Regular board. We flew up to Perrin AFB [TX], I think it was, and met a board of officers, about five or six officers. There must have been about 100 of us that went in and were interviewed. Out of that they picked the two of us and I think a couple of other guys from the multi-engine schools. So I ended up with a Regular commission.

H: You knew at that point you wanted to make it a career?

M: No, I didn't. I didn't have the faintest idea. I thought I just got in to win the Korean War. (laughter) As a matter of fact, when I came home from Korea, I thought, "Gee, I only got in here for a couple of years. I'll go ahead and get out now because the war is over. I won it." Fortunately, I was smart enough to not turn in my resignation myself. There were six of us that came from

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Korea back into this squadron. Three of them were Regular officers, and three of them were Reserve officers.

(End Tape 1, Side 1)

Of the three of us that had Regular commissions, the other two decided that they would turn in their resignations and get out because they had gotten in to win the war the same way I had, and since we won it they were going to leave. So they did that, and both of their resignations were turned down. I was smart enough then to figure out I shouldn't do it. Once having decided that I was going to have to stay in for the 3 years after graduation from pilot training, I took time to notice what the Air Force was really about, and I decided I liked it and sort of put all that stuff behind me.

H: Then I had asked you about how you got lined up for Korea.

M: When we got ready to graduate, we were looking for our class assignments, assignments for our class. They finally came in, and it was a big disappointment for a lot of the guys. In those days there were two gunnery schools, one at Nellis [AFB NV] and one at Luke [AFB AZ]. Nellis had the reputation of being the place where all the good pilots went. They trained you to fly F-86s up there. Luke was more of a fighter-bomber base. They flew F-84s there mostly. Our class got assignments that had one guy go to B-47s, one guy go to all-weather school, and all the rest of us were going to go to Luke AFB to be trained as F-84 pilots and to go to Korea as F-84 pilots. The only choice we had was the date that we'd arrive. We had some that were supposed to graduate on Saturday and report on Monday. Other ones that had to report 2 weeks later, other ones

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reported 6 weeks after graduation. We drew numbers, and I ended up with a number to report on Monday, so I got no leave. The programs that they had at Luke at the time were an all F-84 program or half the flying time in the F-80s and half of it in F-84s or all of your gunnery in F-80s and half of it in F-84s or all of your gunnery in F-80s and then just 10 hours to learn how to fly the F-84. I ended up in that program. So I learned how to shoot, bomb, and strafe, rocket in F-80s. When I finished that part of it up, I was to go into F-84s.

At the end of our gunnery class, there was supposed to be some sort of a flyby or something over in Albuquerque, and two of us out of our class of student pilots there were asked to join with all the instructors to fly over to Albuquerque for the show. I was one of them. I was really pleased about the thing. I remember getting up Saturday morning to get shaved and go on down to the flight line and make this flight because it was going to be my first legitimate cross country as an Air Force officer. I get up and started shaving, I got so dizzy I couldn't stand up. I almost passed out. I was barely able to crawl back into bed. I told my roommate, who was the other guy, to tell them I couldn't make it. So I missed that.

Then when I was supposed to start flying the F-84s, when I'd get up in the morning I would be so damn dizzy I couldn't stand up. Finally after about a week of that or 2 weeks of it--I'm sure that the flight surgeon and all the guys thought I was a malingerer--they put me in the hospital and found out I had mononucleosis. I was confined to the hospital for about 3 weeks. I got a 2-week convalescent leave. I was still really, really weak when I went back. I

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flew out my 10 hours of F-84 time, and then I went home on another 3-week leave before I went to Korea.

When I got to Camp Stoneman [CA], because my class had graduated and I was all through with my gunnery, I had all the documents from that class, but because I was 5 or 6 weeks later in actually graduating, I got all the documents that went with that class too. So I had two sets of graduation documents. I remember when you went to Korea you had a project number. That project number identified you as to what kind of airplanes you were supposed to fly. So I ended up with a project number for F-84s, but this other class that went through the same program that I did had project numbers for F-80s and F-84s. When I got to Camp Stoneman, going through the processing line, I saw a couple of guys that I vaguely recognized as having been from Luke but a couple of classes behind me. It turns out that they graduated the same time I finally left after I got out of the hospital. We were standing there talking about going to Korea. I was saying, "Man, I didn't want to go over and fly those F-84s. They were real dogs. There wasn't anybody in the world that could ever shoot me down in an F-80." Even though it didn't go as fast as an F-84, it was a lot more maneuverable. We stood there and talked, and I said, "I noticed in my documents on the way out that I had a project number for F-80s too. I thought maybe I'd switch over to be an F-80 pilot." One of these guys said, "Hey, my cousin's a private down there and he's working in the processing line. Let's go down and talk to him." So the three second lieutenants went down and talked to the private. He said, "Oh, yes, you want me to change your number for you." He changed our project numbers from F-84 pilots to F-80 pilots because we were fully qualified. Then I was selected to go



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to a special school before I went overseas. Then when we came back, we went on over. We got to Tachikawa and then got assigned to the 8th Fighter Bomber Group as F-80 pilots. So I was the only guy in my class that went to F-80s. All the rest of them went to F-84s.

H: What was this special school you went to?

M: I can't talk about that. (laughter) It was classified.

H: When did you first start flying combat after you got over there?

M: By now it must have been about October. It was the first of October or the first of November, I've forgotten, in 1952. I graduated from pilot training in May 1952. As soon as I got there, I went down and checked into my squadron. I was obviously the newest guy there. The three of us got assigned to three different squadrons--the other two guys I told you about. They had three squadrons there, and I was in the 35th. One was in the 36th and the other one was in the 80th. They had a thing called the replacement training unit that they sent all the new guys through, so the three of us went through there together. We went out and started dropping bombs and shooting guns and things like that at our gunnery range we had nearby. When I was at Luke I did really well in all my gunnery except the dive-bombing. I did average on that, but the rest of my stuff was really quite good. But I never really got the feel for dive-bombing. On my first gunnery mission in Korea, my gunsight stopped working for some reason. That's what you use to dive-bomb with. So I dive-bombed with no gunsight at all. I just sort of eyeballed it, like the old Kentucky windage.

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I put down four bombs. I think I had an average of about a 10-foot miss which was something unbelievable. I did better in my first run with no gunsight than I ever have done in all my gunnery school stuff. It's just somehow early I got the picture. After that I was pretty good at that stuff.

H: Did you disregard the gunsight after that?

M: No. I used the gunsight. I figured out what I was supposed to be doing other than just using the damn gunsight. I sort of was doing it by the way they told me which was sort of a step 1, step 2, step 3, step 4, and I wasn't really using my flying skills and my judgment. After that I got it so I could handle that pretty well. We flew a day flight and a night flight. We got checked out in a T-33 first and then F-80s and then a few gunnery flights, so probably after six or seven flights we were assigned to fly our first combat mission. Still with this little replacement training unit, we flew three combat missions with those guys. Not as any special squadron but just as a group. We took easy targets down close to the front lines. Then my fourth mission I was over in our squadron as a squadron pilot. We started flying regular combat.

H: Were your missions primarily air-to-ground?

M: During the days that we had F-80s, later on we transitioned in F-86s, but during the days that we had F-80s which was most of the way through the winter. It was probably about February when we finally got F-86s. They were all air-to-ground. I liked it. It was fun. You got shot at, but you could see what you were shooting back at. And you got a lot more action than the guys who were flying

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air-to-air combat because in those days there really weren't very many MiGs around. The new guys, the second lieutenants, mostly were flying wingman to the older guys. In the fighter-bomber business, fortune shined on me and didn't on some of my compatriots, and I moved up very quickly through the different positions. You start off flying number 2. You fly it and went to number 4, then became element leader, number 3. Then I got checked out very quickly as a flight leader so I could lead a flight of four. Then our flight commander was going home, and we had three or four guys who had a lot more combat time than I did, but for some reason or other I got picked to be the flight commander. So I became a flight commander when I had 35 or 40 missions, not very many, maybe even less than that. Then I was a flight commander up until we finished our F-80s where I had 79 combat missions. At that time we were given a choice. If you had 60 combat missions, you could go home, or if you wanted to finish up your 100 combat missions, you could go down to another squadron that was still flying F-80s and finish up there, or you could stay and fly F-86s. So I elected to stay and fly F-86s. I finally finished up flying 145 combat missions. The last one was about 2 hours after the armistice was signed.

I was telling you about the three guys that switched around and went over as F-80 pilots. The fellow whose cousin changed them for us went over and got killed very quickly. He was probably shot down about 3 or 4 weeks after we got over there. So that wasn't a very good deal for him. The other fellow finished up his tour in F-80s and went home, and I stayed on and flew F-86s.

H: How did you like the transition from F-80s to F-86s?



M: Well, it was kind of interesting. I work for Rockwell, you know. We've got a guy that has worked for Rockwell--he doesn't any longer; he retired a little while ago--named Bob Hoover. Hoover and I have been friends for 30 years or more. I met Bob Hoover over in Korea at K-13 where I was assigned, Suwon. When we were making the transition from F-80s to F-86s, we didn't get to spend a lot of time learning how to fly that F-86. We got three rides in it to learn how to take off and land it, do a few stalls, and do a few things like that. Then we loaded up the guns and went over on the range and fired at some ground targets, and I think they dropped a couple of bombs, I'm not sure what. I think I had like six or seven flights in it when I flew my first combat mission in it. So I was still trying to figure out how to keep it in the air, let alone how to fly combat with it. A lot of the young guys were in that situation. The only thing was that I had the most combat experience of all the recently graduated pilots. We had a squadron commander who was a lieutenant colonel. We had a squadron executive officer who was a major. We had up until this time a squadron operations officer who had just a ton of combat time, and he was going to go home. So all of a sudden I became the senior combat pilot in the squadron. The squadron commander having had none, although he was a much more experienced pilot than I was. We brought in another ops officer who got shot down very quickly. I guess that one decided he didn't want to fly combat. I remember one night he told me he had a lovely wife and some lovely children and he wasn't going to get himself killed in that dumb war. So they yanked him out of that job. He was a terrible leader obviously. So I became the acting operations officer for a while until they got a more senior

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guy in. And he got shot down, and then I would step back in. I was the acting operations officer for the entire time we had F-86s. So from February until the war was over in July, I guess, off and on I was the acting ops officer, including when the war finally ended I was that.

H: Of these 145 combat missions that you flew, what were your principal targets?

M: Well, as I started to say awhile back, mostly they were air-to-ground. There was a short period of time when we first started into flying F-86s, for some reason or other people thought it would be too hazardous for us to learn how to dive-bomb in those things, and we started off flying air-to-air combat. So I flew about 10 missions maybe, Yalu sweeps and things like that where we didn't see very many airplanes. I never got in any big dogfights or anything. Then for a number of reasons, one of which our squadron commander kept leading us across the Yalu River and things like that, our group was finally told to stop flying. We were prevented from flying north of a different river. The Yalu River was up here and then there's another major river that ran through a town called Sinanju. We were not supposed to fly north of that river any more because we couldn't stay where we were supposed to be. Then we went back to flying air-to-ground, so we flew air-to-ground the rest of the time. Our targets were a lot of railroads, towns, supply dumps in towns, close air support, armed recce. That was the one thing I liked most of all was flying these early morning missions looking for whatever targets you could find out on the roads. When I was flying F-80s, we used to fly night-interdiction missions too, where single-engine airplanes would take off at staggered times

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during the night, fly up to specified broad general areas in North Korea and drop bombs on trucks that were up on the roads. That was dive-bombing at night and the bombs with no instruments were a little hazardous. We lost an extraordinary large number of guys doing that.

H: Did you go after dikes during that period?

M: Oh, I think probably I went after a couple of dikes. We'd get a fair amount of close air support. I liked to do that. That was that pinpoint stuff up close to the front line. We did a lot of work on bridges, a lot of railroad stuff. As a matter of fact, we had a standing order of any time you saw a locomotive you could deviate from whatever your mission was to go get it. The first distinguished flying cross I got was for getting two locomotives in a rail yard. I enjoyed my time.

I guess the thing that was kind of the difficult part of my tour over there was I flew up to 100 missions, then I extended for another 25. I told my mother and dad that, and they said, "Oh, whatever you want to do." Then I got to 125, I extended for another 25. They again said, "Yes, that will be okay." Then I went on an R&R to Japan. Because the R&R courier was leaving on a certain time in the afternoon and I was checked out as a group leader, we were going to fly a big mission that afternoon, a 60-ship mission. We only had in our squadron two group leaders, a squadron commander and myself, and it was our turn to lead. He couldn't do it for some reason. I was going to lead the group which meant I'd miss the R&R courier. After I flew the combat mission, I came back and got my stuff and went up to Seoul and just hitchhiked a ride to Japan. It was

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getting close to the end of the war, and it was getting close to the end of my tour, so I was getting ready to go home, and I had to do a few things. I wanted to buy a car. I had a shotgun I wanted to get engraved. So getting there late I figured, well, they wouldn't mind if I got back a little late.

When the R&R courier went back, I wasn't on it, and it crashed on takeoff and killed 47 guys from our wing and 17 from our squadron. Fortunately I wasn't on it. I'd called my folks and told them that I was over there. So they put two and two together and decided I was on that, which was probably pretty logical, but I really wasn't on it. I didn't want to scare them, so I just wrote them a letter the next day. I wrote the date real big so in case they were worried about it they could see that the date was the date after the accident. I didn't call them back and tell them I was okay because I didn't want to scare them. That was a mistake on my part.

I went back to Korea and started flying combat again. I remember being briefed for a flight and stopped by the orderly room to get my mail, I had this bundle of letters from my mother and my father, my sister, my aunts and uncles, telling me if I received the letter, they were glad I was alive. My mother's had tear stains all over it. They had been pretty good up until now, and I looked at that and I said, "Oh, heck," so I thought, "Well, I'll quit." So that was going to be my last mission, and that was really tough to fly your last mission. I didn't realize that.

We had a thing we used to call the 90-mission clanks where when guys got their 90th mission you could see their

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personality change like that. All of a sudden they'd start counting, "Gee, I've got 10 to go." "I've got nine to go." "I've got eight to go." "I've got seven to go." The flight commander in our flight that preceded me didn't eat for like 2 weeks while he tried to fly off these last 10 missions, got all shot up on his 99th mission. He still went out and flew his 100th that afternoon, and came back and he was so goddamn drunk he couldn't fly for 3 days. (laughter) Anyway, that mission was a tough mission. I told the squadron commander I was retiring. He said, "Okay." We didn't have an ops officer at the time so I continued to schedule. I wasn't leading any more, but at least I continued to make the place run. Then a few days later he said, "Gee, Jim, we need someone to lead the group. It's our turn. We really need you to fly." So then I flew my last mission all over again. Then I went on and on and on and on and on. I did that 15 times, including the last one when the war was over.

The way the war ended was they signed the armistice at 10 in the morning so that we could fight until 10 at night, and whatever airplanes you had inside Korea you could keep there. I guess the master plan was to bomb all the airfields to keep the Chinese from flying their airplanes across the Yalu. In retrospect, that was stupid because they did it anyway. But because we had F-86s, we could provide armed escort to F-84s, and they were going to go up and bomb the airfields right after the hour of that afternoon. So our whole wing was told to put up a max effort of escort fighters along with the 51st and the 4th to provide for this last, final massive raid. We ended up we had eight airplanes left in our group, three from one squadron, three from another squadron, and two from another squadron. They



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wanted to send third-rate airplanes up to bomb these airfields all by themselves just to see how it was going to go in the afternoon. We were going to go up unescorted. It was so far that we were going to have to drop our tanks, and we had to take little bombs with us. Dumb mission.

Our squadron was assigned to fly four pilots, and the other squadron was assigned to fly the other four. And it was their squadron lead's turn. I couldn't get anybody who wanted to fly. Nobody wanted to get shot down after the war was over. They all wanted to fly that escort mission in the afternoon when they could fly around 35,000 feet and not get shot at, and people knew whoever went in and dive-bombed those airfields in broad daylight with no deception was not going to make it. We had two guys that were grounded, one guy medically and one guy for doing some bad things. So I unground him. I couldn't unground the medical guy. Two new guys who really were looking for combat missions. They had only two or three missions a piece. So one guy I ungrounded and these other two and I were the only guys I could find that were willing to fly it. I decided the four of us would fly it. I went over to the combat ops to get briefed. There was some major from the other squadron who was going to lead us. He said, "Hey, Jim, you're qualified as a group leader. You can lead these guys. I don't want to fly this." I said, "Bullshit, lead it yourself." (laughter) Anyway, he took off.

As soon as we got over the bomblines we got a combat mission accredited. So I ended up leading it anyway. We had to drop our drop tanks to get up to the target. When we dropped our drop tanks, when I got through, either I had guys drop their bombs and their tanks together or they

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couldn't get their tanks off. I ended up with two guys, the number 4 man from the other flight and the number 4 from my flight that had their bombs on and their tanks off, and I had one tank hung on. So you are never supposed to fly up past a certain place without an even number of airplanes. You sure as hell weren't supposed to fly up there with one drop tank hung on. Here I was, I was faced with the decision of aborting the mission which I have never done in my life or taking those two green kids up there and I've got a hung tank, so I wouldn't have been much good to fight with the MiGs or anything. Anyway, I decided we had better go on. So the three of us went up to the Yalu together. When we got up there it was socked in. I was never so goddamn glad to see clouds in my life. It was sort of low clouds that I couldn't find the airfield. It was too low to bomb, so we didn't get killed after all. (laughter) So I came home and the war was over.

H: Did you take any hits?

M: Yes. I had my wingman shoot me up one time. I've got a gun camera film on his gunsight sitting on the back of my head. You can see the gunsight jiggling. Fortunately, he didn't hit me, but he hit my airplane, about 6 inches from me. Then one time we were dropping tanks right over Pyongyang. Either I got hit by my tank or somebody else's tank or flak and knocked one of my horizontal stabilizers off the airplane. It broke it loose and it just flopped around and it just threw me all over the sky until it finally fell off. It jammed the other side into the fuselage so I didn't have any vertical elevator control. I flew the airplane back and dropped the bombs off, finally got the gear down, and I was able to land it by sheer luck.

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H: Were you still single during this period?

M: Yes. I was single. No romantic interest at the time. A couple of girlfriends back home, but nothing really serious.

H: According to your biography you wound up at Dow AFB, Maine?

M: Yes.

H: Was that your desires?

M: No. That was when I learned you've got to be careful how you volunteer. When I came home from Korea, it was not my intent to stay in the Air Force. Like I said, I really only got in because the war was on. I figured, well the war's over, they are going to let everybody out like they did after the Second World War. It wasn't until I'd been home for a while, I realized that was a mistake. Anyway, when you got ready to come home, you filled out a form. You could say where you wanted to go. My mother and father lived in Jackson at the time. The two nearest Air Force bases were Selfridge AFB in Detroit [MI] and Wright-Patterson AFB down in Ohio. Selfridge AFB was in the northeast section of the country, the way they had it divided up, and Wright-Patterson was in north central, so that is what I put down. I put down northeast and north central, and I got northeast. I got Bangor, Maine, so they gave me exactly what I asked for. In retrospect, that wasn't too smart. Anyway, I got sent up there. It was an F-86F squadron, day fighters. It was an air defense squadron. It had been an Air National Guard squadron that got activated during the Korean War, put on air defense

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duty. They had F-80s for a while. Then they went into F-86s. It was really a very remote base with practically no facilities. We didn't have any alert hangars to put our airplanes in. We used to stay on alert in a little wooden shack with a furnace in it that got about half of the carbon monoxide in the building and the other half went up the smokestacks. We were simply flying day fighters. We only stood alert during the day. I guess it was an hour before sunrise to an hour after sunset when the moon was less than half full. When the moon was more than half full, we did it all night long. I don't know what the hell we could have done with the moon at night. I was up there for 13 months.

I guess the highlight of my tour there was not being there for a while because I got to ferry an F-86 on a ferry flight over to France. I picked it up at Warner-Robins AFB in Georgia, went from there to Dover, Delaware, up to Bangor, and then we were supposed to go to Goose Bay. Then we went to Greenland and then Iceland and then to Scotland and then into France.

H: Where did you go in France?

M: Went to a little place called Chaumont. It took us 2 months. The half of it was that we did it in December. When we got down to Warner-Robins to pick up the airplanes, we had a tough time getting the airplanes checked out. There were 12 of us, I think, three flights of four. When we got down there they couldn't get 12 airplanes ready for us, so we were there about a week. We started out and the first leg was up to Dover, Delaware, and we landed there just in time to be told they were going to delay high

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flights for the Christmas season, that we should all go home and come back after Christmas. Well, the next hop was to Bangor, which was our home station. Three of us from our squadron were on it. So we flew up there and left the airplanes there.

(End Tape 1, Side 2)

After we reconvened the high flights and the guys caught up with us, we went up to Goose Bay. They'd had a big windstorm up in Greenland so it was blowing all the rescue airplanes, SA-16s, into the fjord. One went into the fjord and sunk. One went into the officer's club, and the other one blew into the base operations building. So they didn't have any rescue airplanes. We spent a week or so waiting for them to bring the rescue planes up. Then we flew on over to Iceland and then to Scotland, spent about a week there waiting for the weather to clear up on the continent. It did. We went on into Chaumont, dropped the airplanes off, then went back up to Scotland, spent a few more days there, and then hopped the next courier home, and ended back up in my squadron. So the highlight of my tour in Maine was not being there. That was my first trip to Europe too.

H: Why was your tour such a short one at Dow?

M: Well, because I volunteered for every assignment there was to get out of there. (laughter) I was a bachelor as we'd pointed out earlier, and there were no girls in Bangor. That's when I realized that if you asked somebody what it was like at that place, and he said, "Well, if you are married and you like to hunt and fish, it's a great assignment," I knew that whatever anybody said to me



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afterwards there were no people and there's nothing to do. What really happened is, I did volunteer for a lot of different assignments. I volunteered to go to some remote base in Canada, at the RCAF [Royal Canadian Air Force]. I volunteered to go on an exchange tour with the U.S. Navy. But each time I was told I hadn't been home from Korea a year and I couldn't transfer to another base for a year. About that time, as we were going through it, the squadron was going to ultimately transition into all-weather fighters, F-86Ds. The guys that were in the squadron were sent down to Tyndall AFB [FL] to go through F-86D training, and then they were coming back. Plus we were getting new pilot graduates who had gone through F-86Ds coming into the squadron. So I knew I was going to have to do that. We finally got down to there was a squadron operations officer, myself, and the squadron commander who hadn't been through F-86D school yet. We got another allotment and I was offered--by that time it was a permanent change of station, so when I went down through Tyndall and graduated from there, I went up to McGuire AFB [NJ]. I spent 2 years there flying F-86Ds.

H: What did you think of the D versus the F?

M: Well, if you had to make an intercept at night in the weather, it was better than the F. Other than that it wasn't. The -86F was one of the best airplanes I ever flew. It was really a great airplane. There was nothing that you couldn't whip with it, if you knew how to fly it. We used to do a lot of practice dogfighting and things obviously. I really liked it. It was a comfortable airplane. I felt at home with it. The F-86D didn't have as much fuel. It had

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an afterburner which used it up quicker. It had that big bulbous nose on the front so it wouldn't go as fast.

H: It was an electronic man's nightmare.

M: It was. I spent more time flying around in the emergency fuel control than I ever did operating the thing normally. It finally got so that when you had an electronic fuel control failure, you just switched over and went on about your business. I think that was the only time I ever ran off a runway. One other time out at Edwards [AFB CA] I had a major accident. I was taking off one day at McGuire, and the tire blew out. What it did was the electronic fuel control had a wiper arm on it something like a rheostat for the afterburner. So when I started bumping around like that, it just lifted the wiper arm off the card it was wiping on which shut my afterburner off, and then part of the engine--I must have jiggled the fuel control a little bit too hard so the RPM came off too. So I sort of had a semi-flameout on takeoff and ran off the end of the runway. This was a Military Air Transport Service field at the time. I guess to keep the multi-engine pilots from landing short, MATS put in this design of about 1 by 6 boards that they stuck in the ground vertically, flat side to the approach end of the runway and painted them red. So when the pilot was coming down, he had this whole mass of lumber out there, so you'd stay above it, or any smart guy would. Then when you landed you were far enough down the runway so you wouldn't be short. I assume that's what that was for because it didn't have anything to do with the fighters we were flying. When I flamed out and got to the end of the runway, there's this mass of lumber there which I went through at a

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very high speed, made toothpicks out of them. Didn't hurt the airplane though.

H: How long were you at McGuire then?

M: I was there for about 2 years. During that period of time I was a flight commander and assistant operations officer. We had two fighter squadrons there. I was in the 332d squadron. They had the 539th squadron there too. When I got there the squadrons were numbered 2 and 5, and I was in the 2d Fighter Squadron. I don't think there was a 1st Fighter Squadron in the Air Force at the time. So we had the lowest numbered squadron in the Air Force, we really thought that was a big deal. The Air Force then decided they ought to try and consolidate squadrons that had some relationship with each other during the Second World War together, and the 2d and 5th had. They were in, I think, the 52d Fighter Group. At McGuire we had the wing headquarters so we couldn't have a group there. They took our two numbers and transferred them someplace else where they could have a group, and then they gave us these two numbers. I don't know where they dug them up, but one was the 332d and the 539th. Both of them had been training squadrons during the Second World War. So we didn't end up with a very distinguished history to our squadron.

I was there for 2 years, and during that period of time I decided that to really be successful I needed to go back and finish up my schooling. F-86D pilots were considered a critical resource at the time. They couldn't be transferred to fly other types of planes. You couldn't go to school. You couldn't do hardly anything. I was waiting for that to clear up, and it didn't seem like it was going to. Finally

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I decided that I would make an application to the Air Force Institute of Technology to go back to school. If it got turned down, I'd just have to resign and go back to school on my own. I put my application in, and surprisingly enough it was approved. I was probably one of the first two or three guys that got approved to go back to school. The F-86D came off the critical resource list, and they sent me to the University of Michigan where I got my degree in aeronautical engineering.

H: How much of a problem was it for you to get back up to speed with math and all that since you had been out of it quite awhile?

M: It was a challenge. I graduated from junior college in 1950, and this was in 1957, summer of 1957. I started in summer school which made things go pretty quickly. I started with thermodynamics which is a fairly hard course and statics. I was going to review all my math when I was in the fighter squadron. I had planned to take off a little time before I reported to school to do this, and I had been doing some studying while I was on alert, but not enough. I was really sort of procrastinating. I was going to do it all at the end. We sort of had a change of command ceremony in my flight and another guy was to become the flight commander.

I was just sort of doing odd things about the squadron. I was planning on spending a week or so of really boning it up. We had an operational readiness inspection team, ORI team, come in. They just came in unexpectedly. The squadron commander called me up and said, "Jim, we need you to come back down here and fly." Of course, I was still on

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active duty. I hadn't checked off the base. I was still in the squadron. So I did. They were there for about 10 days. It took all this period of time that I was going to use to bone up to go back to school away from me, so I went back to school really pretty cold.

Like I said, I had thermodynamics and statics. Statics, I just intuitively understood that. Thermodynamics was fairly complicated. I had reviewed about half of my calculus, the differential part of my calculus, but I hadn't gotten to integral calculus yet in my review. We met every day in thermodynamics, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday for an hour. Statics was Monday through Friday an hour and then Wednesday was 2 hours. I had to take a test every Wednesday. I remember one Saturday morning as I sat in class and the guy was talking about these integrals, I thought, man, I don't understand a word this guy's saying. So I went over to the library and picked out about five or six calculus books, and from Saturday morning at 10 o'clock when I got home until Monday morning at 8 o'clock when I was back there I gave myself a 48-hour course on integral calculus. I did have a few holes in my math during the time I was at school, but I was always a good math student, and I really understood it well. But every once in awhile there would be a little hole there where I was trying to remember back 8 or 9 years earlier of what it was and I hadn't reviewed that little part of it, and it caused a little difficulty. But I got straight As all the way through Michigan, so I didn't hurt too much.

H: Were your professors sympathetic with your situation?



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M: No. I think they all thought it was nice to have Air Force officers there. There were a lot of Air Force officers at the University of Michigan. There weren't very many in undergraduate school which was what I was in. Most of them were in graduate school. But there were a lot of Air Force officers there. They were familiar with us, but no sympathy, no extra special treatment. We all got along well. As a matter of fact, I still maintain my relationships with the University of Michigan, quite closely as a matter of fact. I'm the national chairman of the college of engineering fund raising campaign this year.

H: They awarded you an honorary doctorate later on.

M: Yes, they did. I probably had the quickest doctorate. I got a bachelor's degree in 1959, and an honorary doctorate in 1965. That didn't take long, did it? As a matter of fact, the professor who was my advisor was working for me in 1969. Ten years later when I was the Apollo program manager he'd come down to Houston and work in the summers.

H: Did you have to maintain flying time while you were at Michigan?

M: Yes. As a matter of fact, that's where I learned how to fly multi-engine airplanes. When I got there, we still had to maintain our flying. The nearest airfield was Selfridge which was about 75 miles away. The only airplanes that they had available for us to fly when I got there were C-45s and C-47s. The C-45, I never particularly liked. It was an awkward airplane to fly, terrible airplane to land. It didn't have very good performance for hardly anything. They had a few C-47s there, but they only let the old multi-

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engine pilots fly the C-47s, and all the other guys had to fly the C-45s. Well, I shopped around all over Michigan trying to make arrangements for other kind of flying. I did have a friend of mine who was in the Marines, and he and I used to fly Marine T-34s which were single-engine, tandem cockpit trainers, but you could go up and do acrobatics and things. So I flew those off and on whenever I could. I met a B-47 pilot who first checked out in C-47s. He was a B-47 pilot, checked out in C-47s. We were neighbors, so I convinced him he ought to check me out in a C-47. So I got checked out in a C-47 and flew them for a while. Then a bunch of T-33s came in. I think we had about 120 jet-qualified pilots there. I've never figured out exactly how this happened, but I ended up running the jet flying program while I was there. My buddy who checked me out in the C-47 ran the multi-engine flying program. For about a year and half I took care of the scheduling and that kind of thing. I'd get the pilots together, and we'd pick when we were going to fly. I wasn't the senior ranking guy. I was just another guy. I have no idea how I ended up with that job. But we managed to get our flying time in.

H: Did that detract from your study time, having to do that?

M: Oh, yes. It was a long trip over to Selfridge, and sometimes the weather would be bad. They didn't have a freeway that ran over there in those days. The freeway ended right in Detroit, so you had to drive through Detroit on a surface street. It'd take a couple of hours to get there. Drive a couple of hours over there. The weather would be bad. You'd sit around for an hour or two, and then drive a couple of hours back. You didn't need 6 hours of

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wasted time when you were in school. But it wasn't too bad. It all worked out.

H: Wasn't that considered degrading for an old fighter pilot to have to be stuck in these old multi-engines?

M: (laughter) All the fighter pilots used to fly---- After I got checked out in the C-47, I convinced this guy to check out a couple other fighter pilots too. We never flew it like a multi-engine airplane, with copilots and all that stuff. If you are going to fly, you got in the left seat and you flew it. The only thing that you couldn't reach were the cowl flaps which were way over on the right side. Say you and I were going to fly for 4 hours together, for 2 hours I'd get in the left seat and I'd fly everything. I'd tell you to open and close the cowl flaps when I wanted it. If I were going to put the gear down, I'd put the gear down myself. I'd put the flaps down now. Of course, that's not the way the multi-engine guys do it. They'd call the copilot and tell him to do that. Then we'd switch seats, and he'd fly, and I'd sit there. We didn't do it the standard way, but we got our flying time in. We sure were glad to get those jets back.

H: Where did you live during this period?

M: I lived in Ann Arbor. Having spent some time in Michigan, I thought I'd buy a house. I bought a house in Ann Arbor with the intent of keeping it, but when I got ready to go I chickened out and sold it.

H: Were you still single at this period?

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M: No. I was married by then. I was married in 1956. My older son, Mike, was born in April 1957. Then we went off to school the first of June. He was only about 6 weeks old when we got to Ann Arbor. I remember we bought a used playpen. I had this third-floor little apartment I rented until my house was ready. He slept in the playpen. He played in the playpen. He even slept in the drawer one night. (laughter) We took the drawer out and put it on the floor, but that was the only thing we had to put him in. As a matter of fact, my daughter, Ann, was born in Ann Arbor.

H: Let's talk about what lined you up for the Flight Test Center?

M: As I mentioned my squadron commander in Korea had talked about going through engineering school and then becoming a test pilot, and that seemed like a really good idea. When I got to school, I'd been away for so long. I really wasn't sure how it would go. It went really well. In those days you could have a maximum of 3 years of school. The normal policy was 2 consecutive years. I figured I was going to a pretty tough school and I had straight As, so maybe they'd make an exception. I applied for a 1-year extension so I could get a master's degree. I got summarily turned down which really made me rather angry, since there was a little newspaper that went around that dealt with what was going on. I noticed that there were two or three other guys that got approved to do something like that. Why I didn't get approved, I don't really know. I was assigned to Wright-Patterson AFB into one of the SPOs. That didn't really appeal to me very much. I thought, well, I'll apply for the test pilot school. This is pretty late. Another guy there named Ed White [Lt Col Edward H., II], who later became an

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astronaut with me, lived on the same street that I did. Ed and I got to be quite good friends. Ed was there to get a master's degree in aeronautical engineering. We got to be good friends, and we flew together a lot. We lived about a block and half apart on the same street. Ed's desire was to go to the test pilot school, so he'd applied for it, and he had been accepted. When I found out I couldn't stay and get my master's degree, I don't remember whether I called the school or what, but, anyway, I sent in an application for it, fairly late, like way too late. I don't know why they accepted me, but they did. So quite late in the year like a few weeks before I graduated I got my orders to Edwards, and I was accepted for that class. They must have had someone drop out of that class is all I could figure because there are only 16 people in a class. And Ed had had his acceptance before I ever even applied. Anyway, I went out there and went through test pilot school.

H: What kind of experience was that?

M: Oh, it was really quite a pleasant one. I really enjoyed that. As I mentioned earlier, I sort of instinctively knew how to fly. I don't know why. I'm a fairly good athlete, but I'm not outstanding. I'd never be on the NCAA all-star team. I didn't stumble around on my feet or anything, but for some reason or another I just really took to the flying part of it very well. Having gotten a degree in aeronautical engineering and knowing how to fly well, it just seemed like that would really be the challenge. That's where I could put all that stuff together. So I went out to Edwards. Actually we got out there a little early because time between when I graduated from college and when I needed to report out there was like 8 weeks or something. So I



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took some vacation to go visit my parents and do some other things. Then we drove out. I got out to the school about 3 or 4 weeks before the classes started and flew some of the airplanes. I hadn't been flying anything except T-33s. I flew T-28s and T-33s and a few other little things like that to at least get my hand back in flying. When the school started, I really enjoyed it. It was a combination of academics and pilot training and learning how to fly the new way, taking the things that I learned both at Michigan and then in the academics out there and putting them together and figuring out what the airplane was supposed to do and then going out and showing, by God, you could do it. I really enjoyed that. Test pilot school was 8 months long.

H: Quite a lengthy course.

M: Oh, yes. A very extensive course. Sort of like I got my master's degree at the test pilot school. (laughter)

H: What was the makeup of the faculty?

M: There was a commandant whose name slips my mind. It was divided up into two branches, a performance branch and a stability and control branch. I'm having a mental lapse. I can't remember who the heads were of any of those. Tom Stafford [Brig Gen Thomas P.], who was later an astronaut with me, was one of the instructors in the performance branch, I think. Anyway, they were mostly Air Force pilots who had been through the test pilot school and stayed on as instructors. Then there were a couple of civilian engineers, aeronautical engineer types who taught. We had simulators, a few simulators of flying. We normally had classes in the morning and flew in the afternoon or flew in

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the morning and had classes in the afternoon. It was a pretty hard course. It kept you busy. A fair amount of homework. But the thing that was good was, like I said earlier, that you studied the theory of it, took the test on it, got a chance to talk about it in class. Then you got a chance to go out and fly the test. We reduced our own data. We had a bunch of old electromechanical adding machines, calculators, that we did it with. So you got a chance to see what was really happening. I really got a lot out of it. It was such a good way to put the flying and the academics together.

H: You felt it was as good a course as it could have been?

M: Yes. Later on I went back to a course that was called the aerospace research pilot course. It was to teach you how to become an astronaut, and that had a different slant. But this course led to really how to flight test airplanes, and that's what I wanted to do. I was fortunate enough when I graduated to get a chance to stay at Edwards. I got selected to stay there. That was very nice.

H: I thought that was understood in the beginning. You mean they were sending test pilots to other bases.

M: Yes. We had 16 test pilots in our class. One of them was a German so he went back to Germany. Well, I guess he stayed in the United States and flew on the F-104G program, but he was not going to stay there at Edwards. Then that left 15 of us, and I was the only one of the 15 that stayed at Edwards. Most of them went to Wright-Patterson. I think a couple of them went to air logistics centers as maintenance

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test pilots. I was going to say one of them went to Eglin, but I don't think so. So I was the only one that stayed at Edwards. We only had a few test pilots at Edwards. We had 11 fighter test pilots I think when I was there, and the tour was quite long. Normally you stayed 5 or 6 or 7 years. So that meant you needed one guy about every 8 or 9 months to fill it out, and sometimes the guy stayed even longer than that. There isn't a big demand, and they graduated something like 40 a year.

H: How did the duties at Edwards differ from what they did say at Wright-Patterson as far as test pilots were concerned?

M: The major responsibility at Edwards was the flight testing of new airplanes. Wright-Patterson was modifications to airplanes or all-weather testing. That was the headquarters of all-weather testing. So if you are going to find out how a modification to an airplane handles icing or something like that, you'd do that at Wright-Patterson. At Eglin it was air-to-ground weapons. At Holloman AFB [NM] with air-to-air weapons. Those were the four flight test centers at the time. At Edwards you were testing the basic airplane. You didn't do any armament stuff, or not very much in those days. We did the stability and control and the performance flight testing. Take down the landing performance, climb performance, cruise performance, stability and control, and quick evaluations of airplanes. I got so that I could get in an airplane and fly a 50- or 60-minute flight in it, and I could tell you not everything about the airplane but I could tell you almost everything about the airplane. You got pretty adept at taking an airplane up and doing sort of a qualitative evaluation of the airplane. You could just go out and do an afterburner climb. On the way up you could do

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a couple of stick hits, pop the stick or the rudders, to get the longitude and lateral stability of the airplane during climb at different airspeeds. Then get up level, and you could get your climb performance by just timing your climb with a stopwatch, and then you could level off, and by timing your acceleration you could see how long it took you to get up to Mach 1.5 or 2 or whatever it was, and record this on the way. At the same time do a bunch of stick kicks and rudder kicks to find out what the stability was at different Mach numbers. Slow down and do some high-speed turning performance, and then lower speed turning performance. Get real slow and put the gear and flaps down and figure out what your stability was in those conditions and what the handling characteristics were. Acrobatic kind of things.

H: Wasn't this a dangerous situation doing this to an unproven aircraft?

M: Normally these quick qualitative things were done to proven airplanes. During my tour there I went over to France to fly the Mirage IIIC. I was really supposed to see whatever else I could fly over there for my own benefit and also for the Air Force's benefit. They had a Mirage IV which was a supersonic bomber. It's a small delta-wing bomber. I was sort of supposed to fly that if I could. They never would let me fly it. They only had two of them. But I did fly some extensive flights in the Mirage IIIC where I dropped bombs and fired rockets and fired the guns and did a lot of stability and control stuff with it. As a matter of fact, I did all the stability and control. There were three of us, three pilots. I did all the stability and control. The three of us shared the performance flight testing.

(End Tape 2, Side 1)

One other fellow took the lead in air-to-air weapons testing, and another fellow took the lead in air-to-ground weapons testing. Since we did the stability and control first, which included the basic airplane, and this airplane could also be equipped with a rocket engine, so I flew it with a rocket engine a few times. After we did that part of the flight testing, my major part was over with, so I had some spare time. I went out and did some of the armament testing with the other guys, but they really had the lead in those things, so I had some spare time. During that spare time one week I went up to the flight test base outside of Paris. Every morning and every afternoon I flew a different airplane. It was sort of for my own personal edification, satisfaction, but also to see whatever else I could find that would be useful to the U.S. Air Force. Of all those airplanes I flew, most of them were old things that had been around awhile. I flew trainers, commercial airplanes, twin-engine cargo airplanes. One airplane that I did fly that was highly being used for training was an airplane called the Etendard. They only had two of them, and it was the first airplane that I'd seen that was supersonic strength level without an afterburner on it. This was in about 1962. It had an air-to-ground range and radar which we didn't have any of them in the United States at the time. It was kind of a nice airplane, so I got to fly that one afternoon. Although it really wasn't much different than any of the other airplanes as far as the way I went about it, I wrote up a short flight test report on that, that was useful when I got back so our Air Force could know what the French were doing. And there were a lot of other times when you could



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do something like that. But you didn't normally do that with a new airplane. Normally when you're flight testing an airplane in a major test program, you gradually go faster with it or higher or slower, do things with the engines, so that you just gradually expanded the envelope of the airplane until you got out to the boundaries of the design. That was a lot of fun. I really enjoyed that. That was probably the best job I ever had.

H: The Mirage IIIC was considered to be quite a hot aircraft. Did you find that to be the case?

M: In those days it really was. It really performed very well. It was really a lot of fun to fly. It just didn't have much fuel in it. As soon as you took off, you were looking for a place to land. As a matter of fact, when they put the rocket engine in it, they had to take out one of the fuel tanks and the gun pod, I think it was the gun pod. Anyway, the rocket went up in the center part of the fuselage, and then one of the fuel tanks was used for the rocket fuel, so you are really low on fuel then. It was a good way to get up to high altitude quickly if you wanted to shoot down high-altitude bombers. That was about the time that Gary Powers got shot down and the day of the high-altitude bomber sort of disappeared. It was a very, very good airplane. As a matter of fact I think they are still flying.

H: How did that stack up to what we were fielding at the time?

M: Very well. I went to France expecting them to be in the dark ages. Their older airplanes were really bad. Those first jets that they built after the Second World War were even worse than our first jets. But their new airplanes

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like that Mirage, that was a topnotch airplane. It was as good as whatever we had flying in those days. The F-4 was just coming out at that time. So the best airplanes in the U.S. Air Force were F-104, -105, and -106. It did things different than they did. It was a lightweight fighter, very, very maneuverable. It didn't have much fuel, but it was really a good airplane.

H: Did they go to drop tanks?

M: Yes. They had drop tanks where they could put on big ones and little ones. It carried a lot of armament. In France you don't have to go very far. It's only a 10-minute flight to the border. So they didn't have to worry about all that fuel.

H: They weren't concerned about other areas?

M: No. Well, at least in those days, it was my experience that European fighters always had a lot less fuel than American fighters did because they really didn't have to go very far. They were right there with the enemy. You could attack Germany in 10 minutes from most bases in France and vice versa, and you could get from Germany to the Soviet Union very quickly too.

H: How long were you with this tour in France?

M: I was only over there about 5 or 6 weeks. It was very short. It was to just evaluate that one airplane. My time at Edwards was about 3 years or so.

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H: According to your bio, you logged over 4,500 hours of flying time and 3,500 hours of this was in jet aircraft. Does that sound about correct?

M: That's about right. Most of my flying time was in jets.

H: What types of aircraft were you flying?

M: The airplanes that I flew a lot of were the F-80s and the F-86s in Korea and F-86s when I got back, T-33s and the C-47 when I was at school in Michigan. Then when I was out at Edwards I flew mostly T-38s, T-28s, F-104s, T-33s, F-100s, F-102s. Then I got assigned as the Air Force project pilot on the F-4, for the Air Force F-4. But I only got to fly that a couple of times, then I went to work for NASA. I used to fly the big airplane just for the heck of it once in awhile. I've flown B-52s, taking them off and landing them. B-47s, C-130s, B-57s, F-4s and F-106s. I never flew the F-105. I never flew the F-101 either. Other than the -105 and the -101, I flew all the fighters that we had up until that time. F-84s.

H: The -104 was considered real hot.

M: Back when I was flying, yes, that was the fastest thing around. It couldn't maneuver very well, but it sure went fast. I really enjoyed flying it. It was really a good airplane. It was a little airplane. A lot of the airplanes were so big and bulky. If you got in an F-104, boy, it was like putting on a tight jacket. You really sat low to the ground when you were taking off and landing. It was really a lot of fun to fly.

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H: Did you have any close calls in testing some of these new aircraft?

M: Well, the only close call I ever had was, I did a lot of barrier engagements where we crashed airplanes into barriers. The only flight accident I ever had in my entire flying career was on an F-104 at Edwards. It wasn't even an experimental or engineering test flight. It was just a maintenance flight test. I'd flown the airplane one day. For some reason or another it started going up and down in pitch with no motion of the stick. It had a pitch damper on it. I thought maybe the pitch damper was doing something. I turned the pitch damper off, and it still oscillated up and down like that. When I brought it down, I built the thing up. They worked on it that day and the next day maybe. Finally, they were going to have it ready to go again. I was at the aerospace research pilot school at the time. They needed the airplane to fly some flight that day, so I went down to do a maintenance test flight on it very early in the morning like 6:30 or so. I got in the airplane and went up, and I checked it for the problems that it had. It didn't have that problem. They'd fixed it.

I was getting ready to--they needed the airplane on the ground in a hurry, so I was just going to go and get in the supersonic corridor and run up to Mach 2 and burn up some fuel and then come on in and land. I went into afterburner and I was out at one end of the corridor, pretty far from the base. I was making this turn to come back around to get in the corridors. I was accelerating. I was up to about just a little bit supersonic, like maybe Mach 1.1 or so. All of a sudden the stick started going back and forth and it started oscillating back and forth until it was going

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from one side of the cockpit to the other side. I wrapped both arms around it and both legs around it. I just couldn't hold it. It was doing it by itself. I called the control agency or maybe the tower, I don't remember which, and I told them to mark where I was because I was going to bail out. I yanked the engine back out of afterburner into idle, and I threw the speed brakes up so I'd slow down. And finally it sort of got less and less and less, and I got it back under control. I flew along, and it worked fine. So I said, "Forget it, I'm not bailing out, I'm going to come back to the base." Then it started it again. Same thing all over again. Well, I went through this about five or six times. I finally got it back to the base. I was still in it. I still hadn't jumped out of it. So I decided I'd try to land it. I put the gear and flaps down, partial flaps, and it didn't seem to affect it at all. I started to come in to land, and it started this oscillation, so I pulled up out over south base in case I had to bail out. It stopped. So I came back and tried another one. Just as I got close to landing, the same thing happened. I pulled back up and it stopped. I came back down around, and it wasn't doing it, so I really got committed to landing then. I was down to a few hundred feet, and it started. I was too low and too slow, although I was still going pretty fast. I must have been doing about 220 knots. I had a lot of fuel on board. I only had partial flaps down, so I thought maybe I could control it better. Anyway, I was committed to landing. There was no way I could pull back up. It started rolling. The stick was going back and forth. Pretty soon it was rolling violently about 80 degrees either side of right side up. I came down and touched down on one wheel, and it was low and it just tore that gear right off. The wheel got



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stuck up underneath the wing. Fortunately it didn't come off. Then I bounced up in the air.

The next time I came down, I came down at a 90-degree vertical right on the wing tip. I don't know exactly how I got out of that. The wingspan was only 22 feet from tip to tip, so from my nose to the ground was 11 feet. I remember that. I could see the sparks going out of the corner of my eye as the wing was grinding along on the ground. By then I was trying to bail out, but I couldn't get the airplane right side up long enough to pull the ejection handle. In the meantime I had thrown out the drag shoot, pulled the drag shoot handle. As I bounced off the wing tip back on the other wing or wheel, I don't remember what, the nose pitched up, which F-104s were prone to do, so I figured I was a goner again. Just as the nose got up the drag shoot popped out, so that slapped the nose back down. I think I knocked the other wheel off then. I'm not sure. The pieces were strung along the runway. By then I wasn't going in the direction of the runway any more, so I was going off the runway. I remember hitting the big sand dune and bouncing up in the air 30 or 40 feet, maybe even higher than that. The airplane was still rolling. I could see another sand dune coming out in front of me. I figured, looks like I might just about get level when I get to that sand dune. If I did, I figured I'd tear off all the rest of the wheels, the gear. Fortunately, I hit it level, not in the bank. So I hit it, and, bang, I knocked all the other wheels off. By then we were slow enough to where the drag shoot was keeping my nose pointed in the direction I was going. The F-104 had a very bad habit of turning sideways and rolling because it had such short wings. Anyway, it didn't roll over. Finally, I ground to a halt, promptly shut the engine off

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and jumped smartly over the side and ran. It didn't blow up so I went back and shut all the rest of the switches off. That was the only accident I ever had. I had a lot of close calls out at Edwards, but that was the only accident.

H: Did they ever figure out what was wrong with that?

M: Yes. As a matter of fact they did. There was a maintenance job that was supposed to be performed on it, a tech order compliance, which was to take out little filters. In the hydraulic lines there were some filters that kept small particles of dirt from getting into these control valves. When they had assembled this certain group of filters, they had drilled them so that the drill burls were on the wrong side of the filter, and this had been discovered. The filters were supposed to be replaced on all the airplanes. In this particular airplane it was written up as having been replaced. We got this airplane from Eglin, and I guess this thing was supposed to have been done at Eglin. It wasn't done. So one of these little chips came off and it flowed downstream with the hydraulic fluid and got into the control valve. They were very, very small control valves. As this got into it, I guess it just hung the control valves up, and that caused the hydraulic pressure then to surge on the ailerons, and then the aileron linkage went back through the hydraulic back to the hydraulic valve and caused that to surge back and forth, and that made the stick go back and forth. As a matter of fact, in that movie, "Right Stuff," where they showed Chuck Yeager crashing in a -104, I think that might have been the -104 because they were able to repair it, and they put a rocket engine on it. But that was a close one.

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- H: Had you bailed out of that thing, would they still have been able to determine the problem?
- M: Probably not. There wouldn't have been much left of it. Oh, I saved the airplane, which is a dumb thing to do. I should have jumped out of it. I never did bail out. My only missing Air Force experience was bailing out.
- H: Well, of all the airplanes you tested, what was your favorite?
- M: I liked the F-104, and I liked the Mirage IIIC. The -38 was a nice airplane too. I did a lot of flying in that, a lot of early testing in it. Then the other airplane that I really liked was the F-86. Of the American airplanes, probably the F-86 and the F-104.
- H: Let's talk a minute about why you got over into the NASA side of it. Did you have any aspirations toward flying the X-15?
- M: As a matter of fact I did, and I was selected to be an X-15 pilot. I sort of got into that by way of the aerospace research pilot school. When I graduated from the test pilot school, I'd done well academically there, and as I mentioned earlier I'd done well academically at the University of Michigan. I'd also done well on the flying at the test pilot school. Then went down to flight test operations, started flying fighters just as another test pilot. The Space Program started at about that time. The Air Force decided they ought to start a school to teach people how to be astronauts. So my boss called me in one day, Colonel

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Peterson, and said, "Jim, I've got a great opportunity for you. We are going to send you down to the aerospace research pilot school. You are going to be the first student. You can help set up the school. You can help put the academics together, the flying program, and all these things. It will be a great career opportunity for you." I said, "Gee, Colonel, I don't really want to do that. I went through the University of Michigan, then the test pilot school. I like my job as a test pilot, and I really don't want to go down and go to school." He told me again what a great opportunity it was, and I told him again I really didn't want the opportunity. Finally, he said, "Goddamnit, McDivitt, you are going to go to that school." I said, "Yes, sir, I didn't know you really cared." I volunteered (laughter) and saluted.

Anyway, I went down to this thing we called the aerospace research pilot school. It was run by a guy named Tom McElmurry [Lt Col Thomas U.], who was one of the staff members at the school. Frank Borman [Col Frank] was just a recent graduate of the test pilot school, and he was going to stay on as an instructor in this school. There was a guy named Bill Schweikhard [William G.], who was a civilian. He was an aeronautical engineer from the test pilot school. Those three fellows and me--and I was going to be the student. But really what it was we were all students, and we were all instructors. What we did is we laid out the curriculum, the academic curriculum, divided up who would be responsible for which part. We went to study those parts and then taught the other guys. We made arrangements with different universities to attend schools, to send instructors in. We put a flying program together. I did most of the flying program. Different things we could do

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with airplanes that would help guys understand "low L over D" approaches like they use on the shuttle today and those kinds of things. So I went through that. That was 6 months.

H: I have a specific question to ask you that came out of the Flight Test Center history. The January-June 1963 Flight Test Center history stated regarding the creation of the "USAF Aerospace Research Pilot School" that you were one of the five of the first class to graduate from the course. The history also noted that the idea for this school initially received "numerous rebuffs and exceedingly little support" from the Air Force because it "had not yet come up with a space mission." Could you comment on that?

M: I don't know--I wasn't a member of the school faculty. I don't know how they got the thing put together. They had approval for it when I got involved in it. You didn't have a lot of funds at the time. We didn't have very much in the way of airplanes. But when we laid out the program one of the things that we suggested was they take three F-104s and add rocket engines to them, build some big simulators, get a different staff of people to teach the academics, bring in the right kind of guys, and that seemed to have gotten funded. I do know though that that was a very difficult time for the Air Force because they were really struggling with their mission in space.

When I graduated from the school, I went back down to flight test operations, and had been there for a short period of time when they asked me if I'd like to be on the Dyna-Soar program and be on the X-15 program. I leaped at the X-15 program. I agreed to that in about 10 seconds. But I told them I wanted to think about the Dyna-Soar program. That



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was the Air Force's space program at the time. It was a project Boeing was involved in. It was to be a small shuttle glider, launched it up and then it glided back down into the atmosphere like the shuttle did. I went up to Boeing and spent a day or two in the factory and talked to the engineers, and I came home and concluded that that program would never fly. I told my boss that I didn't want to be on the Dyna-Soar program, and he thought I was absolutely nuts. He said, "No self-respecting Air Force test pilot has ever turned down the premiere flight testing program in the Air Force. I don't understand why you are doing that." I said, "Well, the program will just not thrive. It'll never work." I'd had enough training at the aerospace research pilot school that even as a novice I can call that. The reason for that was really twofold. The Air Force was struggling with what its mission in space was, and I believe McNamara was the Secretary of Defense at the time. He'd been up to Boeing for a review, and he told the Air Force guys and the Boeing guys that research vehicles weren't part of the Air Force agenda. Those were NASA programs. That was a NASA responsibility. NACA, it was in those days, I guess. And if they couldn't find a mission for that then they ought to kill the program or something to that effect. They tried to do things with that spacecraft that it couldn't possibly do. They didn't have an open window machine gun placed in it, but they had every other kind of dumb contraption to make it look like a military weapon system that you could think of. There weren't any rockets in the United States big enough to lift the thing with all this junk on it. So because of that problem it was obvious that there was wide dissension in the Air Force about what really the Air Force role in space was; and was it a research role, was it an operational combat role?

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Anyway, I told them I didn't want to be in the program, which didn't endear me to a couple of people. Anyway the program was killed. It never did fly just like I said it wouldn't. It turned out that that wasn't a mistake on my part. But there was that problem. Later on when I applied for astronaut training it was obvious that a lot of people in the Air Force thought people who went into NASA were traitors to the Air Force.

H: General Rushworth [Maj Gen Robert A.] commented that he was having the time of his life in the X-15 and the thought of flying around in a tin can, as he termed it, just seemed very unattractive.

M: Well, that's right. I mentioned earlier I went over to France to fly the Mirage IIIC. Before I left my boss called me and said, "Jim, I want to offer you the X-15 job." I said, "Yes, I'll take that." The Dyna-Soar thing. When I came back and talked to him about the Dyna-Soar thing, he said, "Oh, okay." A few days right after that he called me in again and said, "When you are going to be gone, we've just gotten the word that NASA is going to have another astronaut selection. Do you want to be included in the astronaut selection because we'll have to send in an application for you when you are gone?" I said, "I don't want to have anything to do with that. I want to fly the X-15." So I went on over to France and flew. My stuff came back, and when I got back I started getting ready to fly the X-15. Bob White [Maj Gen Robert M.] was the number 1 pilot. Bob Rushworth was the number 2 pilot. Bob White was leaving; Bob Rushworth was going to move up. I was going to become the number 2 pilot in Rushworth's place and he's going to take White's place. So, man, I was getting ready.

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I was getting fitted for pressure suits, and I was chasing all the X-15 flights and studying the handbooks and flying the simulators and stuff. Then my conscience got the best of me. I'd been through the aerospace research pilot school. I'd been through the test pilot school. I had my degree in aeronautical engineering. I knew I could fly well. I knew the fun thing to do would be to stay and fly the X-15, but then my sense of responsibility got to me. I started thinking, gee, maybe I ought to get in the space program because I've had all this training. I knew the other guys that were flying. A lot of them didn't have any experience in flight testing. I thought about it and thought about it and thought about it. Finally I decided that maybe I ought to do that.

So I went down to see Bob White, who was a lieutenant colonel in those days. I was a captain. I knew Bob had been very instrumental in me getting selected for that job. At least I assumed he had. I called him up and said, "Have you some time, I'd like to talk to you." He said, "Come on down." So we sat around and drank beer, talked about this thing from about 7 or 8 o'clock at night until about midnight or maybe 1 o'clock. I weighed all the pros and cons. What I really wanted to do was make sure that he wouldn't feel that I'd let him down if I got off the X-15 program. He said, "No, no. I think you've got to do what you need to do and what you think is right." We went over what was right. Anyway, we concluded that he would help submit my application. Applications had been closed now for months, and the Air Force was in the middle of their selection process. The next morning we met down at operations at 5 o'clock which was 8 o'clock back in Washington. He called somebody in the Pentagon. He was a

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very big name in the Air Force in those days. He called somebody in the Pentagon and asked him if they'd accept my application late, and they said they would. He typed the application up for me. I couldn't type. My lieutenant colonel's secretary typed it up for his captain. They said that we should get it in right away, and it had to be signed by the director of flight testing, a different Colonel Peterson. I took it up to his office and waited around. He was busy. Finally I gave it to his secretary and asked her to have the colonel sign it as quickly as possible, that we'd already talked to the Pentagon, and they were expecting it out of there that day.

I hopped back in my car, drove back down to the flight line, took off my uniform and put on my flying suit. I was sitting in my office filling out a flight test card for a flight test. Colonel Peterson came storming through the door, threw my application on the floor, and said, "Goddamnit, McDivitt, what's this thing?" Of course, I immediately stood up and saluted and said, "Sir, that's my application for astronaut selection." He said, "You can't do that. That's being a traitor to the uniform and the Air Force," and all that kind of stuff. We talked it over for a while, sort of one-sided. He screamed and I listened. I said, "No, sir. I've already made up my mind. We've talked to the people at the Pentagon. I've thought about this long and hard." He said, "Okay, you're off the X-15 program right this second." So he yanked me out of the X-15. Fortunately I got selected for the astronaut training because my career at Edwards----

(End Tape 2, Side 2)

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After that run-in with Colonel Peterson, it was obvious that my career at Edwards was limited. A funny thing happened though. After I had flown my first space flight, maybe 5 or 6 years later, I got a letter from Colonel Peterson. I hadn't seen him in this whole time. He said, "Jim, I'm sitting here on my patio in Albuquerque. I'm retired from the Air Force now. I'm just sitting here thinking about my career and how proud I was of all the things that I've done. But there was one mistake I made and that's when I really raised hell with you with respect to joining NASA. I just want to let you know that I think you were right and I was wrong," which I thought was really nice. I'd never seen the guy since he threw me off the X-15 program. He may not even be alive today. Anyway, he saw fit to change his mind.

There was a lot of difficulty in the Air Force with respect to the guys who were astronauts, especially so with the group of guys that I think I was in. I'd gotten promoted to spot first lieutenant in Korea, and it was confirmed before I came home. So I was a first lieutenant after about 8 or 9 months commissioned service. Then I got promoted to captain very early too. The first time I came up in the below-the-zone, I got promoted to captain. So I was a captain after I had been in the Air Force less than 3 years, which made me eligible for major very early. In those days one got considered for promotion by time-in-grade. Well, as I came up for below-the-zone selection for major, they changed the rules from time-in-grade to time of commissioned service. So where I would have been eligible the next go-round at least for below-the-zone, I wasn't eligible for the below-the-zone thing for another 3 or 4 years. I spent a lot of time as a captain. Then when I did come up for below-the-zone, I'd been a captain probably longer than anybody else



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on the list. I'd had very good OERs and I expected to get promoted. By now I was an astronaut. I've been through the aerospace research pilot school. I graduated first in my class out of Michigan, first in my class out of test pilot school. I knew I'd gotten good OERs in my fighter squadrons. I figured, sure, I was going to get promoted. I didn't get promoted. Then I came up below-the-zone the second time, and I didn't get promoted then either. Ed White's dad was a friend of Secretary Zuckert's. I think the Secretary had retired. He asked him if he could figure out why Ed and I hadn't gotten promoted. The message we got back was, well, the Air Force doesn't like the guys that are with NASA.

Along the line there I had gone down to the personnel files in the Pentagon and looked at my OERs, and they were all over on the far right-hand side which is as good as you could get. I was standing there looking at them this one day, and I said to one of the officers standing there. I said, "Gee, I've really got a question about the field grade promotion stuff." He said, "Oh, you're lucky. There's the chairman of the field grade promotion board." I said, "Oh, okay." So I walked over and there was a colonel. I said, "Colonel, could you help me out here a minute, please, sir?" He said, "Sure." I said, "I've come up for promotion eligibility in the below-the-zone two times, and I haven't been selected. I've been a captain for a long time having gotten promoted at a very early time in my commissioned career. Would you mind taking a look at my OERs?" So he looked at them and said, "Well, gee, they're really pretty good." Then he turned over the backside of the last one where it had my present assignment that said Manned Spacecraft Center, National Aeronautics and Space

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Administration. He looked at that and said, "Oh, young man, I don't think you have much of a career in the Air Force." I said, "Oh, really." He said, "You're not very well educated." I'd also taken Squadron Officer School while I was an astronaut by correspondence. He said, "You're not very well educated. I don't think you've got any future in the Air Force at all. If I were you, I'd get out. It's quite obvious you haven't really prepared yourself for a military career." I mean he was just cold as could be. It was obvious he couldn't understand why I hadn't been promoted either until he got to the last page. So I went home and thought about that one for a while.

What really was confusing was when I was selected by the Air Force--the Air Force had the whole screening process for astronaut selection. I think they submitted seven Air Force names to NASA. The Navy submitted everybody. They had hundreds. And the Marines had hundreds. The Army had lots of them. Then there were a zillion civilians. Well, the Air Force only submitted seven, and four of us got selected. Maybe it was nine. Anyway, a very small limited number. And they picked four of us. So the Air Force had done a good screening. When they picked us we had a chance to meet with the Chief of Staff. We met with the Deputy Chief of Staff of Personnel. We had 8 or 10 generals that spent half a day with us. They put together a little charm school for us where they had people come in and tell us how to do interviews and make sure that we kept our socks pulled up. The whole damn thing. They told us, "You guys are blue-suit representatives in this wonderful program." It was obvious the guys that were two, three, and four stars thought it was a good idea that we were over there, and all the lieutenants and captains thought it was a hell of an

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idea that we were over there. But it was equally obvious that the colonels and the lieutenant colonels and the majors thought we were a bunch of jerks and traitors.

I seriously thought about resigning. As a matter of fact I wrote up my resignation once, and it was in the process of going through. It took too long to do all this. I was getting ready to fly Gemini 4, and I didn't want it to look like sour grapes when I was going to resign from the Air Force and then go fly space flights. So I withdrew my resignation. I was going to take care of it when I got through flying. We flew. Ed White and I flew on Gemini 4. And we'd made major. By then we came up in the normal zone and they did promote us. I was a captain with 2 years or more seniority on Ed, although we both graduated the same time and commissioned the same year. So we were both barely majors. As a matter of fact, I never had my major's oak leaves on my uniform. Of course, we didn't wear our uniforms much. After we flew our space flight, the President came down to the Manned Spacecraft Center and promoted the two of us to lieutenant colonels. It was the first Presidential promotions that they had. Well, that took the world back, and it changed really the attitude that little management group of Air Force officers had. After that I never really saw any prejudices against us or anything like that. But it was really like the Air Force had a split personality as far as we were concerned. We were forced to do things that were exceedingly awkward.

I remember one time there was a dining-in down at Patrick AFB [FL], and the Secretary of the Air Force was going to speak. So they invited us to come down because we spent a lot of time at Patrick being close to the launch facility at

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the Cape. We were all set to go. Boy, just the Air Force guys. We were going to get out our uniforms and brush up the brass. We get a phone call from the White House late in the afternoon that said we can't wear our uniforms. We have to go in a tuxedo. Fortunately, we all were able to dig up tuxedos and flew down. Here we are at this military function. There must have been 1,000 officers at this function. The Secretary was wearing a tuxedo, and five or six of us were wearing tuxedos. I mean we really looked like a bunch of jerks. Anyway, after the President promoted Ed and I--he promoted Gus Grissom [Lt Col Virgil I.] too, so three Air Force guys got promoted to lieutenant colonel--that really seemed to change the whole attitude. We never got any flap after that at all. Shortly thereafter the Air Force sent a whole bunch of officers down to the Manned Spacecraft Center, I think 121 officers, to learn the space business. So we got over that animosity.

- H: I've heard that said not only about NASA but past interviewees have commented that anytime you get out of the mainstream of the Air Force you're a second-class citizen.
- M: That's right. As a matter of fact, they had the U-2 program at Edwards when I was there. One of the guys who had been in it and had gotten out was talking to me one night. He said, "Whatever you do, don't get in any of these super secret programs." I said, "Why not? That sounds like you would really be helping your country and all that." He said, "No. You get out of the mainstream and they forget all about you. Nobody knows what's happening to you."

But to go back and answer the question you asked me about Rushworth and flying that X-15. I really struggled with

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that because that would have been so much fun to do. It was obvious that I had--well, I remember a lot of good things I could have done in flight testing. I really enjoyed the work. I was a fairly new guy still when they picked me to do that, so I thought, gee, this is really quite an honor. By the rule, if you'd done what would have been the most fun, it would have been that. But my conscience got the better of me.

H: What I don't understand is that so much of the data derived for the space program came out of the X-15, or all the X flights.

M: Well, that's right. The high-speed aerodynamics, we could only go so fast in the wind tunnel. We could fly regular airplanes up to about Mach 2, but if you go back to when Chuck Yeager broke the speed of sound in the old X-1, boy, that was all brandnew. Nobody knew what was going to happen. Then Mach 2, then 3, then 4, and then 5, and I think the X-15 went up to Mach 6. The thing about spacecraft, they would go Mach 25. As a matter of fact, when the shuttle was coming down--the first shuttle--I was standing out at the lake bed up at Edwards with a bunch of Rockwell guys. One of them was Charlie Felts who was one of the design engineers on the X-15. He was the division general manager for the shuttle division at the time. He was only staying on--he was ready to retire--until his first flight. He was standing out there. He was just crying like a baby. The tears were just flowing down his face. The controller or the pilots, I can't remember who it was, was calling out the Mach numbers, Mach 20, coming down through Mach 16, Mach 14, Mach 12, on down like that. When they went through about Mach 15, Charlie was standing there crying. He said,



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"I spent all my life trying to get up to Mach 6, and these guys are coming down through Mach 15." (laughter)

That was the thing with spacecraft. You either went fast, or you didn't go very well. I think probably sometime after we got in people really began to realize this. I think Gemini was going along well. Then Mercury was going along well. They had Gemini following it, and then Apollo following it. Well, all of a sudden there was a goal out there other than just flying a guy in space. When Mercury started, they had all the flap about flying monkeys and things. The first people that went up were monkeys. People would say, "Gee, you have a monkey that can fly, why the hell do you need a human being here to do it?" There was a lot of animosity between the fixed-wing pilots and the garbage can pilots, I used to call them, and I was right in the middle of that. Some of that stuff in Tom Wolfe's book, The Right Stuff, he really captured the flavor between the macho kind of test pilot, and what was this funny stuff that people were going to do in garbage cans?

H: As you know they awarded astronaut wings to the X-15 pilots?

M: Oh, yes. The criteria was to get over 50 miles. Rushworth has them, I'm sure. Joe Engle [Col Joe H.] has them. As a matter of fact, Joe Engle, Ed White, and I all got our astronaut wings together, as I recall. No, I guess we got a medal together. Anyway, Joe had them. Bob White had them, I'm quite sure. And there was every reason to do it. Because when you get up that high, you're like a spacecraft. You aren't up there for very long, but you're up there. But it was a trying time, and I think there is a problem again now with the astronauts. When my group got in, they sort of

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all went in, and when time got ready for people to leave, they tended to leave the whole thing. Slayton [Maj Donald K.] got out. Grissom got killed. Cooper [L. Gordon, Jr.] got out. Then in my group, Borman got out. Then I got out. Stafford stayed in. Ed White got killed. So there weren't very many of us that stayed. Then the following guys, most of those guys got out too. The military was sort of looking at, well, gee, we are sending the cream of our crop off to never return. While you can maybe start out a program that way, you can't continue a program that way. You tend to have the military services say, "Hell, I'm not going to give my best guys to a program like this. I'll give them the dogs." So you've got to have some way to get these guys back. Now the tours are limited. I think they are 7 years with the understanding the guys will go back. They are taking guys out now and putting them in another program. When I left the astronaut program, after having been an astronaut for 7 years, I went into the management. But instead of going back to the Air Force to do it, I stayed at NASA, and I ran the Apollo space program for NASA, which had been done by other Air Force generals. General Phillips was the program director. I was just the program manager for the spacecraft. We had an Air Force general who ran the lunar module for a while. So there was precedence, but I think the military and NASA are still struggling in how one deals with that. Because there was no doubt that to get people who were qualified to fly the shuttle, you are not going to get them out of the civilian ranks. You'd have to have high performance airplane experience. You just can't take some guy and train him to fly the shuttle.

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- H: I've had past interviewees remark that there wouldn't be a NASA had it not been for the cream of the crop from the Air Force making it so.
- M: I think that's true. I don't think it was just the Air Force. I think the Navy and the Marines did that too. But that's right. They really needed the influence that the military test pilots gave to the program because the guys running the programs all came from various backgrounds. The doctors and the psychologists--and the psychologists, they were for flying monkeys. They wouldn't screw things up and you could train them. The doctors, they wanted more medical experiments. They didn't care whether you flew it or not. They wanted to put you up there to see whether your heart stopped or not. The ground controllers, they didn't want to give you a window or any control system. They wanted to control it all from the ground. The pilots had to really fight for the right and the capabilities to fly the thing from the spacecraft. I think that's what really separated our space program from the Russians is that our guys really had a lot of control over the spacecraft, and they could modify what was going on up there in real time. They could take control and shut this off or shut that off or turn this on or modify the profile or whatever. Russians were in these canned profiles. If you wanted to reenter, you sort of hit the reenter button, and everything happens automatically. Well, we had to check this and put information into the computer. We maneuvered the spacecraft ourselves, fired the retrorockets ourselves. And I think that really had a big influence on the direction the program went. We would never be where we are today without having had the guys in there, especially the first bunch of guys, the first and second bunch of guys, who came from some

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flight testing background. They had enough to get in there and fight for what they thought was right. I think by the time the third group got there, maybe even our group, that fight was pretty much over. It was accepted that the pilots would have an input to what was going on. It was very important.

H: The natural progression would largely appear that the astronauts that would have gone through the X-15 program prior to going into Gemini or Apollo, either one, but that didn't seem to be the case.

M: No, I don't really think so, Jim, because we only had three X-15s. From time to time we destroyed one or the other so we only had, I think, one left at the end. There weren't enough of them to really be used as a training vehicle, and the X-15 was a challenge enough to just do what you needed to do. Mike Adams [Maj Michael J.] got killed in the X-15. He'd been flying it. There was a NASA guy that had the thing turn over on him and squashed his back, and he ultimately died from the injuries many years later. It wasn't a toy. It wasn't a training vehicle. It was a research vehicle. If you had used that as a training vehicle and run guys through there, you never would have had enough astronauts to fly the other stuff. And the skills were really considerably different. The basic skills were the same. You had to be able to control things. You had to be able to think. You had to be able to adapt to new environments. One was an aerodynamic vehicle with the nose hopefully always pointed forward. Spacecraft, you could do any direction you wanted in space, and when you came down, you came down backwards. (laughter) You went into one but upside down. How can you do things more screwy? I don't

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think it was necessary to train, and I think you would have stopped the space program by trying to get them through the X-15. You would have destroyed the X-15 program too. Because the data that came out of the X-15 was very useful in things like the B-70, and if we ever build a supersonic transport, and we used it in the shuttle a lot. So it was a research vehicle that could really live on its own. It didn't need the space program behind it. And you didn't want to have that. They were good independent programs.

(Interruption)

I think the shuttle is really derived from the things that we learned from the X-15 and from the garbage can spacecraft. I think a lot of the good aerodynamics really came on the airplane side out of the X-15. That progressed up that way. But even in the garbage can type of spacecraft, Mercury was really a crude vehicle. It was really crude. When we saw the Gemini compared to Mercury, we thought, man, this thing is really a Cadillac. I flew on Gemini 4 with Ed White. It was a 4-day mission. It was the first long duration mission in Gemini. The first one was only three orbits, 4 1/2 hours. The last Mercury flight, all the moisture that had accumulated inside the spacecraft shorted out a lot of the wiring, and Gordon Cooper had to make sort of a manual reentry because water had whipped around. In 1 G it sort of falls on the ground, but up there it just whips around, so it whipped around and shorted out wires and things. So on our spacecraft they put padding around the walls to keep the cold from coming in, but they wanted us to wear our helmets with our face plates down for 4 days, so we wouldn't breathe all the moisture into the cockpit because



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they weren't really sure whether this stuff was going to work or not. I mean it was really pretty crude.

When I retired from the Air Force and NASA in 1972, I went to work for the utility company for 3 years, and I built railroad cars for five or six engineering companies, and then I came back to work for Rockwell in about 1981. So it had been almost 10 years since I'd been near a spacecraft. I went to a reception at the Smithsonian. I was up in the balcony having a drink with some people, and all of a sudden it dawned on me that my Gemini 4 spacecraft was there someplace. So I went down into the museum and I looked around for the thing. I knew it was by one of the doors. Finally I saw it from the rear over by this door. I walked up to it. As I got close to it, I thought, on my gosh, they've taken it down and they've replaced it for a half-scale model. I thought, well, they must have done that to save space or something, but why would they do something like that? It didn't save that much space. As I get up close, when I got right up next to it, I looked in the front, I realized it wasn't a half-scale model, it was the real spacecraft. It looked so small. I thought, my god, I must have been nuts to go up and spend 4 days in space in something like that.

Then, of course, we went through the Apollo which was much more sophisticated. It had better computers in it, multiple computers. The lunar module was an ultra lightweight vehicle, then the shuttle. All those things had progressed to where the Mercury was the beginning of aerodynamics and the X-15 was about the end of aerodynamics from an airplane standpoint. I don't think we'd flown anything faster than the X-15 has ever flown as an airplane. That was the basis

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for the SR-71, the aerodynamics was. So it was a very valuable tool. One was sort of at the old age, and the other was in its infancy. I think the thing that was so nice is that the aerospace industry was able to blend those things together and go on with it. Because Rockwell built the X design and built the X-15, designed and built the Apollo, so they were able to utilize that stuff.

H: Bell built the first.

M: Bell built the X-1. Then there was a D-558. I don't know who built that. Then there was the X-1, X-1A, X-1E, X-2. They had very unstable rocket engines in them.

H: Why did they jump in number configurations all the way up to 15?

M: There were other airplanes along the line that had X numbers associated with them. They were real weird looking airplanes. They were research airplanes, but they weren't high-speed research airplanes. One of them had a real skinny little wing. A couple of them had long wings. Some of them were delta wings. And they all did different things. But the X-15 was the high-speed, high-altitude research vehicle. The other ones, some of them weren't very good. Some of them they only flew one time. (laughter) "Goddamn, we aren't going to fly that again."

H: That one X-15 broke in two on impact.

M: There was one that Scott Crossfield was flying. He couldn't get a start on it. They dropped him over Rosamond Lake. You could vent the fuel. This thing was designed to land

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empty. You could vent the fuel. But when you were gliding down, the fuel vents were at the rear, so if the tank was aimed down and the vent was at the back there was a certain puddling of fuel up in the front end of the tank, so the airplane was a lot heavier when it landed. When he landed, it bent the thing right in the middle, and it skidded along. His two skids, the nose wheel, and his belly were dragging on the ground. Jack McKay [John B.] was the other fellow that I was trying to think of earlier--the NASA pilot. We dropped him up over Mud Lake, I think it was. He couldn't get his engine to start. Same thing, jettisoning the fuel. He couldn't get all the fuel out. When he landed, part of the skids broke off. So instead of the airplane breaking in the middle, one of the landing gear broke which caused the airplane to flip over on its back, and it skidded along on top of the canopy and on top of the tail. It ground the canopy off and as I recall ground the top of Jack's helmet off. It didn't grind his head off fortunately, but he ended up sort of holding up half of the airplane with his torso. And I think he lost like an inch and a half or 2 inches as a result of that accident. It just crushed him down. I didn't know Jack that well. But I used to see him from time to time. I saw him more before the accident than after the accident. Then I left Edwards, and I didn't really see him much. I notice that he died a few years after that with a little thing in his obituary that said he died as a result of his X-15 injuries. Then we had one running up on a test stand up at Edwards where they were running an engine run, and the thing blew up. It blew the cockpit right off the front end. I don't remember who was in that. I think Crossfield was in it too. Maybe Bob Rushworth was in it. Did he mention it?

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H: He mentioned a nose wheel coming down. I don't know how many Mach he was flying, and the thing completely burned up.

M: Oh, really? I didn't know that.

H: When he landed, there was no rubber left on it.

M: Yes. I could see how it would melt off at those speeds. Anyway, they blew another one, blew the nose off. Then Mike Adams lost control of one up at high altitude, and so they came down tumbling, and he got killed. So it was really a hazardous program, and I envy the guys who had a chance to fly them. I'm sorry I didn't.

(End Tape 3, Side 1)

H: Is there anything you would like to add to what you were talking about yesterday?

M: We finished up talking about the X-15 and what an interesting program it had been. How the information that was gained from the X-15 was used to both improve the quality of knowledge with respect to airplanes and how it was also used in the development of spacecraft especially for the shuttle, because of the very high-speed aerodynamics where they can only come from flight testing airplanes at that velocity.

After I submitted my application to the Air Force for inclusion in the astronaut selection program by NASA, I was invited to Washington. We had a screening process, some interviews, a selection process where the Air Force selected either seven or nine of us. They sent us to what we

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jokingly called a charm school. How to do well on interviews, how to conduct ourselves in a selection process. I went through the physical evaluation by the Air Force doctor at Brooks AFB in San Antonio [TX]. That was about a week long. We had some personal interviews in Houston with some other astronauts. I believe it was Deke Slayton, Al Shepard [Alan B., Jr.], and I think probably a third one, I forget who that was. And I think we might have had some written material, a test so to speak. I've forgotten what it covered. Anyway, we were finally notified who had been selected. Of the Air Force guys, there were four of us. Frank Borman, Ed White, Tom Stafford, and myself. We were joined by three Navy guys, Conrad [Charles, Jr.], Lovell [James A., Jr.], and John Young [John W.]. Two civilians, Armstrong [Neil A.] and Elliot See [Elliot M., Jr.]. Of our group Elliot See got killed very early in an airplane accident, and Ed White got killed in the spacecraft fire. The rest of us survived, I think.

After we were selected we had a big press announcement in Houston. It was kind of funny. We were all supposed to check in at some hotel and asked for some name as if it were a real secret. Say it was Larry Donner, Joe Smith or something. I got off the airplane at the airport and rented a car. I was going downtown to this hotel to check in. Alongside the road was this huge billboard talking about some hotel. Assume the name of the guy that I was supposed to ask for was Larry Donner. Say, "Larry Donner sent me." I'm looking at this big billboard. It's talking about this hotel, and on the bottom it says Larry Donner. (laughter) Here we thought we were playing cloak and dagger stuff, and we were just asking for the hotel manager. Anyway, we got



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checked in and had our press conference, and it was really quite an exciting time.

H: One of the questions that I have, I went through the NASA chronology and it pointed out that you and eight others were selected for training in Projects Gemini and Apollo out of 253 applicants on 17 September 1962. To your mind, what criteria do you think was used to select only 9 of the 253? Why were they passed over?

M: I got involved in some other astronaut selections later on where I was on the reviewing committee and did the interviewing and things. First we sort of set a criteria of what we really needed. We also set a goal of about how many people we needed, not absolute. We didn't say we needed exactly 12 or exactly 14. We said we needed about this many. Of course we had the pretty standard requirements that you had to meet to just be involved in the selection process. In our group you had to be 6 feet or less in height. You had to be in good health. You had to have a degree in engineering or the physical sciences. You had to have been a graduate of a test pilot school. You didn't have to be a test pilot, but you had to have been through the test pilot school. So that eliminated a lot of people right off the bat. I think there might have been a requirement for jet flying time. The next group, you did not have to be a graduate of a test pilot school, but you had to have at least 1,000 hours of jet flying time. I think the thing that NASA was looking for was more of what they had when they picked the first group, really people who had some experience or had been associated with flight testing. I think in the first group all of the people were supposed to have been test pilots, but as I recall some of

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them had fairly limited test piloting experience. And the same thing in our group--Frank Borman had not been a test pilot. He was an instructor at the test pilot school. Same thing with Tom Stafford. He had not been a test pilot. He was an instructor at the school. Ed White and I both had been test pilots. The Navy guys, I think all three of them, Conrad, Lovell, and Young, had all been test pilots, and the two civilians were also test pilots. Elliot See for General Electric and Neil Armstrong for NASA. Why they picked the nine of us, I have no idea. I guess you'd always like to think you were the best of the bunch. I really don't know.

Later on though when I was involved in it, what we really tried to do was by looking through academic records, personal history forms, interviews, considering the medical evaluations, we just tried to pick the best guys or girls, whatever it was. It was all guys in those days. Lined them up as best we thought their skills would fit the requirements of what we thought we were going to have to do. I think by the time they'd selected us, they had a lot better feel for what astronauts did. In the first group they weren't really sure whether they were even going to fly in spacecraft. They were still fighting the monkey versus the human being thing in space. Where by the time we got selected, or in the selection process, there had been the Grissom and the Shepard flights. John Glenn [John H., Jr.] and Scott Carpenter [M. Scott] had flown. So there were four space flights that had already taken place, and I think they had a lot better idea of what they were looking for. Then we had a better idea of what could be expected. There were a lot of people, and I was glad to get selected.

H: The 1963 NASA chronology noted that the NASA Manned

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Spacecraft Center announced assignment of areas of specialization for astronauts on 26 January. You were assigned "guidance and navigation" as your specialty. Do you know why you were chosen for this particular specialty?

M: I'm not really sure. Let me talk a little bit about what happened when we first got into NASA. We were told to report I think the 1st of October in Houston, and we would have about a month to get located. The Manned Spacecraft Center at the time was under construction. As a matter of fact, what it really was was a big hunk of ranch land that had some drainage ditches and some underground utilities put in. I don't think there was one thing that stuck out of the ground more than about 6 inches, so it was just a big flat hunk of land. So NASA had 10 or 15 buildings that they had rented throughout the southern part of Houston. The astronauts were all assigned to the headquarters building. There were 16 of us at the time; 7 Mercury guys and 9 of us. The Mercury people were involved pretty much in the Mercury program still. We got there, and the Schirra [Walter M., Jr.] flight was going to take place very quickly. The Cooper flight was on the books after that. There was a backup crewman for each of those. Then there were CAPCOMs [Capsule Communicators] involved in the flights. That job was always done by an astronaut. So you ended up with about five or six of the first seven guys pretty heavily involved in Mercury. At that time Grissom had been assigned to look after the Gemini program in a general way for the astronaut office, and John Glenn had been assigned to look after the Apollo program in a general way in the astronaut office. John was involved in a lot of other things at the time, and Apollo was still pretty far away, so he didn't spend an awful lot of time doing that. And Gus, where he spent a fair

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amount of time on Gemini, was still somewhat involved in Mercury. So when we first got there they decided that there ought be some sort of training program for us, and we went to school, classroom type school, probably 6 or 8 hours a day for 3 or 4 months.

I should say we arrived down there on the 1st of October with the understanding that we'd have about a month to get acclimated and then we were going to enter into the training program. What happened was, I think on the second or third day they were there, somebody decided that it would probably be more worthwhile for us all to go down to the Cape and watch the preparation and launch of Wally Schirra's flight. So we had to hop on an airplane and head off to the Cape. I remember we were staying at a hotel, Shamrock Hilton Hotel, and got the message that our furniture was arriving the next day. In the morning we got that message, and in the afternoon I came home and told my wife I was leaving that evening for the Cape and she'd have to get our stuff all moved in. I had to quickly drive her by the house to show her where it was. She did that the next day, but unfortunately the air conditioning in the house didn't work. And in Houston in the summertime it's unbearable. While it was October it's still summer down there. So she had to end up moving back into the hotel until I got back so she could survive. Anyway, we left right away. We spent a week or 10 days down at the Cape for Schirra's flight.

When we came back we entered into this 3- or 4-week training program. Having had in the last 3 or 4 years a couple of years at the University of Michigan--more than that. In the last 5 years I'd had 2 years at the University of Michigan, 8 months in the test pilot school, 6 months in the aerospace

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research pilot school, I could have taught the courses. It really wasn't anything that was new to me, but the other guys came from various backgrounds. What it really did is, it got us all sort of level of what we were understanding of what really happened in space. It was a combination of theory and practice. Auto mechanics, basic propulsion, electrical systems, human factors, body responses, things like that. Then looking at what some of the systems were in the Mercury, going through the Mercury handbooks and things. Not because we were ever going to fly Mercury, but just so that we would understand what was in the first generation of spacecraft. As we went through all of that, we got to the end of the program, which wasn't very long, and went on a tour of a lot of the aerospace companies. Visited Rockwell, Boeing, Lockheed, McDonnell-Douglas. It was more of the west coast kind of guys and St. Louis. Then we were all assigned to these areas of responsibility as you indicated there. The idea was that we would sort of have a matrix where we had one guy in charge of each of the total spacecraft programs. The Mercury was being handled by whoever was the commander of the next crew coming up, next flight coming up. Gemini by Grissom, as I mentioned. Apollo by John Glenn. Then across the board we were given these responsibilities.

You indicated mine was guidance and navigation, so I had the responsibility for guidance and navigation in Gemini and Apollo. We got a crossover between the two spacecraft. So what we would learn in Gemini we could apply to Apollo, and if it was applicable we could take that experience from Mercury and apply it to Gemini and Apollo. Guidance and navigation wasn't really applicable. It wasn't anything that really happened in Mercury that could be applied to



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Gemini. There were no computers on board Gemini, and it was really all ground controlled, ground computed. So I did have that responsibility. Now why I got it, I have no idea. I would maybe guess that because I had been through the test pilot school and these other things and navigation and guidance were fairly complex that maybe I got it for that reason. But quite frankly I don't have any idea.

I found it to be one of the really interesting parts of the business though because we really were getting into new areas. Since we didn't have a computer on Mercury, there was nothing you could do as far as controlling where you were going to go off of Mercury. Gemini was an entirely different thing. We had a computer which helped calculate where you were during launch. We had a computer that steered the spacecraft during reentry. We had a computer and radar system that was used for navigation during rendezvous, and the spacecraft itself could actually maneuver in space by not only changing its attitude like the Mercury could do, but it also had thrusters which could change the velocity so that your orbit would change which allowed you to do rendezvous and other things like that. So it was a whole new ball game. In Apollo, again, we had to have some very sophisticated, much more so than Gemini, computational equipment and inertial measuring units. That system was capable of actually steering the whole rocket complex spacecraft into orbit if the rocket or launch vehicle computer failed. Then it could be used to make the transfer to the lunar orbit or to the lunar transfer and then you could use it to go into lunar orbit, maneuvering around the Moon, and then come back to Earth, and it would do the reentry at Earth. Plus the computers in the lunar module were used to steer the lunar module down to the

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proper place on the Moon and then bring it back up and do the rendezvous and the rejoining of the two vehicles. So it was a lot more complicated, very time-consuming in working out the details. It was one of those problems similar to the other things which happened in space where you never had enough weight or volume or space, space in the sense of computer storage, to do the jobs that you needed. So trying to get all the things that we needed crunched into our computer and not making it any bigger than necessary was kind of interesting.

I might say that was a unique way of working on the programs because we used that concept all the way through Apollo. When I got assigned to a Gemini flight, then somebody else sort of looked after guidance and navigation. When I came off of Gemini 4, I was a CAPCOM on Gemini 5. Then I went over to the Apollo program, and I was the astronaut that was in charge of the whole Apollo program for the astronaut office. I had working for me people who looked after those systems, propulsion, environmental control, electrical, communications, guidance and navigation, guidance and control. So it was a good concept that we came up with, and we continued to use it throughout the space program while I was there.

H: Did NASA do a psychological profile on each of the astronauts to see if they would be compatible as team members to one another, or how did that work out?

M: We had some psychological testing done, but I'm not sure that was ever used in teaming up the guys. As a matter of fact, I don't really know how they got teamed up. I think it was more the dart board game than it was some very

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complex psychological evaluation. When I graduated from the test pilot school, the Air Force was looking for what they called "motivated volunteers." They were doing some stress tests that had been underway for quite a long time, and they would select volunteers from throughout the Air Force. They were mostly enlisted men. I guess they had some civilians, a few officers. Then they would run them through this battery of stress tests, and they were trying to find out what people could handle in the way of stress. The tests included either putting your hands or feet in a bucket of ice water for some period of time. That hurt. Most people did it, but a couple of really tough guys couldn't handle that. There was a thing called the double masters test which was an EKG type test where you had to go up and down some steps for a long period of time. There was a test where they put you in a Navy Mach 1 pressure suit helmet, put your head in that, and then put you under water, turn all the lights out, and you stayed under water for a couple of hours. When I went in there, I just fell asleep. They ran you on a centrifuge at certain G levels. After that I worked on a number of centrifuge programs for the Air Force and NASA before I became an astronaut, so that was my introduction to centrifuge. We had to sit in an altitude chamber equivalent of 65,000 feet altitude in a T-1 pressure suit, which is the first pressure suit. That was a very difficult thing. I think there were only two of us or maybe three of us that didn't pass out during that. As a matter of fact we had one guy, an Air Force officer who wasn't part of our group, who wanted to get involved in this stress testing. He was assigned down here in Los Angeles someplace. He finally talked his way into getting involved in the program. He came up, and during this hour-long session sitting at 65,000 feet, his heart stopped. They were

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able to revive him. He didn't die, but he was grounded and never did get a chance to fly again. So that wasn't a very clever thing on his part. That was pretty hazardous. We had one guy in our group accidentally disconnect his pressure suit and dumped the pressure in his pressure suit. Fortunately they were able to bring the altitude chamber down quick enough so that it didn't kill him, but it could have. Then we had to sit in an oven at 170 degrees for an hour. They put us on some vibrating machines that vibrates you at different frequencies. It's interesting that each one of your organs vibrates at a different frequency. So at one frequency your stomach is going up and down, then your kidneys, then your bladder. Anyway, when we went through all this stress testing, we were able to do a much better job than the average subject that they had, or I guess I could put it a different way. We were stupid enough to try to stick out the entire length of time of each one of the tests, and it really came up with a different set of data points for the people who were doing research.

Well, during all that we also got involved in a bunch of psychological testing. I don't remember why. Later on when we did the psychological testing for NASA, those of us who had been through it were sort of like old home week. We didn't have the same psychiatrist and psychologist asking the questions, but the questions were still about the same. They were just as stupid the second time as they had been the first. We as a group of astronauts really didn't put much credence in that kind of testing, and, quite frankly, I don't think that any of this psychological testing was ever used in teaming people up.

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H: But didn't it stand to reason that certain people were more compatible to one another than others, and it could have been in other instances where somebody couldn't stand a particular individual?

M: Well, if one guy couldn't stand him, probably nobody else could either. I don't think it was so much a matter of two guys getting together who were compatible, but if you had a real ass, it was hard to live with him no matter who you teamed him up with. Maybe they just wanted a team of guys who were less sensitive to that rather than people who were compatible with him. I was fortunate. I was assigned with a good bunch of guys. Ed White and I, as I'd mentioned earlier, had gone to school together. We lived on the same street up at Ann Arbor, Michigan, for 2 years. We went out through the test pilot school together. We were selected together. We shared the same office when we first got down to Houston. When they assigned these technical responsibilities, I was given guidance and navigation, and he was given guidance and control. Sort of very much overlapping, so we worked very closely together on our technical specialties. Then we were assigned to fly Gemini 4 together. I'd have to say he was probably the best friend I've ever had here on Earth. We got so used to each other that we almost didn't have to talk. I could tell what he was thinking. The same thing with him with me. We really were very, very close. We were about as compatible as any two people could ever get to be. I don't think I established quite the same relationship with the other fellow that flew on Apollo 9, but we were still good friends and got along well. I think we had respect for each other. I'm glad I flew with those guys instead of some of the other



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ones. There were a few of them I would have preferred not to work with.

H: I have a few little landmarks here that maybe you can identify with. The 1964 NASA chronology stated that on 27 July "NASA Manned Space Center named Capt James A. McDivitt, USAF, and Capt Edward H. White II, USAF, as pilot and copilot to the second manned spaceflight of Project Gemini, GT-4, 4-day earth-orbital mission in early 1965. Astronauts named as backup crew for the flight were Maj Frank Borman, USAF, and Lt Commander James A. Lovell, Jr., U.S. Navy." How did you react to this crew selection?

M: Rather enthusiastically as you might imagine. We had not been involved in crew selection for the Mercury at all. When we got there it was pretty well set. We knew who was going--like I said Wally Schirra was only a few days from flying his flight. Gordon Cooper was going to fly the next flight. He was the last of the Mercury astronauts to fly. Deke Slayton was grounded because of a heart problem. So we were all anxiously waiting to see how things were going to go with respect to the Gemini crew assignments, and the program was moving along fairly quickly. As I mentioned earlier, Gus Grissom was assigned to look after the overall program, and so we sort of expected that he would be assigned to fly the first flight, but it turned out that he really wasn't. Al Shepard was named, and I forget who was the copilot that was named with him. But Al Shepard was named to command the first flight. Shortly thereafter, Al was grounded because he had an inner ear problem. Then Gus Grissom was named to fly the first flight with John Young as his copilot. I don't even remember who the backup crew was for that right now. I think it might have been Cooper and

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Conrad, but I'm not really sure. Anyway, when one of our guys was assigned to fly the flight, we were really all ecstatic about that and lined up a lot of celebrations and things. It wasn't long after that that they picked the second crew, and I was named to command it. I was really stunned when that happened because there were a lot of Mercury guys still who hadn't been assigned to fly another flight, and I was picked to be the first commander out of our group. I thought, gee, that was really great. We didn't have any of the old guys on our team. We were just four guys that had all been selected together, which meant we all were going to have to learn together. Borman and Lovell were a couple of other good guys. So I was really happy about the whole thing, really pleased.

H: Was there much family pressure of the astronauts participating in this sort of thing?

M: The family, meaning against it or for it, like their wives and their children? Well, my wife was very supportive of all this. She and I met when I was a fighter pilot. She understood the problems of being married to a fighter pilot. I was in the Air Defense Command at the time.

(End Tape 3, Side 2)

As I was saying, my wife was quite understanding about that. When we first met I was a pilot in the Air Defense Command. A lot of times we'd get called back to--we'd be on what we called hour alert where we couldn't be too far from the base. I remember one time she'd decided to take me out to dinner. We'd only been dating a month or two, and she was going to take me out instead of me taking her out for a

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change. We were over at the officer's club at Fort Dix, and they got this phone call and somebody said, "Red Apple," or whatever the code word was to come back. We'd just ordered and our dinner was just being served, and I said, "I've got to go. You want to stay here and eat or do you want me to take you back to where you live?" She said, "Well, just take me back." So we got up and walked out and left our meals there. A number of times when we'd have a date to go someplace, I'd get a scramble, and the weather would close in. I couldn't get back to the base. I'd end up at some other base. And some other guy would take her to the thing. He'd have the tickets for the play or whatever it was. Anyway, she was sort of accustomed to that. Then I'd been a test pilot out at Edwards for 3 years. While there weren't any guys in our own organization that got killed or anything, we had a number of them bail out and a number of other people flying out of Edwards were killed. She got accustomed to those kinds of things. I had that accident that I think I mentioned earlier. I just called her up from the hospital and said, "Hey, listen, I just had an accident and I'm okay. Don't worry about it. I'm over at the hospital, but I didn't get hurt." She said, "Okay." So she just went about her business. She was very good about all those kinds of things. So when I talked over with her applying for astronaut training, she was very supportive of it. When we got down there, she thought it was fine.

My children were still pretty young in those days. As a matter of fact, one of them wasn't even born. But I remember telling them one morning about the fact that they were going to make an announcement that I was going to fly the next flight. That was in late 1964, and my children were born in 1957 and 1958 and 1960. So one of them was 4,

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one of them was 6, and the other one was 7. I got the kids together, and I was going to make this big announcement, this grand, grand announcement. So I told them. Then my older two, the 7- and 6-year-old said, "Oh, we'd already heard that at school, daddy." That I was going to fly on the next space flight. My younger son, Patrick, said, "Oh, daddy, there's a fly on the milk bottle." (laughter) You could see it was really a big deal to them, and they wanted to go out and play. They didn't care about all that junk. It sort of put everything in the proper perspective.

H: How quickly did you get into this goldfish bowl environment?

M: Instantaneously. When we went through the selection process where they were interviewing a lot of people in Houston, that wasn't a very big deal. We flew in and out of Houston at different times, and they didn't have everybody there at the same time. But when they made the grand announcement, as I mentioned, we all got together and had to say, "Larry Donner," or whatever it was that was the guy we were supposed to see. We all got together. I think we spent the night at the hotel. Maybe we just checked in. Then we had the big announcement. My God, there were ten billion reporters, cameramen, TV, still photographers, radio, everything you could think of. We had this formal press conference. They asked a bunch of stupid questions which we probably responded to in an equally stupid manner. From then it was on. You were then an astronaut.

I remember sort of our last night on the town before anybody knew who we were. It was after the announcement, but nobody really recognized our names or anything yet. I guess we were all staying at this hotel. There was a trucker's

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association convention in the hotel. I think it was the Rice Hotel in Houston. Anyway, Ed White and I decided we'd go crash the party. So we walked up and told them we were from the Acme Trucking Company or something, went on in and had a couple of drinks, and just looked out the window at the city, and all that kind of stuff. I remember Conrad and Lovell came up, did the same thing. I think Neil Armstrong came up, and he did the same thing. So we were having a pretty good time, and Pete Conrad was really a very gregarious guy. I think Neil and Ed and I were sitting over in a corner having a drink talking about something, and Pete Conrad and Jim Lovell were over someplace else, and Conrad was making a lot of noise. Finally the guy who was at the door when we came in came over to us and said, "Listen, I know you guys aren't truckers." (laughter) He said, "I don't mind if you stay, but you've got to get that ass over there out of here. He's making too much noise." So we thought we really didn't need to start on our astronaut's career by getting thrown into jail, so we went over and got Pete and Jim and we all left. If we had done that a month later, I mean it would have really been bad. But we really got into the fishbowl thing right away. Whatever you want, people wanted autographs, stopped you and wanted to talk to you. Your life ceased to be your own.

H: How quickly did it become a real bother?

M: Well, it never bothered me. Even to this day before I came in here, I told you I had to sign some mail and some documents. I think I signed this morning a request for about five autographed pictures, and there were autographed cards in there. I signed about eight or nine of them. I still get those almost every day. I can't believe it. It's



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been 20-some years since I flew my first space flight, and almost 20 years since I flew my last one, and I still get those requests every day, every day, every day. I've always looked at it as a privilege that I had that was paid for by the taxpayers, and I benefited from their efforts, and it's sort of my responsibility now to respond and do whatever I can to help out. I had a lady in recently who is writing a book about astronauts. She came to interview me. I spent about an hour with her. She was saying that a couple of my friends said that she could interview them for \$5,000 a piece. I think one of them wanted \$10,000 for an interview. I've never done any of that stuff. I've never charged a penny for an interview. I've never made a penny by endorsing commercial products or anything like that, and I've probably spent as much time doing it as most of the other people. I don't charge for people who ask me to go speak except if my company won't pay the expenses. Then I've got to pay the expenses. I've always felt that it was my responsibility to do this, so it really doesn't bother me. It's inconvenient sometimes, and I can't accept all the requests I get because I wouldn't have time to do anything else. But I try to do what I think is my fair share and take care of what's still my responsibility. Everybody didn't feel that way, but I did.

As a matter of fact, during the time that we had the astronaut program going on and I was a participant, there was always a lot of hassling about responding to these requests. Congressman so-and-so would call up and he'd want you to go to the strawberry festival or the watermelon festival. It would appear to be some jerky little thing that didn't make a damn to anybody, so the astronauts really didn't want to go. First of all, let me say that we couldn't

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possibly take care of all the requests we had because we would have all been gone every day, every week, and nothing would have ever been accomplished as far as getting on with the flying. So we couldn't make them all. But there were very important people in Congress who were supporting the program and wanted to be able to take an astronaut into their district and show the people in their district that they could bring an astronaut there and let their people see what one looked like and all that. There was a lot of controversy inside of NASA on how this ought to be handled. Jim Webb who was the NASA administrator was one of the finest politicians I've ever seen in the skills of the trade. I used to joke, you could walk up and it didn't make any difference what you said to Mr. Webb, he'd respond with a speech on the space program. You could say, "Good morning, Mr. Webb," and he'd respond something to the effect, "Yes, it is a great morning. It's a great morning for the space program, and we are really moving ahead, and we are going to do all these things." He was a consummate politician, and he was the kind of guy the space program really needed at the time. He understood a lot better than the astronauts did the value of political support for the program. We didn't. We were too naive, I think, too involved in the technical aspects of it, protecting our families, or other things like that. We really should have been. So there were a lot of confrontations between NASA management and astronauts over public appearances. In retrospect, I think that the NASA management was correct, and the astronauts were not correct.

H: Did that pose a problem with you when you and your family went out to eat or take part in any public function?

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M: Not really. Around where we lived our neighbors saw us all the time. If I was out in my yard in my shorts working in the yard and was full of dirt, was sweaty, and stuff like that, the glamour really wore off in a hurry. People who knew us just knew us as people. I think you would find a lot of times when your neighbors would have their relatives from out of town come in, and they'd want to meet an astronaut, so we'd go over and do all that kind of stuff. We used to have tour buses go by our house all the time. They'd stop. You'd be out there mowing the lawn or working. They'd all stop, and you'd hear the tour bus guide say, "Now, there's Jim McDivitt. He's working in his yard. He's the commander of the Gemini 4," and yak-yak-yak-yak. After a while you just ignored them. Occasionally, people would jump off the bus and run over to try and get an autograph or something. Normally, if they weren't really a pain in the butt, if they were not obnoxious, I'd normally respond. Some of the guys used to have fun with them. John Young who has a tremendous sense of humor. And, of course, there were people driving by all the time too. His favorite thing was, they'd always say, "Do you know where any of the astronauts live?" He could speak with a Spanish accent, Mexican accent. "No understand, senior. I'm just a gardener." (laughter) Or he'd point them down the street someplace. Shepard was bad. They'd come up and say, "May I have your autograph," and he'd write down John Glenn or Gus Grissom. He'd write somebody else's autograph. (laughter) These guys played around a little. I was pretty straight. I didn't feel sorry for the people, but I felt they were just trying to show their support or whatever you wanted to say for the program. I learned to live with it.

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- H: The 1965 chronology noted that "Gemini GT-4 countdown at Kennedy Space Center with astronauts James A. McDivitt, Major, USAF, and Edward H. White II, Major, USAF, was delayed because of a minor fueling problem. Launch of the GT-4 mission was scheduled for June 3d." What was the nature of these fueling problems?
- M: As we got close to flying, our training program was going on fairly well. As we got close to flying, we decided that we would do an EVA [extravehicular activity], to go outside the spacecraft. When I say close, I mean something like 2 to 4 months before flight time. We decided that we could probably do this. Gemini 3 flew in something like March or April. I remember it was still cold up north. We decided to add this extravehicular thing to the program, but we were going to do it very secretly, because the Soviets had not done anything like this. So they started developing in a frantic way equipment to go outside with. It was a little pack that ultimately Ed White wore on his chest. We developed a little maneuvering unit which was two bottles of nitrogen and a couple of arms that had little nozzles on them, two of them pointed backwards, one of them pointed forward. We had an air bearing table that we got on. Ed and I both practiced with this maneuvering unit. We started practicing getting in and out of the spacecraft in a pressurized suit in 0 G. We found out that the damn seats were not sized properly.

As a matter of fact, I think NASA spent more money redoing the seats for me than they probably did anybody else. When I first got in the program, I was asked to fly up to St. Louis very quickly one day. They were having a review up there. I put on a pressure suit and went out and got in a

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model of the mockup of the spacecraft. They closed the hatch and it fit. I said, "What's the matter?" They said, "Well, you have the tallest seating height. We wanted to make sure you fit in it." About 2 weeks later I got another call to go back up there. They'd made a mistake. They'd put me in the thing where I was sitting vertically like we are here in these chairs, and, of course, you never sat in a spacecraft that way. Because when it was on the pad, it was pointing straight up at the sky, so you were really lying down in it.

So I went up and got in the thing that way, and the hatch wouldn't close by about 4 inches. So we had to redesign the seats so that I'd fit in that. Then when we started doing the EVA training where we were pressurized and trying to get into the seats in 0 G, they didn't fit again. So we had to redesign the seats all over again. We were fighting for like a quarter of an inch of vertical height. So we went through that change in the spacecraft.

We put in some connectors in the spacecraft so we'd get oxygen to the hoses that went out to Ed. We tried to decide who was going to go. Finally we decided that I was the commander, and commanders are supposed to command and that means if we are going to do EVA it would be Ed's turn to do it, so he did that. Anyway, we got all set to go. We redid the stowage, which meant that we had to go change all the places that we were going to stow things so we could put all the extra equipment in the spacecraft. We got all set to do that, and then a week or two, maybe 3 weeks before, the Soviets had a space flight, and one of their guys went out. Leonov [Aleksei A.] went out. So they did the first EVA. We were really crushed over that. But as we got down to the



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flight time, the flight date slipped a little bit because of all these preparations for it. But when we got down to the actual date of launch, I don't recall a fueling problem, but we did have a problem which delayed it.

Oh, a few days before the flight they were tanking the spacecraft up with water. They had a very complicated plumbing system, and they got the valves in the wrong place. So as they were putting the water into the tanks for the flight, they were supposed to hold maybe 40 gallons say, or 50 or whatever it was. Say it was 50. Pretty soon it went 40, 45, 50, 55, 60, 65. Obviously they had more water in the tanks that it could hold, so something was wrong. They stopped and went back and checked. What happened was the water was going into the tanks and going out of the tanks and got into the pressurization system in the air loop. I went down and got in and looked in my hydroxide canister which is a big canister about 3 or 4 feet in diameter and about 3 feet high. It was filled with lithium hydroxide. It's a chemical that takes carbon dioxide out of the air. It got in there, so they had to take the seats out of the spacecraft and take the lithium hydroxide canister out, replace it with a new one, dry the spacecraft out. That slipped the date a few days. My birthday is 10 June, and I was hoping they would keep slipping until I was up in space on my birthday, but unfortunately it didn't make it.

Finally on 3 June, that was the launch date, and we finally did launch on it. But when we got ready for launch we couldn't get the tower down. This is the umbilical tower. For a Titan rocket launch, the way they did them at the Cape in those days, we launched them not from a hole but from the surface. There was this big tower that was hinged

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at the bottom and leaned up against the side of the rocket, and at the top of it was the white room. When they got ready to put the thing down, they would collapse the white room and then this arm would pivot at the bottom and lay back down on the ground. Other rockets, sometimes they were on wheels and they moved them back. But you had to get it away from the blast of the rocket. You also had to get it away from where it might get hit by the rocket on the way up. Then there was just a little umbilical tower left standing. For some reason or other there was an electrical problem, and as this big tower would start going back, it would blow a circuit breaker. Then it would stop. Then they would get the circuit breaker back in. They could get it to go back up, but then they couldn't get it past about 45 degrees, and they had to get it down to 0 degrees. Finally the crew in the blockhouse got two brooms. One guy got on one side of this big circuit breaker and the other guy got on the other side with these brooms, and they just held it in so the thing went on down and finally laid down.

A couple funny stories about that. One was that after the flight they took those broom handles and cut them up sort of like big quarters, about a quarter of an inch thick, half inch thick, and gave them to all the launch crew. Then the ends of them, they gave to Ed and I on a little plaque. Ed had one, and I had one. The thing that this provided was, of course, a delay, which gave us a chance to talk to our wives on the telephone, and both Ed and I had fallen asleep in the spacecraft. (laughter) They called us up and said, "What are you guys doing up there?" We'd fallen asleep, so our heart rates had really gone down low. Then another thing they did when they were fooling around with it, bringing it back and forth--first of all I should say I

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don't like heights. We were pretty high up on the top of that thing. It was sort of like a U, and this U fit right around the spacecraft. When it would start back, as soon as the U got clear of the spacecraft, it would jump over about a foot and then it would lean on back. Well, when they would bring the thing up, as it was coming, I could see it out the window. As it was coming, I could see the U, and the U wouldn't be lined up with the spacecraft. It'd always look like it was going to hit the spacecraft. Right at the last instant, it would jump over and line up and then it would come forward. I kept thinking, if that damn thing doesn't move over at the last instant, it's going to hit the spacecraft and knock us right off the top of this rocket, and it's going to be a long fall to the ground. Well, it never did, and so we finally did get launched, but we were maybe an hour or two late.

H: What kind of sensation was that?

M: The launch? It was really a lot of fun. We had done a lot of training, a lot of simulations, and everything that happened in flight except two or three things we'd simulated. The one thing that we hadn't simulated was during the launch count. As you got very close to engine start, they opened up the propellant valves, which allowed the propellant to start moving towards the engine, and there was this great, big, gushing and gurgling sound as the propellants in the upper tank, whichever one it was, flowed down through the column into the engine chambers. You all of a sudden could hear this (gurgles). I thought, oh hell, what's that? Finally, we figured out--not finally, but almost instantly we figured out what it was. Then the engines lit up and we took off, and it was, of course,

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something we'd never experienced before. It's much different than most people think. You don't take off with 8 or 10 Gs of force. The rocket is full of fuel so it's very heavy, and the engines put out a certain amount of thrust. Normally, you take off about  $1\frac{1}{4}$  Gs. Then as the rocket propellant burns up and the total vehicle gets lighter, the rockets continue to produce the same or a little bit more thrust as you go up in altitude. So the weight goes down and the thrust stays the same, so the G level goes up. So on Gemini the G level went from about  $1\frac{1}{4}$  up to about, it was either 4 or 6 on the first stage, then it staged. That was exciting because you are going along at either 4 or 6 Gs, and all of a sudden you are down to 0 Gs, and then you're back up to when the second stage ignites after you drop the first stage off, you go right back up to a high G level. As I recall, on Gemini, we went from on the second stage from either 4 or 6 Gs up to  $8\frac{1}{2}$  Gs at burnout. Once you get up above about 6 Gs, it starts getting annoying, and when you get up to 8 Gs it starts to hurt. It does me anyway, right in the middle of my chest. When we got to the end where we were at orbital velocity it just shuts off. So you go right from  $8\frac{1}{2}$  Gs to 0 Gs. That was really exciting. Then we're in orbit. It was quite a thrill, quite a thrill.

H: It's a great amount of Gs to no Gs just in a matter of----

M: In a split second. I think normally one would have had the opportunity to say, "Gee-whiz, wow," and look outside and all those things, but we were going to do this extravehicular activity thing, an EVA, right away, very quickly. What I was supposed to do was disconnect from the rocket, separate from the rocket, and then pull out in front, stop, turn around, and face the rocket, nose to nose

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so to speak, from a short distance away, and get stabilized, and then we were supposed to align our platform in case we had to come back in on the first revolution. I did this. I turned around, got aligned, got the spacecraft stabilized with respect to the rocket, and then went into an alignment mode. Well, as soon as you start the alignment mode, you destroy the alignment that you already had, which is the one we had at launch. Then it takes awhile for this thing to stabilize, and you are supposed to hold it steady for like 10 or 15 minutes. Well, I turned around, which destroyed the alignment. Then I was committed to getting the thing aligned. In the meantime I thought I was stabilized with respect to the rocket, and our relative position started moving, and the rocket started moving away. I thought, gee, I'm not stabilized, but I really can't thrust around much or I'll screw up what I'm doing with respect to this other thing, and I thought I could just maneuver over to the rocket as soon as we got aligned. Well, instead of moving slowly as it did when we first started, it started moving away faster. It was tumbling. Later on after the flight, we determined that when the rocket engine shut off it opened up the vents in the tanks, and we were venting fuel overboard which is the same as a low pressure rocket. While I had stabilized with respect to the big rocket, the big rocket was thrusting, the second stage of the Titan. So it just started maneuvering around, and we couldn't figure out what the problem was. Anyway, I curtailed my alignment as quickly as I could and started chasing the rocket. We'd get up close to it, and then it would get away from us again-- again because of this venting of the fuel.

Very quickly we got into darkness because of the delay in launch. We had to go half the Earth in darkness. When we



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were practicing for the EVA, we figured we had to have lights on the rockets, so we put two lights on the rocket that were strobe lights, real bright, flashing white lights. Well, that was a very stupid thing for us to have done, because when you've got a cylinder--well to judge distance, and you are going to judge distance off of the lights, you have to have a pair of them so that you tell the distance between them. And it's hard to judge the distance to a single flashing bright light. We had put two lights on the rocket. At no time could we ever see both of them. No matter how you'd turn the cylinder, you could only see one of them unless you just got it exactly right, and then you could just see the edges of the two lights. So you knew that you were perpendicular to the two lights, but it didn't tell you much about distance. Well, that was a bad mistake. And with this thing thrusting around in the dark and me trying to chase it, first getting close to it and then trying to get the hell out of its way as it looked like it was coming towards me, I really used up a lot of fuel. When we came back out in the daylight, I called Houston and said, "Houston, can you tell me what my orbit is? I'd done a lot of thrusting, and I want to make sure I'm still in orbit." Well, the guys on the ground almost all died. (laughter) They didn't know whether I was coming down or staying up, and I wasn't sure what it was either. I'd just assumed that the rocket was in orbit, and as long as I was near the rocket I'd be all right. I'd still be in orbit. Well, it turned out that the rocket finally got away from us in the darkness. It almost ran into me two or three times, and I finally said, "We're going to get killed up here doing this. I'd have to wait until I got into the daylight." By the time we got into daylight, it had maneuvered quite a ways away. So we just eliminated that from the plan. What we

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were going to do is try and do an EVA where Ed would go over and take a patch off the thing and put it back in our spacecraft. It didn't have much scientific value, but it had a lot of PR value. Well, anyway, we eliminated that.

(End Tape 4, Side 1)

We started then to get ready for the EVA. It really took longer than we had expected. We had practiced it many times on the ground in a simulator, but it wasn't exactly like being in flight. During the course of chasing this rocket around at night, I couldn't help Ed get ready, and he was falling further and further behind the time line. When we came out on the daylight side, we were not ready to do the EVA, so we delayed it one revolution which gave us adequate time to get ready to do it. Then the next time we came around in daylight, we did go out, or we did open up the hatch and he went out.

A couple of interesting things happened getting ready. First thing was our flight was the first long-duration flight, 4 days. We had never flown more than a day before, so we had a lot of medical experiments that they were doing with us. One of which was we had a blood pressure cuff inside our pressure suits. We had a little bulb. The blood pressure cuff had a little tube on it like they normally do, and that tube ran up our arm down across our chest to a little fitting on our suit. We were supposed to put a little bulb in that fitting and pump the blood pressure cuff up the same way that the nurse would do in a doctor's office. Well, it was supposed to be a fitting on top of that other fitting which was to prevent your suit from deflating in case the blood pressure hose failed. We were

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going through our checklist to get ready to open up the hatch and got to the point where it said check your blood pressure fitting on your suit. We did, and it wasn't there. I said to Ed, "I don't have one." He said, "Well, I don't have one either. What do you think we ought to do?" I said, "Well, let's hope the blood pressure cuff doesn't fail." We just went without one, so we had a hole in the suit. Somewhere between us and eternity was our blood pressure cuff. Fortunately they held together.

Another thing that was really quite serious was we got ready to open up the hatch, and as Ed started to unlock it, it wouldn't unlock. One time during an altitude chamber test some months before in St. Louis, we were practicing an EVA. We were going to open up the hatch and then close it. We got the hatch open okay, but when we brought the hatch back down to lock it, it wouldn't lock. It didn't make any difference because we were at the end of the altitude chamber test, so we continued on in a pressurized condition. When the test was over, they just brought the chamber back down to sea-level pressure, and we got out. I finished getting dressed first, and I went back out. There was a technician working on the hatch, so I worked with him while we found out what was wrong with it. There were some new cogs that had teeth that had to go together and some little friction devices that had to move those teeth out so they could engage with the other teeth on this big long handle. Well, I had worked with them on that thing and I saw how it all operated.

When we got ready to open up the hatch and the damn thing wouldn't unlock, I thought, oh, it's probably not going to lock either. Ed said, "What do you think we ought to do?"

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I thought about it for a while, and I sort of went through mentally what I remembered from 4 or 5 months before on how it went together. I thought, well, I hope I can get it fixed. I said, "Let's go ahead and open it up anyway. We'll try it. I think I can get it fixed." So we went ahead and finally got the hatch open. Then Ed went out. We got all those spectacular pictures. He floated around out in front. There was a lot of stuff written up in the newspapers about how he was in an euphoric state and he wouldn't come back into the spacecraft and all that. Well, that really wasn't the case. I was trying to get him back into the spacecraft in the daylight. I could see the darkness coming. In other words, you are moving across the horizon. I wanted to get him back inside the spacecraft in the daylight, so if we had trouble with the hatch, I could see what we were doing to get the damn thing closed. It turned out that by the time he did get back in and get down in the seat and got the hatch closed, we were in the darkness, and the hatch would not lock, which meant we were going to get burned up on the way in if we didn't do something about it--either that or drown when we hit the water. So we weren't in a very good shape, and he hadn't even seen the mechanism. I was sitting on the left-hand side, and he was sitting on the right-hand side, so I really had to work on the right-hand hatch from the left-hand seat in the dark, pressurized. So I got my finger up in there and fiddled around with it and pushed on it and tried to figured out where the little cogs were, and I finally got them pushed together, and we did get the hatch locked which was a very pleasant sound or feel when we could feel the gears began to engage and we could pull this lever in, and we knew we had this thing made.

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Anyway, when we got this thing locked, the plan was then for Ed to take all this junk off that he had on--these big long hoses and this box and his little gun and stuff--and get plugged back into the ship's system. Then we were going to open up the hatch again and throw that stuff out. Well, I didn't mind risking that to do the first EVA, but we weren't going to do it to throw that junk out. So we ended up flying our whole flight with all these 40 or 50 feet of gold-covered hoses and this little box and all that. We kept it down in one foot well and the other foot well because we couldn't store it back where we got it out. There was no way. You'd have to have rubber arms and 14 joints to be able to stuff it back in there. As a matter of fact even during reentry we finally folded it all up, and Ed put it on his lap during reentry.

H: The 1965 NASA chronology stated that "a homemade U.S. flag carried by astronauts Virgil I. Grissom, Major, USAF, and John W. Young, Lt Commander, U.S. Navy, on a March 23d Gemini 3 flight was hoisted at NASA Manned Space Center the moment astronauts James A. McDivitt, Major, USAF, and Edward H. White II, Major, USAF, went into orbit. The flag would be flown only while astronauts were in space flight." Has this tradition continued?

M: No, I didn't even know that. (laughter) I don't know. I really don't know about that, Jim. One thing about the flag that I do know is that during the Mercury program all of the spacecraft had names. Friendship 7, Aurora 7, and something 7. When we got to Gemini, we all wanted to name our spacecraft. Because Gus's spacecraft had sunk during Mercury, he jokingly named his spacecraft "Molly Brown," the unsinkable Molly Brown from the musical. Dr. George



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Miller became the NASA Associate Administrator for Manned Space Flight along about this time. Brainerd Holmes had left. George didn't like the idea of the astronauts naming their spacecraft, so he forbid people to name their spacecraft.

Gus and John went ahead and called it the "Molly Brown" anyway. A couple of times during the flight the flight controllers referred to it as the "Molly Brown," and I guess George Miller just about lost his mind over that. We wanted to name ours the "American Eagle," and Miller wouldn't have anything to do with that. I pleaded with him and pleaded with him and cajoled him and pleaded with him where there wasn't anything wrong with the term "American Eagle" and while he didn't like the "Molly Brown," how could he not like the "American Eagle?" Well, he wouldn't have anything to do with that, and he insisted that we be called Gemini 4. All of the backup crews used to do little things, put little cards around in the spacecraft and stuff, funny little things for takeoff. When we got in they had this little taped name on the instrument panel the "American Eagle." But we didn't get a chance to use "American Eagle." A lot of the guys then had patches that they had made up. They had little insignias or something. We didn't have an insignia. We didn't have a name for our spacecraft. So we thought, well, we had a NASA insignia that was on the pressure suit. Here we are American pilots flying these things, and we don't even have a flag. So Ed and I asked the program manager to see if he could buy some flags for us in Houston and bring them down to the Cape, and he did. We had these two American flags sewn on our sleeves. All the astronauts ever since have had an American flag sewn on the sleeve of their pressure suits. I don't know much about the

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flag that went up and down the pole, but I do know about those that went on the pressure suits. We had them sewn on there.

H: What was the original purpose in your trying to align up with this rocket when you first got into orbit?

M: Well, the concept was that we wanted to see what people could do when they went outside the spacecraft. The concept probably would have worked if the rocket wasn't thrusting around and tumbling, but we were really aggressive in what we were trying to do. The concept was that you'd fly up right next to this rocket. Ed would get out of the spacecraft, and with his little maneuvering gun he'd fire it, and it would propel him over towards the upper stage of the Titan rocket. There were a couple of metal patches that we had put on the top of the rocket. He'd go over there and retrieve those things. Then we'd bring those back and put them in the spacecraft and take them back down to the ground. Then the people would be able to examine those things and determine the kind of heating that rocket saw during launch and a few other things. It wasn't of any great technical value. It really was more of, what could you really do up there? I think in retrospect it was way too aggressive, but you can't succeed in these kinds of things unless you set pretty high goals, and we set some pretty high goals. The thing that we thought we overlooked was the fact that the rocket when it shut down didn't stop thrusting. It still had that small venting which caused it to not only move around the sky relative to the other spacecraft which wasn't thrusting but it also caused it to tumble. So it was tumbling, and it was really totally impractical to do what we had tried to do. The thing that we

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never had a chance to evaluate was what happens to the rockets afterwards because the guys never bothered to look at them. As long as they came off the rocket, they just forgot the rocket and went about their business in what they were doing. So we found out that that's what happens with them. (laughter) We didn't try to do that any more.

H: According to the book Gemini: America's Historic Walk in Space, "McDivitt and White clearly demonstrated by trying to gain distances in space by simply looking at an outside object could be troublesome indeed." Is this what you were talking about?

M: That's right, and that has nothing to do with space. If you know what the size of the object is in space, you can judge distance very well. If you don't know what the size of the object is, then it's difficult, because you don't know whether it's a little thing up close or a big thing far away. It's not one of those things where you can do sort of a depth perception test where you can try to look at something else and see if, well, yes, it's about the same distance out there. If it's the same distance as a telephone pole and I can tell if the telephone pole is very big, then it means I'm up close. If I can tell that the telephone pole is very small, then I know the object is a long way away. I think that really refers to the fact that I couldn't tell the distance of the single, bright, flashing light at night, and I can't do that on the ground very well either. (laughter)

H: The 1965 chronology stated 6 June that "The 2 million people in Melbourne, Australia, saluted astronauts McDivitt and White as Gemini 4 passed overhead by turning on all the

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lights in the city. McDivitt said to the Carnarvon tracking station, "Tell them I thank them for lighting the night for me."

M: The way our orbit was when we were down in the Southern Hemisphere it was dark. We go around the Earth in 90 minutes, and then the Earth is turning underneath you so that you go around it over a different part of it. Then the part that's in light north or south is the same for each pass. We were passing over Australia in the dark. They did turn those lights on for us and we could see them down there. There was a cloud overcast or undercast, but we could see that, and it was really nice to see that, and to know they'd done it just for us.

We saw a lot of other things at night which were kind of interesting. One thing I remember, we saw the southern lights, the aurora borealis up north, and I think it's called the corona borealis down south. The interesting thing was it's down below us. I've looked up at the northern lights so many times when I lived up in Michigan and Illinois and Wisconsin, and to see the southern lights down below me was really kind of an interesting thing. There was a great big long curtain of light that had many different sizes and shapes and colors. And another thing which sort of astounded us was we could see shooting stars, but they were also down below us. Of course, it's a small particle, or it could be a large particle for that matter. Coming down out of outer space and then as it got down into the atmosphere, it burned up because it's going so fast and the heat and the friction from the air. I remember sitting there one night looking at those things with Ed, and there were quite a few of them. It dawned on me. I said, "Hey,

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Ed, do you know what? Those things are pretty to watch, but the facts are that they are passing us on the way down."

(laughter) If you are on the ground, normally they'd burn up before they get to the Earth, but up here they are not burned up. They are just going by. We didn't get hit by any.

H: Is that a possibility?

M: Oh, yes. As a matter of fact, if you plot the frequency of like the meteorites, it's quite high. The frequency goes up as the size goes down, so that there are very, very, very many, very, very tiny ones and there are very few fairly large ones. Our pressure suits had many, many layers of felt and other things that protected us against micrometeorites. Now if you got hit by something the size of a pea, it would just disintegrate you because it's going about 25,000 miles an hour, and it would be like getting hit with a bullet going about 10 or 15 times faster than a normal bullet. So anything that big would just really wipe you out. These things are more like flecks of dust, mostly. (laughter) And over the years we used to plot the map on the windows of the spacecraft to see if there were any pits in the windows and try to determine if you were getting hit by the micrometeorites. You couldn't tell from the rougher structure. We had a number of strikes that looked like they were micrometeorites on the spacecraft. No big ones though.

H: Did what you see in space ultimately surprise you or did you have some preconceptions of what you were going to see?

M: No. It surprised me. We trained very well for all of the things that the spacecraft did. It's impossible to train



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for what you really see up there. Although I suppose, by today, most of the people have seen enough movies of the Earth going by and things so that it wouldn't be surprising to them. We didn't have much of that in those days. We didn't have any movies taken from orbit of the Earth as far as I can recall. We had some still photographs but very few of them. Boy, when you are up there and you are moving around at 5 miles a second and here comes the Earth. I remember saying to Ed, "Oh, Ed, it looks just like the globe." (laughter) It really did. The continents, they looked just like the continents, and the water looked like the water. But you can't see the finer details. But, boy, you're really going across it fast and see all these spectacular sights. That part nobody could really prepare you for. We saw some things at night, as I mentioned, which were interesting, different. There's a band around the Earth, sort of like a shell. When you saw the stars, the stars would come down and get to this band, and they'd go out like they were at the horizon. Then one time we noticed that, gee, they appeared below the band. We thought below the level of the Earth. So after watching this phenomenon for a while, we realized that there was just this band right near the edge of the horizon that was fairly opaque. A very, very bright star, you could see as it went down through it. The fainter stars would just disappear and then they would reappear below it. The aurora borealis. Thunderstorms at night, you'd look down and see the lightning flashing around. You could see that. In the daytime you could see--like I said it was hard to see some things, but it was really quite easy to see other things. If there was contrast between them, between a runway and surrounding terrain. For instance, if you had a concrete runway in the desert, it's very hard to see because you'd

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have light tan in the concrete and light tan in the desert, not much contrast. But if you had a black-topped runway that was really black against a light tan, you could see that, or if you had a white concrete runway and black farmland area, you could see that. We were supposed to pick out certain airfields and use them as tracking points. We could find the vicinity of the airfield with the naked eye. We didn't need telescopes and all that.

H: What about the arid west of the United States versus the greener east? Could you make those distinctions?

M: Oh, yes. That's where you could see the whites. I even saw the dome stadium [Astrodome] in Houston. Not on Gemini 4 but on Apollo 9, I looked for it specifically. It is a white building right in the middle of a great big black parking lot. I was trying to find my house from 200 miles up, but I couldn't do that. As we flew across Texas, I could see the Gulf Coast which is curved, and I could see Galveston Bay. It was tough to see that because the water is brownish and the surrounding terrain is green and brown from the trees and grass and things. I could see Galveston Bay. Then I was able to find Clear Lake which stuck out to the west of Galveston Bay, and I only lived a little ways from Clear Lake. But you just couldn't see the houses, the individual houses. They all blended into the landscape. But I could actually see the lake. Then I knew where Houston was. Houston was just up to the north of that. I knew down in the southwest corner was the dome stadium. I looked around and, sure enough, I could see that, specifically. I knew I was looking at that building. My eyes were better in those days than they are today though.

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H: What about industrial pollution, smog, things of that nature?

M: You could see that. You could see fires, if there was a fire in a fairly calm day but with a prevailing wind, light breeze, especially if you had a body of water. Say if you are along the Gulf Coast and there is a fire down along the shore and the wind from the north just blew that steam of smoke out over the gulf, you could see that against the gulf.

Yes, you could see that stuff fairly easy. Over North Africa you could see the gas being cleared from the oil wells out on the desert very easily at night. You could see where the rivers emptied into the oceans and brought down all the silt. You could see those brown tones that stuck way out into the ocean. You could see the bottom of the ocean in a lot of places.

In the Bahamas, the Bahamas are just the most beautiful place on Earth to view from space because the water is so clear in that area and the contours at the bottom of the ocean can be seen right through the water. It's very white and sandy, and so when you are looking through the blue-green water, you can see the various shades of blue and green coming up from the bottom. And there's a place down there called the tongue of the ocean where the ocean drops off like 10,000 feet, and you can see this black tongue. You can also see that from airplanes, so you don't need to go up in a spacecraft to see that. You just get a bigger view from a spacecraft. Whenever we passed over the Bahamas and we weren't doing anything, everybody wanted to go look. Truly beautiful. As a matter of fact, I never went to the

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moon, but from the pictures of the Earth taken from great distances, if the Earth is around where that part of it is facing where the spacecraft was and the guys took pictures of it, you could actually see the light blue of the Bahamas. It sticks out from the rest of the Earth, even from those great distances.

H: Your orbit then was north of the equator.

M: Our orbit on the first flight was about 28 degrees north to 28 degrees south. We launched due east out of the Cape. The Cape's altitude is 28 degrees north. When you launch due east, your orbit will go north and south as far as your launch site. So when we launched from 28 degrees, I think it is 28 degrees, north going due east, then our orbit would take us that far down to the south. If you launched over than due east, it would carry your orbit further north and then also further south. Some of the Skylab launches, I think, were out at about 50 or 60 degrees north and south, so they covered a larger part of the Earth. In the earlier days and in Gemini days, we were really just trying to get the damn thing up there, and we also wanted to keep it on what we called the tracking orbits. In the early Mercury days, again, we wanted to take advantage of every bit of extra velocity you could get to make sure you got the spacecraft into orbit. So we always launched from due east to get the help of the rotation of the Earth when you are doing that. The tracking stations on the ground were set up to cover 28 degrees N and 28 degrees S, and those passes, which would be early in that flight, like the first six or eight passes after you took off from the Cape, because that's where most of the Mercury flights were. In Gemini when we started going for multiple days, then you had to

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have equal coverage around the Earth. But we really didn't, so whenever we planned activities, we planned them when we had the maximum amount of tracking coverage, which was for about six orbits, and it takes about 15 per day to go around.

H: What about the North and South Poles?

M: Couldn't see them. We weren't high enough to see that. I would think that they would be absolutely spectacular. I saw a lot of ice and snow on the Himalayas and all your U.S. mountains, South American mountains. My second flight up on Apollo 9 was in March, so there was a lot of snow around the Northern Hemisphere. We could see that pretty well.

H: Is there anything you want to add about the orbit itself on Gemini 4?

M: Well, it was a lot of fun. We had a lot of experiments that we had to do. We were taking a lot of photos. A funny thing that happened sort of after the flight was the flight surgeon came to me about a week or 10 days after I landed and said, "What were you doing at this same time during the flight?" I said, "Gee, Doctor, I don't know. Why?" He said, "That's when your heartbeat was the highest. From launch to recovery and EVA and everything that was the highest heart rate that you ever had." So I said, "It must have been pretty important. Let me go back and check." When I went back and checked, I found out that the only thing that was happening was I was trying to take a picture of Yuma County Marine Corps Air Station. I told you we had these pictures of airfields. We had some maps to help you lead in there. They'd say, "Okay, take a picture of this."



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What we tried to do is, we would try to find the airfield, and then we had a little like an electrical gunsight mounted in the window of the spacecraft, and I was supposed to aim this electrical gunsight across here at the intersection of the two main runways and then just track across the airfield. It was an exercise to see whether we could really track ground targets from those altitudes, and could we find them?

Well, I'd flown out of Yuma when it was an Air Force gunnery school for about a month, and I knew the airfield quite well, and it wasn't that far from Edwards where I had been stationed. And I thought I knew that part of the country pretty well. So when we got close to the California coast and I could see it, I started getting ready for this thing. California isn't very wide when you are going across it at 18,000 miles an hour, and the Colorado River is dirty, and it doesn't stand out very well when you are trying to separate California from Arizona. Yuma is right near that border. As we got up there I could distinguish that there was some vegetation along where this river was, but I couldn't for the life of me find that damn airfield until we were almost on top of it, and I was able to maneuver the spacecraft around and point it, and I finally got the pictures. But that's what caused my heart rate to go the highest. I think the heart rate isn't a very good measure of whether you are excited or not because I know I was really excited during launch and landing. I guess it didn't work out the way the doctors thought anyway. We did have a lot of medical experiments that we did.

We took a lot of photographs in a very unorganized way. It was after that flight that we realized that we had to do

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something different in trying to keep track of the pictures. Because what we'd do was we'd bring this mass of film back, then some poor guy would have to try and identify where in the world that picture was taken. After that we started numbering the film packs and recording what we took. So film pack 1, frame number 5, 6, 7, 8, 9, where we were and what time it was, which then, of course, made it a lot easier to do something with the data.

We did a very simplistic stereo mapping with a handheld 70mm camera. When we came across Baja California, we just pointed the spacecraft down manually, and every 6 seconds after that Ed took a photograph. Later those things were overlapping enough so we could use them for stereo pairs. A number of geologists wrote up cursory observations of northern Mexico as a result of these things. We sent this to Mexico. As a result of that, they discovered a lot of oil and minerals that were really quite valuable. It showed for the first time the value of----

(End Tape 4, Side 2)

As I was saying, this showed us the first benefit of doing Earth research from space. From that we developed many, many Earth resources experiments since then, and it's provided a lot of knowledge about Earth and what we can do on it.

I really think the rest of the flight was a great experience. Everybody ought to do it. We had a few problems, nothing of any great consequence. I think probably the most serious one, not counting the hatch problem which could have killed us both, was as I mentioned

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earlier when the water tank was trying to be filled it got down in the lithium hydroxide canisters. We didn't know it at the time, but this dissolved some of the lithium hydroxide. It got out of the canister into the piping that provided oxygen into the suit. Then when we did get up in orbit with the constant flowing of oxygen across this lithium hydroxide and some moisture in there, somehow or other that lithium hydroxide got into our suits and into our eyes. At the end of the second day or so, our eyes were the color of this red stick here, just like a tomato, and they hurt so bad that for a while I thought maybe we weren't going to be able to last. Finally, it started tapering off, and we were able to go through the 4 days. It wasn't until after we got down that we found out what it was.

We had sort of a funny thing happen. They let our wives come over and talk to us from the mission control center. My wife asked me how things were going, and I said, "We weren't sleeping much because it was too exciting, and we were too close to each other, and things." She said, "Well, how is your left eye?" Occasionally, when I'd get tired, the white of my left eye would get a little red. The doctors thought that we had some code that we were using, because I said, "Well, my eyes are really in bad shape. I can hardly see. They are just totally red." That was the first time they knew anything about it. So they thought we had some code. Well, we didn't have some code, she was just asking if my eyes were getting tired. (laughter)

The one thing that we did do that was a mistake, I can think of now, we decided that we would try to man the spacecraft like a ship. I used to read a lot, and I read a lot about how they do it on ships where they have 4-hour watches. So

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we decided that we both would stay awake for 8 hours. Then one of us would sleep for the next 4 hours, and the other one would stay awake. Then we'd flip-flop. So that we'd be awake for 8, sleep for 4, wake for 4, sleep for 4, be awake for 4, and then be awake for 4, and then you'd be awake for 8. We thought that was a great scheme. That way somebody would be awake all the time. Well, we were so close together in the rocket, and the engines firing. They'd make bumps like this (bumping sounds), and guys talking on the radio you could hear. Anyway, we ended up getting very, very little sleep for 4 days. After that when the guys wanted to sleep, you normally would just shut the spacecraft down, put things up over the windows so that the Sun wouldn't shine in. Then we'd sleep together.

H: You get claustrophobia after a while?

M: No. But I must say the Gemini was very tight, very, very tight. They wanted us to leave our helmets on so we wouldn't breathe moisture out into the cabin in case we had an electrical problem with the moisture. At the end of the 4 days when I got out of the spacecraft, I'd worn all the hair off my head above my ears where the ear pads for my earphones were because I sit so tall that my helmet was right up against the hatch cover. The hatch had a groove in it, so my helmet fit up in that groove. It wasn't designed to put my helmet in, but it was just the way it ended up. Whenever I turned my head, my helmet would sort of resist that, so my head always moved about 3 inches before my helmet did, and I just wore all the hair off. Fortunately, it grew back.

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- H: The 1965 chronology stated that "On June the 7th to begin reentry McDivitt fired a 100-pound thrusting rocket for 2 minutes, 41 seconds. One second too long to guide the capsule into an orbit with 156.2 mile apogee and 100 mile perigee." This caused the landing to be 40 miles off target. Did this cause any particular problems?
- M: Well, that's not completely true. We have a computer on the spacecraft. Somewhere during the course of the flight, about halfway through, we were supposed to turn the computer off. We'd had it on for a while, and we were going to turn it off. Ed turned the switches to off, and the computer just stayed on. So we had some conversations back and forth with the ground about the computer, and then we ran out of radio coverage. We just flew away from where the radios were, so they said they'd get back with us. We were going across Africa, and there was a little radio station out there. I heard this thing come up, "Gemini 4, pull the circuit breaker on your computer." I said, "I don't think that's a good idea. How much electrical power do I have left? Maybe we can just leave it on." They didn't hear me. They said, "Gemini 4, pull the circuit breaker on your computer." I said, "I don't think that's a good idea. How much electrical power do we have?" Anyway I could never establish contact with them. So Ed and I thought it over for a while. We didn't have the faintest idea of how much electrical power we had left. We didn't have any meter or anything on board that would tell us, and we just had batteries. I checked to see when we were going to come up on another station. It wasn't going to be for an hour or so. I thought, well, we'd better do what they said. So we pulled that circuit breaker. When we did the light didn't just go out like that. It just sort of got dimmer. I said,



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"Oh, shit. Push in the circuit breaker." We did. It didn't do a bit of good. The light just went dimmer and dimmer and dimmer and finally went out. We pushed in the circuit breaker, and we pulled it out, and we pushed it in, and the computer was deader than a mackerel. It never did come back in.

When we got around to doing the reentry, we didn't have a computer for guidance. Because we were up for 4 days, a long time, we'd never been up that long before, there was some concern about whether the retrorockets would fire or not. We were going to fire our thrusters long enough, our little thrusters that we used to maneuver around in space. We were going to fire them long enough to make sure that we came down out of orbit. We wouldn't land in a very good spot, but at least we'd get out of orbit. We were going to do that, and then 20 minutes later or something like that, we were going to fire the retrorocket. So we went ahead and fired these other rockets by clock as opposed to using a counter that we would have gotten out of the computer. Then when we got ready to do the retrofire, we didn't have the computer to do those things, so we just did them all manually. Instead of guiding to a landing point, we did a rolling reentry and came on down that way. We had one of our thrusters in our reentry maneuvering unit, reentry control system, fail, so during reentry we got to spinning in a very, very high rate. Because when these thrusters were firing to hold the pitching and yawing rates down, it would put more and more velocity into the roll. This was probably a mistake that we made during the course of the flight where we didn't do what we had trained for. We had trained so that if the computer failed, we would do what we call 90-

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degree bank, go up, and 90-degree bank right reentries, and get down.

After this thing actually happened in flight, the people on the ground decided that rather than guide us to the exactly right spot, what we would do was we'd fly a ballistic trajectory. Even though we didn't get to where we were supposed to be, they'd know where we were because they could track us with radar. They'd know where we were. That part of it turned out all right. We had a helicopter flying next to us before we were ever on the water, so they were right there just like that. What it did do, it got us into a situation where we were doing things with the spacecraft that we hadn't looked at all the problems of it, and we were supposed to do a fairly high rolling rate reentry. This caused us to get off the scale of our instruments. So as this rocket fired, we went around faster and faster and faster. I had nothing to see outside that would tell me how fast it was going. In other words, I was just looking at the black sky, and the instruments were useless. So we got into a very, very high rolling rate which could have been serious. Fortunately it turned out the parachute worked okay, but we could have had a problem. Anyway we landed. It was an exciting trip down, very beautiful. You could see the heat shield burning off, leaving a red and green wake behind us. We finally hit the water. The parachute came out and hit the water, bounced down real hard.

Prior to the flight, very close before the flight, like within the last week, the medical community decided that there was about a 50-50 chance that Ed and I would die when we landed. Because we'd been up in space for such a long period of time--4 days was in those days--that our heart

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would be deconditioned, and when we came down, we would be sitting up on our spacecraft. Prior to that when people came down they were all lying down in their spacecraft except, of course, Gemini 3. Gemini 3 had only been up for 4 hours. On the last Mercury flight when Gordon Cooper came down, he was lying on his back, and they recovered him by picking up the spacecraft, putting the spacecraft down, and then when he got out, he couldn't stand up. He almost fainted. It turned out that it was probably more from dehydration than anything else. The concern was that our hearts had been deconditioned from 0 G, we'd land, we'd be sitting up, our heart couldn't pump blood to our brain, we'd faint. Since we couldn't fall over, like you do normally and then have the blood come back to your brain, we'd die. So there's this big medical controversy. Fortunately, the NASA flight surgeons prevailed, and we went.

Anyway, we came down. We hit the water. Ed and I checked around for leaks to make sure everything was okay. I remember looking over at Ed and said, "How do you feel, Ed?" He said, "I feel great. How do you feel?" I said, "I feel great too. I guess we aren't going to die after all." (laughter) And we didn't. Anyway, the helicopter came and rescued us. We got a dunking in the water a few times, but we got back up on the ship. When we landed on the ship with the helicopter, they had the big red carpet rolled out for us. We got out and started walking up to the admiral and the captain of the ship who were waiting for us. I thought to myself, my God, maybe there is something to this medical stuff because I'm having a difficult time walking. It didn't dawn on me until about 30 seconds later that the reason for that was I was on a ship and it was rolling on the sea. (laughter)

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H: Did you ever find out why they asked you to pull the circuit breaker? What was behind that?

M: Well, they just decided that we'd just use the circuit breaker as a switch to turn it on and off instead of the other switch. They thought maybe the switch was broken. But something went wrong with the computer. The thing that was so interesting was, that's an IBM computer, and IBM that day had decided that they wanted to advertise their computers. So they took out all these double page ads in newspapers all over the country, and had some radio and TV spots that they were making announcements with. I think there were some magazine ones that said, "Gemini 4 is flying with an IBM computer." Then they told how wonderful it was. Well, here you have the headlines on the newspapers that said, "Gemini 4's computer fails." Then you open it up inside the newspaper and there's a big ad that says, "Gemini 4 is flying with an IBM computer." They got some of the ads stopped, but they didn't get them all stopped. They never did find anything wrong with the computer by the way. Unless something got hung up in the logic and it just never got unstuck. That was a bad blow for IBM.

H: Was this with the thought in mind that you would conserve battery power by cutting that?

M: Quite frankly, Jim, I don't know. Our spacecraft was totally battery powered, and we couldn't run all of our equipment for 4 days because we'd have run out of battery power before that. I knew that. The thing that I didn't know is I didn't know how many kilowatt hours or amp hours I had used up, up until that time how many I had to go because

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we had powered a lot of our stuff down. We used up more fuel up in the front of the flight than we had anticipated by chasing that rocket around. So we were powered down a lot. I thought that we probably had a lot of electrical power left. But I really couldn't tell, and I just thought, well, it would be prudent to do what they said, although it didn't sound like a good idea to me. It turned out I was right, but it was just a minor issue.

One thing that I didn't mention, and there is a lot of misconception about, is that during the time we were up there, Ed was asleep, and we had everything powered down. The rocket system was turned off. We were just tumbling through the sky. The spacecraft don't go like airplanes with their nose forward. They go any damn way they want to go. So we were just sort of tumbling along through the sky. I glanced out the window, and there was an object right in front of me. How far away I don't know. It had a geometrical shape similar to a beer can with something like a round pencil sticking out about 45 degrees from the center line at the top of the can. It was all white. It wasn't ragged or jagged or anything like that. It was very specific, geometrical shape. I couldn't tell whether it was a little thing right up next to the window or a big thing a long ways away. That might go back to the difficulty with the depth perception. There was nothing else out there to compare it with. I looked out and I saw that thing. The first thing I thought was oh, my god, I'm going to hit it, because we are going 18,000 miles an hour. It dawned on me very quickly though that it was obviously in about the same orbit that I was in. Because if it weren't, I wouldn't have even seen it because you can't see things moving 18,000 miles an hour, up close anyway. So the first thing I did



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was to prevent bumping into it, I reached behind me and turned on the electronics that controlled the rocket system so they could change the attitude and maneuver the spacecraft if I needed to. We had two cameras just floating in the cockpit. I reached over and grabbed one and pointed it out there and took a picture and grabbed the other one and took a picture. By that time this nose of the spacecraft had drifted around where it blocked out this object. None of my instruments were working either so I couldn't tell exactly which way I was moving and I was looking up at the black sky. The only thing that I really had a reference from was the Sun, and I couldn't see the Sun. The Sun was behind me, but I could see the shadow on the nose of the spacecraft.

Finally by the time the electronics heated up, they weren't all solid-state in those days. Electronics heated up, and I was able to fire the rockets. I tried to maneuver the spacecraft back down to where I thought this thing was or to point it in that direction. I never was able to see it again. I thought, well, it's no big deal. It's obviously going about the same speed I am. If it were big it would be so far away it probably wouldn't be bothering me. If it were up close, well, it must be small. So I looked around the whole sphere that I thought I could see in. I never saw anything again, so I didn't think much about. The next time we came up on a radio checkpoint, I was talking to the ground. I said, "Oh, by the way, I saw some unidentified thing up here which I couldn't recognize. I tried to take a picture of it." Well, that's about all I said about it because it was no big deal to me.

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When we landed we were out on the aircraft carrier. We were going to stay out there and debrief the mission, so we didn't fly back in. We stayed on the aircraft carrier, but they wanted to see all the EVA film, because that was really a big deal in those days. They flew all of our film off the carrier--we landed in the Atlantic Ocean--someplace inland, and then they transferred it to a NASA plane, flew it down to Manned Spacecraft Center, developed the film, and had a big press conference. We watched the press conference, and we watched all the film that night on the aircraft carrier which was kind of exciting. At the end of the press conference, one of the newsmen said, "Hey, what about this UFO that McDivitt saw?" They said, "Oh, well, we didn't develop those pictures, but if you want to see them, we'd find them for you."

So they were then in the process of developing all of the rest of the film. I assume some lab technician in the photo lab went through the film and found what he thought were a bunch of UFOs, flying saucers, and then they released that picture to one or two guys. I mean it was no big deal. So it got printed a few places. I didn't get back for 3 more days. I didn't read all the newspapers. There was no way I could see all the newspapers. So it just sort of passed by. I never thought much about it.

Years later I started getting all these phone calls and letters from people who were in the UFO business, quoting me about what I'd seen in space and showing pictures of the stuff. I thought, what in heaven's name is this? I should say one other thing. When I did get back from the flight, I got all the printed Gemini 4 pictures, and I went through them one at a time to see what that thing was, to see if I'd

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really taken a picture. I never did see anything in those photographs that looked like what I saw, so maybe the camera was out of focus, or who knows what? Well, I started getting all these phone calls and telegrams and letters and newspaper clippings. Well, what happened was the UFO community picked up on this stuff, and they had been publishing this picture for years crediting me with seeing this thing.

What the photo guy had released was a picture where we had a reflection of the Sun in the window of the spacecraft. We had five or six panels of glass with a gap of air between them, and we had a lot of bolts over on the side. So when the Sun shined on the window just exactly the right way, you'd get multiple reflections, either from the bolts or from whatever. This picture was a disk-like object with a long tail that stuck off the top of it, and there were about five or six of these things in perfect echelon. It looked like a formation of flying saucers. Of course, that's what the guys released, and everybody thought, oh, my God, McDivitt saw all these flying saucers.

So I started getting all these requests to appear on TV stations, give lectures, and stuff. So I tried to do it for a while. I tried to sort of set the record straight by saying, "No, that isn't what I saw. No, I didn't see flying saucers. I just saw something that I couldn't identify." Well, I did that for a while, and it was hopeless. I had people writing books who'd come and interview me. I'd go in great detail. I'd stretch it for them. I'd show them what it was. Tell them I thought it was nothing. Then I'd read the book and they'd show the picture that was released of these things which were window reflections, that they knew

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damn well were window reflections. Finally, I just gave up on it, but I got to be an UFO expert by default.

H: The 1965 chronology stated that Dr. Charles Berry, chief flight surgeon for the astronauts, said after examining you and White that "an awful lot of straw men" have been knocked down and the only ill effects that the two of you suffered were extreme fatigue. Well, did you find that to be the case?

M: Right. As I said earlier, neither Ed nor I had slept hardly at all during that 4-day period, so I'd think that would make anybody tired. The straw men were all the things that--the thing that we were going to die was just one of many, and when we went up and spent 4 days up there and came back in good shape, it really ended a lot of myths about what was going to happen. As I said, we had a lot of medical experiments that we did. We had the blood pressure thing which was just minor. A lot of EKG stuff. They'd done a whole series of x-rays of our ankle bones, heel bones, so they could measure the decalcification that took place when we were flying. We did a lot of tilt-table tests after we got back that measured the response of our heart to reconditioning being on Earth. The one thing Berry didn't mention was we both got saddle sores from sitting on that tilt table. A tilt table is a table with a post on it. You sort of lay down and put the post between your legs, and they tilt the table up. You are not using your legs to hold you up, so your muscles are relaxed, and it makes it very easy for the blood to flow down into your legs, you pass out. This is a test of your blood pressure and your heart response and stuff. We did fine on all those things. So

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all these myths about how space would kill you sort of dissolved very quickly.

H: The book, Gemini: America's Historic Walk in Space, noted "the superb physical condition of the two astronauts," but pointed out that you were "unable to sleep well." What was the cause for this and did you get over it quickly? Did this mean after you got back or while you were still in space?

M: I think he must have meant when we were up in space. We were sitting so close together. It was only like 2 or 3 inches between you. When you are sleeping in 0 G, your arms and your legs go to wherever there is a neutral position. They don't fall down along your side. Also with a pressure suit on, they stick out in front of you because that's the way this pressure suit is built. Also the neutral position for your arms is not parallel to your body. It's out in front of you with the elbows cocked about 45 degrees, and the angle between your torso and your upper arm about 45 degrees. So everything sort of goes about a 45-degree position. When you are doing that, your arm is over into the guy next to you, and if he's manipulating the hand controller which was between us, firing the rocket engines, you could feel the thump of the rocket engines. He would touch you by maneuvering around, maneuvering the handle, or if he needed to adjust the radios or something, he'd have to lean across you. You were constantly getting touched, and you could also hear him talking on the radio, even if you had your own radio unplugged. You could hear him just from the voice. It's like a guy talking 3 feet away from your ear, you can hear him. That's what really kept us awake. It wasn't anything that had to do with space.



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H: Also the book pointed out that both of you had a problem with drying out of membranes in your nose.

M: That's right. I think that probably had a little bit to do with the lithium hydroxide that we had in the air. The humidity in the spacecraft can either be high or low. It's a very closed environment. Ours was just dry, and I think the lithium hydroxide accentuated that fact, so it was dry up there.

H: The 1965 chronology stated that President Lyndon Johnson telephoned his thanks to you and White aboard the carrier Wasp. The President invited the two of you to his ranch for the weekend. Can you describe that affair?

M: He did call us on the telephone when we were on board the ship. I'd forgotten all about that. It was really impressive to talk to the President. I'd never talked to one before. We chatted, and he asked us to come to his ranch. He said he wanted to see us and congratulate us. A really great, great feeling. We stayed out on the ship for 3 days during our debriefing. The mission debriefing, we had it all done before we ever left the ship because we knew there was going to be a lot of hoopla when we got back, and fortunately we had thought this out ahead of time. So when we landed down at May Port, we got on a NASA airplane and flew back to the Manned Spacecraft Center. Our families met us when we got there. It was my birthday then. It finally got to be my birthday.

The President had put in another phone call for us, and he wanted us to call him as soon as we landed. So we went in and called him. He said he wanted us to come to the White

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House. Anyway, he asked us again about the ranch. I said, "Gee, Mr. President, I'll tell you, I'd much rather go to the White House if you don't mind." I said, "Why don't you come down to the Manned Spacecraft Center if you can? I think you'd really enjoy seeing it." He said, "Oh, okay. Yes, I'll do that. Why don't we skip the ranch, and you guys come to the White House. I want to give you a medal. We'll do that there, but I would like to come down to the Manned Spacecraft Center." Anyway, a little while later he did come down to the Manned Spacecraft Center. As I mentioned earlier, he promoted Ed and I from major to lieutenant colonel, which really changed the whole attitude of the Air Force toward people who were in the Air Force but working for NASA.

We did go to the White House then, and he gave us medals. Had an absolutely fantastic time there, got to spend the night at the White House with my wife and three of my children. Only three of them were alive then; the other one hadn't been born yet. Kids got to play in the swimming pool, and Luci Johnson baby-sat them, took them around to all the secret passages, made hotdogs for them that night.

We had been on a couple of parades with Hubert Humphrey who's a great guy, and I really liked Lyndon Johnson, too. A lot of people didn't, but I did. During these parades, Hubert Humphrey kept asking if we'd like to go to the Paris air show, because for some reason the U.S. government had decided not to participate in the Paris air show that year. The Russians had put everything they could into it, and we were just getting out publicity like anything you could imagine.

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When we were there in Washington for our ceremony, we had to go over in the evening to the State Department to give a speech. They had all the Ambassadors in. Ed and I put on this presentation. The President and his wife came over. At the end of the thing when we got through, he got up and said, "Ladies and gentlemen, I want to announce that I'm sending White and McDivitt to Paris this evening with their wives." I thought, oh, my God, we didn't have our passports or anything. They took them for our wives up against the wall, took pictures of them, raced down to the State Department, and made some diplomatic passports, the black diplomatic passports. They had some pictures of Ed and I around someplace. They got those and made some diplomatic passports for us. We went back to the White House, and Lady Bird took our wives through her clothes. They were all about the same size. They gave them a couple of long dresses to take to Paris with them because we were only planning on being in Washington a day. We all hopped in bed about, I don't know what time it was, probably 2 o'clock in the morning. One of my kids was pretty young. He'd wet the bed. In the Lincoln bedroom, I think it was. (laughter) Anyway, we got up about 3.

(End Tape 5, Side 1)

We got up about 3, got dressed, said goodbye to our kids. Luci was up and made some breakfast for us. We had, I think it was a piece of toast and a glass of orange juice or so. Luci said she would take care of the kids. Secret Service was supposed to get in touch with my mother and father who were still in Washington. They had been there for the ceremony the day before. Ed and his wife Pat, and my wife Pat and I went out and got in the Presidential helicopter

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and flew out to Andrews AFB. The President gave us Air Force One. Muriel Humphrey had finally got flown down from Minnesota. She and the Vice President were there with us. Jim Webb and his wife, Jim Webb was the NASA administrator, were there. We got on board the airplane and took off very early in the morning. It had the Presidential quarters, and Vice President Humphrey and his wife took those. It also had a number of bunks, I think four bunks on board, so they decided that's where Ed and his wife and my wife and I would sleep. The NASA administrator and his wife slept on the floor. Because when we got to Paris, we figured it was going to be, look out for the press. So that's exactly what happened. We got to Paris in the afternoon sometime and went out to the air show. We had receptions and press conferences and met with Yuri Gagarin, had a really wonderful time. It was quite an experience, and I guess sort of upstaged the Soviets in their attempt to capture the show. Anyway, we had a great time there.

H: What kind of rapport did you have with the Russians?

M: Things went along fairly well. Before we left, the President said--the President was a lot more sensitive guy than was led to believe. He's always portrayed as a stuffy, old politician who'd do anything to succeed. When he came down to the Manned Spacecraft Center and promoted us, he asked Ed and I to ride out to the airport with him. It was about a 15-minute drive. So we got in the car, and I was sitting in the back seat with him. It was a limousine. In the jump seat was Mr. Webb and Ed White. We were driving along. We'd been talking about the space program, and then sort of a silence came over the car. The President was obviously sitting there in pretty deep thought. Finally he

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said to me, "Jim, I wonder how I would feel if Lynda and Luci were boys and I weren't the President." I said, "Gee, Mr. President, I don't have any idea. Why do you ask?" He said, "Well, today I'm sending 250,000 more troops into Vietnam. I just wonder what all those fathers are thinking who have sons who may have to go over there, and I don't have sons." I told a few people this before, and a lot of them would say, "Well, he was just telling you that because he's a tricky politician." I don't really believe so. Well, in any case, at least not at that instant he wasn't. In any case, before we went over to Paris, he took Ed and I aside, and he said, "Boys, I want you to go over there with one goal. Whatever you can do to help peace is what your goal should be. I've given you special instructions to do that. That's my goal in doing all this." We said, "Okay."

So when we got over there, we made a special effort to go look up Yuri Gagarin, and go over and shake hands with him at a luncheon that we were all at, but we weren't sitting together. Then later on at an air show, one of the NASA guys, the PR guy, came up to us and said, "We've got to get out of here. We've got to get out of there." I said, "Why?" "It's urgent. It's urgent. We've got to leave." So he rushed us out and put us in a car and we started tearing down through the air show and got out on a country road and were going like hell. I said, "What in the hell are we doing?" "We've got to get out of here," he says, "Yuri Gagarin is there. You guys are going to get into a position where it's going to look bad if you do this or he does that." I said, "You are absolutely nuts. I thought you were supposed to be in charge of public relations. This is the dumbest public relations move I've ever seen. Turn the car around. Let's go back to the air show." Well, he



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didn't want to do it. When I threatened to punch him in the nose if he didn't--and I wasn't kidding--he turned the car around and went back. We'd just went off and left our wives and everything. So we went on back. Ed and I, like I said, the two of us thought very much the same. We got out of the car, walked back over to the grandstand where we had been, sat down where we had been, waited the appropriate amount of time, got up, walked over to where Yuri Gagarin was, stood there and started talking to him. We had translators with us. Pretty soon we had a crowd. We had the Vice President of France. We had the Vice President of the United States, and we had a very high ranking Soviet official there. The six of us were standing there talking. We were doing what the President really wanted us to do which was to try to do something which would look friendly.

Unfortunately the Vice President of France asked us for an autograph, and when that happens you tend to lose control. We couldn't tell the guy no. So the three of us signed something for him. About that time a couple of other dignitaries, who were sitting right behind the front row where the vice presidents were, reached over. He wanted to get an autograph. Well, as soon as he did that, then the whole damn grandstand came rushing down to try to get an autograph. Our Vice President had a number of Secret Service with him, but the crush of people, they were getting knocked down and stuff, and knocked around. Finally it looked like we were on the verge of a riot. I said, "Come on, Ed, we've got to get out of here before we get killed." Not us, but we didn't want to see these high ranking dignitaries get knocked down. Then we wiggled our way through the crowd, got in the car, and drove off. So we were, I thought, doing what the President wanted us to do.

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As a matter of fact, when we got back, he told us that he'd heard what had happened and he was really pleased that we had done that. So it was quite good.

Another thing that happened on that trip was one night. Jim Webb was a very clever man, a guy who had been in the State Department before he took over as the head of NASA. We were at the Ambassador's house, Ambassador Bohlen [Charles E.] who had been the Ambassador to the Soviet Union for a while. We sat there with the Ambassador, the Vice President, and Jim Webb. Webb was asking the leading questions. "Mr. Vice President, why don't you tell us about this," or "Ambassador, why don't you tell us about that." He was sort of giving Ed and his wife and my wife and me a history lesson. It was really clever the way the man did that. He had Bohlen and Humphrey telling this history of the last 20 years in international policy. (laughter) That was one of the most interesting times I ever spent in my life.

H: You and White received NASA's Exceptional Service Award from President Johnson in a special White House ceremony on 17 June. Can you describe that ceremony?

M: Well, It was in the Rose Garden. I'd heard so much about these Rose Garden things. I don't recall much else about the ceremony. He gave us each a medal. My mother and father were there. My three children were there. Ed's two children were there, his mother and father. Wives. I think one of my sisters-in-law and brothers-in-law was there. A lot of dignitaries. The President made a speech. We said thank you. We gave him a flag of the United States, a little plaque that went with it. One of those things that probably every American dreams of, and very few of us ever have an

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opportunity to partake of, so it was quite impressive. We had lunch with him.

As I mentioned earlier, I'd met the President down at the Manned Spacecraft Center, and I had a chance to meet with him and talk to him other times. I remember, I'm not sure exactly what the occasion was, why we got into this situation, but he invited Ed and I over to the White House one other time. He was having dinner at something like 11 or 12 o'clock at night, and Tom Dewey [Thomas E.], who is a Republican, he had invited over to help him work on the crime issue. He sat there at the dinner table by himself eating, and Dewey and Ed and I had a cup of coffee. He and Dewey talked over what they could do to handle crime in the United States. I thought it was kind of interesting for him to call on a member of the opposite party to advise him on something like this, but Dewey had a very strong reputation for law and order. Again, it was one of those opportunities where you're sort of sitting in on the inner circles of the White House with the President while he's making tough decisions. He was really a very interesting guy. Took us around and showed us his bedroom, took us through his private quarters. Good things which I guess maybe he did with other people, but I tell you I sure felt honored with what he did.

H: The 1965 chronology noted that "a blotting material to absorb excess moisture which might have caused the eye and nose irritation of astronauts Edward White, Lt Col, USAF, and James McDivitt, Lt Col, USAF, during the June 3d Gemini 4 flight had been eliminated from the Gemini 5 spacecraft, a Manned Spacecraft Center spokesman said." Was this blotting

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material the source of this irritation or do you think it was----

M: Well, we really thought it was the lithium hydroxide, but we weren't really sure. This blotting material was put along the walls to soak up any moisture like the moisture that got around on the last Mercury flight. It could have outgassed or caused something, but we were like 99 percent sure that it was the lithium hydroxide because we could still find traces of lithium hydroxide all through the environmental control system. Unfortunately, the lithium hydroxide that was there was sticking on the walls. That wouldn't bother you. What would bother you is if the lithium hydroxide got loose and got in your eye. Well, there's no way to do an autopsy on my eye. (laughter) We didn't do that, so they eliminated that blotting material, and they also were more careful when they loaded up the water the next time.

H: The 1968 chronology stated that "astronauts James A. McDivitt, David R. Scott, and Russell L. Schweickart, were scheduled to be launched on Saturn 5 in a second manned Apollo space flight." This was later changed where Borman, Lovell, and Anders [William A.] would man Apollo 8, and you, Scott, and Schweickart would man Apollo 9. What was behind these changes?

M: A few disasters that we had in the program caused this changing around. Scott, Schweickart, and I were named as a crew for the backup crew for the first Apollo flight. Gus Grissom, Ed White, and Roger Chappie were the prime crew. David, Rusty, and I were the backup crew. We started working on Apollo right after Gemini 5. Spent a long time trying to get that spacecraft ready for flight. We were

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still in developmental stages. We were still in a lot of engineer changes. The astronauts normally tested the spacecraft as it went through tests at the factory. The test procedures weren't going well, weren't written well. The tests weren't going well. It took a long, long time. There were a lot of delays. So we were spending a tremendous amount of time doing that. At the same time there was another crew, Wally Schirra, Donn Eisele [Donn F.], Walt Cunningham [R. Walter] that were named to fly the second spacecraft. I forget who their backup crew was. These were called block 1 spacecraft. As time went on, we decided that these spacecraft weren't really adequate to go to the Moon. They were all right for Earth orbital flights, but they weren't adequate to go to the Moon. So we started redesigning the thing, and we called that a block 2 spacecraft. That development was coming along, but quite a ways behind in time from the first two.

As we were getting fairly close to the first Apollo launch, they were doing a test on the service module of the second Apollo spacecraft, and that service module blew up, destroyed the service module totally, damage to the command module somewhat. Anyway, there wasn't enough hardware left to really have that spacecraft be available for flight, and a lot of time had elapsed. About this time the first block 2 spacecraft was getting fairly far along in design, and we were going into manufacturing for it, so was the first lunar module. They took the second Apollo primary crew, Schirra, Cunningham, and Eisele, and they made them the backup crew for the first flight. They took my crew off the backup crew and made us the prime crew for the first Apollo block 2 command module and the first lunar module.



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Subsequent to that then was the fire at the Cape, and it burned up the first crew. So that meant then that all that stuff went away. Both block 1 spacecraft were gone now. We still needed to fly a flight on the command module before we took a lunar module up. So our crew was then taken off the first block 1 spacecraft, and Schirra's crew was moved over on that. I stayed on the lunar module. Meantime the lunar module wasn't coming along very quickly either. It was the first lunar module. I worked on the second Gemini, first block 1 spacecraft, the first block 2 spacecraft, and the first lunar module, so I was familiar with the trauma of getting the first spacecraft ready for flight. Anyway, that spacecraft was dragging. We did more and more and more testing. Finally, we decided it wasn't adequate for flight. It wasn't safe for flight because the way the wiring was put in. It was a certain technique they used. When they started it, it looked like it would probably be a good way, but we found a better way later on. We really thought that rather than go up and maybe lose the spacecraft and the crew that it would be better to run that spacecraft all the way through testing and then back around through the Cape for the rest of the testing down there. Put it on a rocket as practice and then just take it all off, so that they would have checked out all the procedures along the way. When that happened, we didn't have a lunar module for even a longer period of time.

We then decided that we couldn't wait to fly the first block 1 spacecraft until we had the first lunar module. That we ought to have a first flight on the block 2 spacecraft. That was the one Schirra and his guys were assigned to, but that still left a big gap between there and when the first lunar module would be available. So it was decided that we

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would take Frank's crew, who was going to fly the second lunar module, move them over in front of my crew, but eliminate the lunar module. They'd just fly another command module. They'd do that around the Moon. I would still go ahead and fly the first lunar module. The reason for that is, we wanted to fly the command module and the service module to make sure that was okay. Then we'd fly this deep space thing to make sure all the ground tracking systems were working all right. Then we'd fly the lunar module around the Earth, do sort of an engineering flight on it. The next flight was a flight like a practice landing at the Moon. The next one was the lunar landing. Each one of these missions had a letter assigned to them. Ours was D. The D mission. The lunar landing mission was the G mission. The practice one was an F one. Frank was going to fly the E mission which was finally eliminated. He flew a mission that didn't even have a letter which was to run around the Moon. So that was the way it shifted around, but it really ended up as a result of the second service module blowing up and the first command module having the fire, then the first lunar module not really being safe to fly, or we didn't feel it was. So all those things created a lot of downstream motion, and that's the way it all ended up.

H: The 1968 chronology noted that you and the Apollo 7 and 8 crews were honored by President and Mrs. Johnson at a White House dinner on 9 December 1968. Charles Lindbergh was also in attendance. What was your impression of that affair?

M: Well, as a matter of fact, we thought that was pretty good. My wife sat with Lindbergh as a matter of fact, and got his autograph. I have two autographs, Charles Lindbergh's and one or the other civilian airplane--it's either Orville or

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Wilbur Wright, I forgot which one it is. I only have two autographs to my name, but those are the two. Anyway, it was really a pleasure to meet Lindbergh. It was nice to see President Johnson again, Lady Bird, Luci and Lynda. Luci especially, I knew her better than Lynda. We had a nice time at the White House. It's always fun to go there. (laughter) It was a big party. It wasn't just the few of us.

H: The 1969 NASA chronology noted that Pope Paul VI "sent personal greetings to astronaut James McDivitt who had an audience in 1967." Can you describe this audience with the Pope?

M: In 1977, I think it was, it was the first lay conference of the Catholic church, the year 1977. The second lay conference was in Rome in 1967, and delegates representing the Catholic church came from all over the world. There was a request made that I go to the conference, not as a delegate of the Catholic church, although I was a Catholic-- I am a Catholic--but as a member of the science and technology community, so that I could talk to them about science and technology in the context of all these social changes that they were trying for. My wife and I went over there and participated in that. Thoroughly lengthy conference, I think we were over there for about 2 weeks or so. We met a lot of people at the Vatican, had an opportunity to have a private audience with the Pope. I was asked by both the President and the NASA administrator to give the Pope a model of the Apollo spacecraft which I did on the altar of Saint Peter's at a mass he said. So I had three or four opportunities to spend some time with the Pope. That was just as impressive as meeting the President,

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probably even more so. Then at the time of my flight, he sent his best wishes.

H: The 1969 NASA chronology noted that on the fifth day of the Apollo 9 mission you and Schweickart reentered the lunar module to perform CSM-LM rendezvous. The chronology stated that "Although problems were encountered with crewman optical alignment sights, COAS, because of extremely bright reflection radar and optical sighting backed up by Earth tracking enabled the spacecraft to dock successfully after being up to 114 miles apart during the 6-hour separation." Why weren't these "extremely bright reflections" problems anticipated during the design phase?

M: I don't even remember that problem. We had so many other problems, Jim. (laughter) Apollo 9 was an engineering test flight as a lunar module, and the lunar module combined with the command module. There were a lot of things that we were trying that were normal procedures. Then we tried almost every kind of an alternate procedure that you could think of. The launches, the lunar launch was supposed to be normal. It was fairly normal. When we on docked and turned around to pick up the lunar module, we found that the shock closed a bunch of valves which we got open again. We were able to do that. We got the lunar module out. We did an EVA where we all went outside the spacecraft. The idea was that Rusty Schweickart and I would go over to the lunar module, and Dave would stay in the command module. We would depressurize the spacecraft, open up both the doors. Rusty would go outside the spacecraft on a thing we called the portable life support system on a handrail and demonstrate that you could indeed get from the lunar module to the command module in case the hatch from the docking tunnel got

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jammed or something. Then we were going to do some other things. Rusty unfortunately got ill, motion sick, very early on the flight. He even threw up once. So we cancelled this EVA thing, I did. Then the next day when we were going to do it, he looked like he was feeling better, so we finally decided to go ahead and do it, although he didn't go all the way across. He just went up to the top and came back down. But it demonstrated what we really needed to show. Then we did a number of engine firings when we were all back together, with both the command module engines, the lunar module engines. We did a bunch of engine tests, control system tests, practice docking, and all that kind of stuff.

Then when we finally got around to doing the rendezvous, we went to on-dock. We couldn't get on-dock quite right. We finally got that fixed. We went out and did this rendezvous which was the first time that we had anybody in the spacecraft that couldn't reentry because the lunar module would have burned up if you had to reentry. Fortunately we were able to redo the rendezvous. We had a light fail on the lunar module. The guy in the command module was tracking us with a telescope on a light. He was calculating the rendezvous solution, and then we had another rendezvous solution calculated on the ground. Then we did one of our own while out on radar. Fortunately, we didn't need the other ones. We did the staging, staged the descent stage off the ascent stage, fired the engines, and then came back in and docked.

Now the COAS thing may have been the docking sight that I used. The way you had to dock the two vehicles was, you had to turn the lunar module around so that the top pointed at



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the command module and the astronaut in the lunar module looked through the top of the lunar module which meant that the controls they were using were 90 degrees different from the direction that he was looking with his eyes. So it was sort of hopping on one leg, rubbing your stomach, and twisting your ear, or something. A very difficult thing to do. It turned out that the light that was supposed to be turned on in the docking target in the command module wasn't turned on. So that this sight which was bright, I couldn't see against this target that was in the command module. Well, I went ahead and did the docking. It was a very exciting docking, and we never did that again, because it was too awkward to make this control conversion. It was just easier to turn the lunar module over and point it at the command module, and then have the command module guide the lunar docking which is what we did the rest of the time. We didn't have any real serious problems. We got the whole job done. It worked out okay.

H: The 1969 NASA chronology stated that "while spaceborne Apollo 9 astronaut James A. McDivitt was selected to receive the Ancient Order of Hibernians John F. Kennedy Medal for National Civic Service." Where and when was this presented to you?

M: Golly, Jim, I don't even remember. We got a lot of awards. I've got a bundle of them at home. I think it was done in New York City, but I'm not really sure. We got a lot of awards. A lot of people liked what we were doing.

H: According to the 1969 NASA chronology you told the March 25, 1969, press conference that Apollo 9 spacecraft performance had been "as near perfect as anything I could possibly

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imagine." Aside from these problems that you mentioned, was this actually the case?

M: Yes, it really was. The lunar module was a very, very complicated spacecraft, very, very lightweight. Matter of fact when I first went up to Grumman for a storage review, I hadn't been working on the lunar module much. I'd been concentrating on the command module. The first Apollo flight was a command module only flight. The lunar module, somebody else was sort of looking after that. When I got assigned to fly the first lunar module, we had some technical reviews and things like that in Houston, but I hadn't been up to Grumman. The first actual function that I had to perform up there was to go for a storage review. Normally in a storage review they have a mockup of the spacecraft. Then they have containers that all the equipment that you're carrying with you that it fits into, and you make sure that you can get it in and out and that you've got everything, and it's accessible. You don't have sharp edges and things like that. Well, we went up to Grumman to do that, Rusty Schweickart and I did. We got up there and went into this white room and went over to this thing I thought was a mockup. We had our pressure suits on. We got in it and we were working away. It was really a tinny-looking thing. It had a little plastic cover over the environmental control system. We knocked that thing off in about the first 30 seconds. Pieces were getting knocked and broken and stuff like that. Every time we turned around, we had these big heavy pressure suits on with great big steel rings in the sleeves. Finally I was really getting irked. I normally didn't do that. I'm normally very easy going, mild mannered. I finally said on the radio, "Goddamn it, it

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seems like we could at least spend enough money on the mockup----

(End Tape 5, Side 2)

"That at least we could spend enough money on the mockup so it wouldn't fall apart when we were doing the storage review." I said a few other nasty things like that. There's this long silence on the radio, and finally somebody said, "Jim, I hate to tell you this, but this isn't the mockup. This is the real spacecraft." (laughter) I thought, holy Christmas, what have I gotten into, because it was the flimsiest looking thing I'd ever seen in my life. Well, it turns out that that really was the way the lunar module was designed. The models that people show of it look like it has real hard sides to it and strong cockpit and things, but it was a very, very flimsy spacecraft. Yet in its own way very strong. The medal of the cabin was two sheets of metal, ten-thousandths of an inch thick, and if you dropped a screwdriver on the ground in 1 G, it would go right through the cabin. When you are up in space in 0 G, of course, you weren't dropping things, so you didn't have to worry about that problem. The outside of the spacecraft was really made out of cellophane and Mylar, 1 mil Mylar, and it was held together by Scotch tape and staples. Since it never had to fly through air, it didn't make any difference. It was always up in a vacuum. Anyway, that was an interesting time.

H: How were sanitary conditions, body functions and everything, handled during your two flights? Was it adequate?

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M: It was adequate. It got the job done. It wasn't very neat and it wasn't very clean, but it was adequate. We had to urinate in a funnel-like device with a honeycomb in it so that the urine didn't splash back out, and then it went through a tube and was vented overboard. When we defecated, it was into a bag that was glued onto our rear ends. That wasn't very neat, but it got the job done. When you urinated and it went overboard, it would go out into a vacuum. When you put water into a vacuum, it evaporates so quickly that it forms into ice crystals. So whenever we dumped urine overboard, it was always so beautiful. I've always said one of the most beautiful sights in orbit was the urine dump at sunset! (laughter)

H: According to the 1969 NASA chronology you were appointed overall "manager of the Apollo Spacecraft Program at Manned Spacecraft Center replacing George M. Low who was temporarily on special assignment to the MSC director to plan future MSC programs and work on organizational matters." Was it understood that this was a temporary assignment for you?

M: No. What was really happening was George Low was being considered as the deputy NASA administrator and it hadn't been approved by Congress yet, and it was taking a long time to get that approval through. The space program was going on, and we had to make the change. I was going to take over as the program manager, so he just took that job on a very temporary basis. I was really the program manager and he was on his way to become the deputy NASA administrator which he did shortly after that.

H: How did you greet the idea of taking that on?

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M: Well, with great joy, really. After I'd finished flying my second space flight, I thought it was time to do a little soul searching. I'd been an astronaut for about 7 years at the time. I'd been a test pilot for 3 years before that. So I'd been in that business for about 10 years. One of the things that dawned on me sometime earlier was that most pilots, especially test pilots, end their flying careers one of three ways. They either get killed or they flunk their physical or they quit. I didn't think getting killed was a very good idea. I didn't want to flunk my physical. So it seemed that the alternative to those two was quitting. Well, how do you quit? It's a matter of you quit today or next year or you do it for another 20 years. But it seemed like when I left that part of my profession, it should be under my control and not under somebody else's. So after my second space flight, I tried to evaluate what I wanted to do in the rest of my working career. For some reason or other, I got a lot of job offers right then. One was to be the secretary of the National Space Council, and the Air Force wanted me to come back and run some Air Force space program. Other things were going on. I was scheduled to fly a lunar flight, Apollo 13 I think it was. I was trying to evaluate which of all these things I wanted to do. In thinking through my career after Apollo 9, I sort of decided that I really liked program management and I'd kind of like to run a big program, especially on the government side because if the program was big enough you had more control there. Then get out of the military and get into private industry.

Well, one day George Low called me up and asked me to come over and talk with him about taking his place as the Apollo program manager, and would I like to do that? I said,



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"Well, let me think it over." I went home and thought the thing over, and I decided that's what I'd like to do. My wife thought I was nuts. She thought I ought to fly a lunar flight. Most wives wouldn't think of that, but she did. The other opportunities were good too, but that seemed to really fit into what I wanted to do with the rest of my life. So I told them I'd do that, told the head of the astronaut office--I guess it was Deke Slayton at the time--that I was leaving, and I was going over to work in the program office. He thought I was nuts too. Anyway, I did, so I had an opportunity to run the Apollo spacecraft program for the last part of the program. Of the seven lunar landing attempts that we made, I was in charge of five of them. I really enjoyed it. I had a lot of difficulties. It was a lot of satisfaction in being able to pull all that stuff off.

H: Along that line, the chronology mentioned that. The 1969 chronology stated that "NASA announced the appointment of astronaut James A. McDivitt as manager for lunar landing operations in MSC Apollo spacecraft program office. McDivitt who would remain in USAF would be responsible for planning lunar landing missions subsequent to first landing and would no longer be a candidate for space flight crew assignments." How did you greet the idea of no longer being eligible for a crew?

M: Well, that was part of the whole plan. As a matter of fact, when George and I talked over my taking over the Apollo program it was conditional on his getting appointed to the deputy administrator's job. We knew that was going to take some time. So when we made that decision, we told the astronaut office I was leaving. It was probably a fortunate

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thing that we had a little delay in his appointment because it turned out that we hadn't really done much of anything in the way of planning the exploration of the Moon. We had really concentrated so much on the first lunar landing. While we had some experiment packages that we'd put together, we really didn't have a very comprehensive plan for the exploration or did we have some very good equipment. The lunar module was designed to land on the Moon and then have the astronauts go out for about 3 hours, and then that was about it. We redesigned the spacecraft to carry the lunar rover. We developed a different TV camera. We developed a communications systems that we----

(Interruption)

TV camera controllable from Earth so that when the astronauts were off exploring, the scientists that were on the Earth could steer the camera around and zoom in and out on different rocks. Sort of like having another group of people up there. We'd lengthened the stay of the lunar module from 24 hours to 5 or 6 days that it could stay on the Moon. We made a lot of changes. While the Congress was fiddling around with the confirmation of George Low, I was in charge of that part of the program. I knew I was going to be responsible for it later on, and we had these redesigns that we needed to do, so it worked out well. I had time to sort of in my own mind plan out what we ought to be doing and get the equipment designs underway. In the long run, it turned out to be the best thing that could happen. As soon as they got past Apollo 11 and Apollo 12 was coming up, we just couldn't wait any longer, and finally George stepped down as the program manager and I took over. Then he was confirmed by the Congress a few weeks later.

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H: Is there anything you want to get into before we talk about the ill-fated Apollo 13?

M: Well, Apollo 12 was my first one. That got off to a great start. That was the one where we launched, and it was struck by lightning twice in about the first 30 seconds of flight. I don't know if you read about the launch they had down at the Cape about a month ago where they lost a satellite. A rocket got struck by lightning. I saw in the paper this morning they thought it was struck by lightning nine times. Well, Apollo 12 was struck by lightning twice. It knocked the fuel cells off the line in the command module which shifted over to emergency batteries that we had. They lost all their instruments. The IMU went off the line. It just wiped out the spacecraft as far as anything electrically.

Fortunately the computer on the Saturn 5 and the inertial measuring unit on it didn't fail. They held together which got the thing into orbit. So we had to get the spacecraft power back up again. Checked everything out as best we could to find out whether anything had been damaged. Then decided whether to go to the Moon or not. That was my decision. So I hadn't been in that job very long before I made my first big decision. Of course, I'd been working the job for some number of months. But that was my first real time decision that I had to make. I was down at the Cape, and most of my technical guys were back in Houston, but we had a good communications setup and talked to all of them. We went through the systems one at a time. Anyway, I recommended that we go on off to the Moon. We did, and it turned out to be a successful lunar landing. We had

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problems on every flight. That was one. After that we did a major investigation of the effect of lightning on spacecraft and rockets, and I'd thought we had all that stuff put to bed. I was really surprised that they had a problem like that down at the Cape, and they acted as if they never heard of lightning before. I don't understand that. As a matter of fact, we gathered the best lightning experts in the entire world and had them over in the theater at the Cape for a couple of weeks working out what we ought to do and how we ought to prevent that stuff, and we never had any problems after that.

H: The 1970 chronology pointed out regarding the Apollo 13 space module oxygen tank explosion that "former astronaut James A. McDivitt, manager of Apollo spacecraft program at MSC, said primary information revealed by pictures was that the entire 13 by 5 1/2 foot panel filled by 250 bolts had been blown off and that fuel cells had remained intact." Was an accurate determination made as to what caused all this?

M: Yes. Some time after the flight, probably 3 or 4 weeks after the flight, we had determined exactly what had happened. Unfortunately, we weren't smart enough to figure it out beforehand. What had happened was prior to the flight we did what we call the compound demonstration test where the astronauts suited up, went out, and got in the spacecraft. They loaded up the spacecraft with fuel. They tanked the service module, the spacecraft, the rockets. Everything was ready to go except that we didn't fire the engines. It was sort of a rehearsal for the whole flight. We also did a lot of tests as we went through that. At the conclusion of that we normally detank all of the propellants

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except for the lunar module which was hard to do, impossible to do almost. We took all the oxygen, hydrogen out of the command and service module. Did those things.

When we got around to detanking the tanks, what you normally did was you just open up the valve and all the liquid oxygen would flow out. The liquid oxygen is made to be liquid by compressing it to a high pressure and then cooling it down to a very, very low temperature and putting it in like a thermos bottle. We opened up the valves on one tank, and it all came out. We opened up the valves on the other tank, and it didn't come out. What we were best able to assume was that a little piece had fallen out in the vent system which was not needed at all in flight. This was a large tank. It was probably 4 feet in diameter. It was a thermos bottle. It had two spherical shells. The inner spherical shell contained the liquid oxygen, and the area between them, the volume between them, was evacuated. Then the exterior shell was the outside of the vacuum bottle and also provided some structural strength. Up at the top there was a neck with a tubing and electrical leads went down inside the tank. There was a long tube that went to the bottom of the tank, so when you are sitting in 1 G on the ground and you open up the valves, and it's liquid because of the pressure would go up the tube, out the tank, and then overboard. This was a long metal tube. Up at the top it had to make a little goose neck turn. There was a metal tube, had a plastic fitting, a metal tube, another plastic fitting, and then went into the exit tube. We thought one of those little plastic fittings had come out so that when the oxygen was forced up the tube, it just got up to the top and spilled back into the tank. It didn't go overboard. Since we never use that in flight, it wasn't a very



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important thing, we decided that we would detank the spacecraft by just turning on the heaters.

Normally if you just let it sit there, as it warmed up the liquid oxygen would turn into gas and the gas could go out through the hole in the top. So we did that. We opened up the valves. We were getting rid of it but at a very, very slow pace. Except the procedure was to turn the heaters on to warm up the liquid oxygen and turn it into gas quicker, so we did that.

The problem then went back to a couple of things which were in the design which had been done 5 or 6 years earlier. When we went from the block 1 spacecraft to the block 2 spacecraft, the design criteria was to go back and redo the oxygen tank system so that it could withstand 60 volts of DC current. It was really designed originally to take 60 volts of AC current. I guess when the engineer was looking through the requirements, he just saw the 60 volts, and he said, "Well, it's already made for 60 volts, so we'll just leave it the way it is," which meant that the microswitches that were in it were inadequate for the 60 volts DC. When you open up a microswitch with DC current across, it will arc more than it will with an AC current. So you tended to build up, transfer metal from one part of the switch to the other part. That was one thing.

The other thing that happened was the instrumentation that read out the temperature in the tank only went up to 80 degrees. The temperature at which the heaters were supposed to turn off was also 80 degrees. When we turned the heaters on, the people in the control center were watching the temperature. They saw it go up to 80 degrees and then the

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switch opened up, like a thermostat in your house opened up, turned the electricity off, the temperature came down a little bit. Then when it got a little bit cooler the thermostat would close and then it would turn the heaters back on. So it was regulating the temperature at 80 degrees just like it was supposed to do. You could see the little wiggles on the chart. Then as the microswitch opened and closed, opened and closed, opened and closed, it finally was arcing enough so that it just stayed closed, welded itself closed. Unfortunately as the temperature then started to rise from 80 to 100 to 200, or to whatever it went to, the temperature on the charts stayed at 80 degrees because that was the limit of the temperature range. So the people who were monitoring it saw the temperature go up to 80, like it was supposed to, stayed at 80, and then it just stayed at 80, so they thought everything was okay. Well, in retrospect, it wasn't. Now we don't know that the microswitch closed because we never got it back, but that was the assumption.

As we left the heaters on in the tank, it certainly heated the tank up, but it also had some electrical wires that were in there that had insulation in it. We think it got so hot that it charred the insulation. The insulation cracked off, so we had some bare wires in the tank. Anyway, the tank emptied just like it was supposed to, and everything seemed to be all right. Nobody caught the fact that the 80 degree temperature was no longer wiggling. It was just constant which meant that it was off scale. We went ahead and did all the rest of the tests on the spacecraft. A week or 10 days, 2 weeks later, whatever it was, we retanked for launch and we launched the spacecraft.

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In going back and analyzing the data very, very carefully, we could see that during the time that we were flying before the explosion took place, that whenever the heaters were turned on or the fans were turned on in the tank--that if you went back and looked at the current that was drawn you could see a lot of spikes and wiggles on the current which meant that we were probably getting shorts in these wires there. Finally, those wires shorted out enough to get the temperature warm enough so that we think it ignited the insulation on the wires. It was in a 100-percent oxygen environment. In a 100-percent oxygen environment in 1,000 pounds per square inch pressure, which this was, you could burn a block of steel. Almost anything would be fuel when you've got that much oxygen in it.

What happened we think was the fire spread up the insulation of the wire, up into this neck where there was a bundle of wires that came together. The bundle of wires with more insulation on it made a bigger flame. As the temperature rose in the neck, it weakened the neck. With 1,000 pounds per square inch pressure in the tank, it just finally blew the neck out, or blew the whole tank apart, and it dumped all this oxygen into the service module. The service module was a long cylindrical body, but it had a lot of holes in it. It wasn't airtight by any chance. It just had holes all over it. What happened was when they dumped so much pressurized oxygen out, it went into a gas and created such a pressure on the side of the service module that it just blew this big panel out. Well, unfortunately, when the panel went, it damaged the other tank. We really had two oxygen tanks in there, and if we'd just blown one tank out and the panel out, we would have still been in good shape. I don't think we would have made a lunar landing, but we

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would have flown around and come home in pretty good shape. What happened was, when the panel blew out, there was a loading panel where we had lines going to each of the oxygen tanks and the check valves and the shut-off valves were at the panel. When the big panel went, we think it broke off the small panel and opened up a line into the good oxygen tank with no check valves in it. So that oxygen just leaked out, and we ran out of oxygen in the service module. That shut off the fuel cells because we needed that to make the fuel cells. We also ran out of water because you get water as a byproduct. Fortunately we had water and oxygen over in the lunar module.

During the time I flew on Gemini 9 I mentioned that we'd done a lot of combined spacecraft work. Fortunately, that all began to pay off then, because the crew went over into the lunar module and they were able to use the lunar module to keep them alive until we could get them back. Unfortunately, they were still on their way to the Moon when this happened, or maybe I should say fortunately, because if they'd been on the way back they would have already used up the lunar module. They were still on their way to the Moon, but they were on what we call the nonfree return trajectory where they were on a trajectory which would not bring them back to Earth. If nothing else would have been done, they would have gone past the Moon out into the solar system, and they'd still be out there, would have been there forever. So we had to fire the engines to get them back. Since we were afraid to fire the service module engine because we didn't know what kind of structural damage had been done to the service module, we had to fire the lunar module engine. Fortunately again, we had done that on Apollo 9, and we knew that it would work right. They fired the lunar module

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engine and got them back into an orbit that would bring them back to Earth, but they had to still go out around the Moon and come back. That orbit would have run them down into the Indian Ocean. We did some calculations and figured that would take too long, so we fired the engine again to get them back quicker. That orbit ran them back into the Atlantic Ocean. Then after they got past the Moon and were coming home, we fired the engines again to make it even quicker because we were running out of everything. That brought them down into the Pacific Ocean where they were supposed to land anyway, and they made it.

H: It was a pretty hairy experience.

M: It was a very hairy experience. I happened to be down at the mission control center that night. We were checking out the television camera system. I went down there to see how it was going to work. I was sitting at my console when I heard, I think it was Swigert [John L., Jr.] say, "Say, we just heard a thud, and there are a lot of snowflakes out there." As I mentioned to you earlier, when the rocket engine fired, you don't hear a bang. You hear a thud, because what you are hearing is, you are feeling the shocks up through the structure of the spacecraft. In a vacuum which is what you have outside the spacecraft, you can't make noise because noise is an air pressure wave. You don't hear noises, but you feel the shock. And when he said that he'd felt a shock, I thought, holy hell, he heard a thud. I thought something must have blown up. When he said he saw a lot of snowflakes---- Remember I told you when you dump the urine overboard it went into ice crystals which looked like snowflakes. I figured we must have dumped something



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overboard that was liquid. There wasn't anything that was pressurized. The water tank wouldn't have blown up. So I figured we must have dumped an oxygen or a hydrogen tank.

I quickly got out my book that I had sitting right next to my desk at the control center. I got out the book and it had in it a 3-dimensional drawing. It had the oxygen tanks right about where he said he was looking where he could see the snowflakes. I thought, holy Christmas. I had my television screen on, and you can call up the systems data on it. I called up the one that had the oxygen system. I remember that it was over in a corner, and I could see that one tank was already at about 100, which meant it was off scale low. The other one was dropping through 400 or 500 psi. I ran down to the flight director, and I told him to tell the crew to shut off the little bottle of oxygen that they had inside the spacecraft. It was not liquid. It was just gaseous oxygen, about 1,000 pounds per square inch. So they did shut that off. It was down already to 800 or 900 pounds. They shut that off, so now they had enough oxygen to reenter with. But I could see from what was going on that we were going to lose the rest of it. Then I thought, golly, there's no way to get these guys home alive. So we evaluated and worked hard and made a decision to fire that engine and get them back on a free return trajectory. They'd moved over in the lunar module and got that cranked up.

We had to go have a press conference. I remember Chris Kraft [Dr. Christopher C., Jr.], and I went to the press conference. I knew their wives were watching on television. Of course, they're all real good friends of mine. I knew their wives and their families. This press guy said, "Well,

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are we going to get them home or not?" I remember with a very dry mouth and a squeaky voice, I said, "Well, we are going to work as hard as we can and their chances are good." Although, quite frankly, I wasn't nearly as optimistic as I sounded.

It turned out that by using some very innovative things we were able to get them home. They ran out of lithium hydroxide in the lunar module, and we were able to go back in the command module and get the little canisters and tape them onto their oxygen hoses. The battery lasted. The thing that was really crucial, and most people didn't realize, is the temperature decline was probably the most crucial of everything. Normally the command module sat on top of the service module, and the service module had the fuel cells in it. They generate a lot of heat. They kept the bottom of the heat shield of the command module warm. Well, when we blew the side out of the command module, we lost the heat from the fuel cells, but we also opened up the side of the service module so all the heat could go out into space which meant that the bottom part of the command module was going to get cold. The tanks for the small rocket engines on the command module were around there. If we didn't have those rocketing, they couldn't control the spacecraft to come back in, and they'd either skip back out into the circle of the Earth forever or way out into deep space or would have burned up coming in. We had to have those, but we didn't know how fast they were going to cool down. I had the guys run some thermal studies on the computer, and they had three lines. One was the normal line. If they had the normal they'd just have enough heat left to get them back. If it was a hot case, they'd get back with about 6 or 8 hours to spare. In the cold case,

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these things would freeze up 8 or 10 hours before we got back to Earth. That's why we had them come back earlier.

Anyway, about a couple of days into the mission, I had them go over to the command module and turn on the telemetry for just a very short period of time. We got the data. They went back into the lunar module. We never even told them why. We got the data, and we plotted it very quickly, and we were on the normal line which meant we were going to get back with just a few hours to spare. When they finally did go back over into the command module just before reentry, one of them said something about, "Gee, I'm trying to get some water out here. I can't get any water. The water tank doesn't work anymore," which meant it had frozen up. We were forecasting that it wouldn't freeze up. Water freezes at 32 degrees, and I think the fuel froze at 17 degrees, but the water was in a warmer place we thought, so we didn't expect it to be frozen. I thought, holy Christmas, maybe they won't make it down after all, but they did. That was probably the greatest space flight, the greatest exhibition of team work and people working. Remember I told you that our space program worked better because we had people in the loop. Without people there, if it had been all automated, we would have never done it.

(End Tape 6, Side 1)

H: According to the 1970 chronology, Lovell, Swigert, Haise [Fred W., Jr.], and you attended the 21st International Astronautical Federation Congress held at Constance, West Germany. What opinion did you have of this affair?

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M: It was a good international symposium on space flight, heavily attended by the Soviets, lightly attended by the Americans, but a lot of attendance by other people interested in space. The European Space Agency had a lot of people there from all the European countries. I remember there even were some people there from Israel. The highlight of it for me was the opportunity to spend a lot of time individually with a bunch of Russian cosmonauts and a bunch of Russian space engineers. Lovell, Haise, and Swigert left fairly quickly. They were only there for a short time, really. I spent about a week there, maybe a little longer. There was a Russian cosmonaut, Boris Yagorov, who spoke English, who was there for a long time. He was a medical doctor who had been up on one of the earlier Russian flights. There were two other Russian cosmonauts there who had just returned from long-duration flights, probably a month or so, and then a bunch of Russian engineers. Like I said, I had a lot of time to spend. We went to dinner a number of times together, went out on the town. Then when the other two cosmonauts left and Haise, Lovell, and Swigert left, it was just Boris and myself, and we spent about a week together, talking politics and a lot of other things.

It was really where one of the joint Russian-American space flights started because just before I got ready to go home, a day or so before, he said, "Jim, my leader wants me to tell you to tell your leader that we think that if we did something in space together, it would be a good idea." I said, "Well, tell me that again." So he did, and I said, "Okay." When I got home I went to see Dr. Gilruth [Robert R.], the Center director. Maybe he wasn't the Center

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director anymore. Anyway, I went to see Dr. Gilruth, and I told him what had happened. Then I went to see Chris Kraft, who was the Center director, told him what had happened. Then I gave George Low a call, told him what happened. Shortly thereafter we were able to make some arrangements for Dr. Gilruth to lead a team over to the Soviet Union, and a few years after that we flew that great American-Russian space flight. I'm not sure that that was a good idea, but that's the way we did it.

H: The 1970 chronology noted that on 14 December 1970 you were nominated for brigadier general by President Nixon who submitted your name to the Senate which confirmed your promotion on 31 December. Did this come as a surprise to you?

M: It sure did. What was the date of that, I've forgotten?

H: On 14 December 1970 you were nominated, and you were confirmed by the Senate on 31 December.

M: It sure was a big surprise for me because there hadn't been any other astronauts promoted to general rank or admiral rank. Although I was no longer an astronaut, I was running the Apollo program. There had been a number of Air Force generals who'd worked on the Apollo before. I was really surprised. I was very young and very junior in commissioned service compared to what most of the people who made general were, so I was quite proud of being selected.

H: The 1972 NASA chronology stated that "Appointment of Owen G. Morris as the manager of the Apollo spacecraft program was announced by Dr. Christopher C. Kraft, Jr., Manned



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Spacecraft Center. Morris, former manager for lunar modules in the program office, succeeded Brig Gen James A. McDivitt, USAF, who became special assistant to the Center director for organizational affairs." What was behind that move?

M: Nifty title, wasn't it? Well, I decided somewhere along the line I was going to retire. I was trying to find the right moment to retire. We were getting towards summer of that year, 1972. The next Apollo flight, Apollo 17, wasn't scheduled until December of 1972. I figured if I waited until December and retired then, it would be right in the middle of the school year, and it didn't seem like a good idea. I'd weighed all the alternatives about staying in the Air Force and getting out of the Air Force, staying with NASA, and finally I concluded that I really wanted to get out and go work in industry. Rather than have it unclear about what my intentions were, at a press conference, the preflight press conference for Apollo 16, I said that that was going to be my last flight as the Apollo spacecraft program manager and that my future plans were indefinite. We flew the flight. It was successful. Then, of course, we had to turn the reins over to somebody else. Owen Morris was the lunar module program manager and I had another very competent fellow named Erin Colin who was the command module program manager, and in discussions with management at the Manned Spacecraft Center, we decided that Owen would become the program manager for Apollo and that Erin would go work on the shuttle. So for the last flight instead of myself and two other program managers, we only had one fellow. The spacecraft was essentially built. What we really needed was somebody in control during the flight. It went very well, and Owen did a super job. The reason I ended up with that

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crazy title was they had to give me some title, so they just gave me that one.

H: Lt Gen John B. Hudson mentioned in his interview last January that he was given the job to try and talk you out of retiring at that particular time.

M: What was his name?

H: General Hudson.

M: Yes. A number of generals tried to talk me out of retiring, but I must say that the Air Force was very, very kind to me. Shortly before this, one of my fellow astronauts decided he'd retire, and he really badmouthed the Air Force. I thought it was in very, very poor taste. I had no dislike for the Air Force whatsoever. As a matter of fact, I was very fond of them and really hated to retire. But one of the things sort of like astronauting and test piloting, it's not whether or not you leave the Air Force, it's only a matter of when. I have a very good friend of mine who went through pilot training with me who's a four-star general today. Earl O'Loughlin [Gen Earl T.], who's going to have to retire this summer. He's going to have his 35 years in, and so Earl's going to retire too. I felt that for me and my family it would be best if I retired then as opposed to retiring at some later date. The Air Force offered me a number of excellent jobs and NASA did too. I thought about it very long and very hard, and I decided that, no, I really should retire then. It was a very difficult decision. As a matter of fact, at my retirement ceremony which was held at Bolling AFB, and the Assistant Secretary of the Air Force came over for it. They had the troops march by, and I

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actually cried. It was very difficult for me. I was very fond of the Air Force. It really made me everything that I am today and changed my whole life.

H: Who retired you?

M: I don't even remember his name. He was the Assistant Secretary of the Air Force.

H: No general retired you?

M: Yes, I guess there were some generals there too. I'll tell you, I was so overwhelmed with retiring that I don't remember who showed up. (laughter) It was a very difficult day for me, Jim.

H: The 1972 NASA chronology stated that you announced your resignation from NASA and the Air Force effective 1 September when you would become senior vice president of Consumers Power Company in Jackson, Michigan. What attracted you to that particular position?

M: Well, it was very peculiar. Jackson was where I'd gone to junior college, and I really didn't like the town. My mother still lives there by the way. But I really did not like Jackson. When I left there, I figured I'm never coming back to this dumpy old place. Along the course of my career I'd been invited to become a member of the board of directors of Consumers Power Company. I had no intentions of ever working there. When I announced my intentions to leave the space program, I didn't have a job. I just started looking for one after that. The president of Consumers Power Company died very suddenly with a heart

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attack. And I had a number of job offers, and I got a job offer from them. It seemed to me I was so involved with all the aerospace companies that I didn't feel it would be ethically correct for me to take a job with any aerospace company. As Apollo program manager, I worked with almost everybody in the industry, as I had on other airplane projects and things, so I just didn't feel it was right to retire and work in the aerospace industry. So I eliminated that right off the bat. Of course, when you are a used astronaut you don't bring a lot of talents to a lot of businesses. I did know a fair amount about the utility business since I'd been a director for a couple of years, and it seemed like a good opportunity, so I went back there as senior vice president. Then I became executive vice president, and even had an opportunity to become president, which I declined. By then I decided I didn't like the utility business that well. At least not in the State of Michigan.

H: Where did you go from there then?

M: I spent 3 years in that area. I learned an awful lot about business, just a tremendous amount about business. But because of the peculiar political situation in the State of Michigan--the Attorney General dedicated to nationalizing the utility companies--the constant intervention by the Attorney General in the affairs of the company, and a very bad business climate in Michigan, I decided that wasn't where I really wanted to spend the rest of my working career. In the meantime I'd become a director of the Pullman Company, and the chairman, chief executive officer, knew I was unhappy with my lot at Consumers, and he offered me an opportunity to become a vice president of Pullman to

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look after the railways, the rail business, which I accepted and became the president of Pullman Standard and chairman of our Pullman Leasing Company ultimately, and finally executive vice president of Pullman after about 4 years. So I not only looked after the railroad business, but I also was in charge of three engineering construction companies that did worldwide engineering and construction. I enjoyed my time there too. I went from utilities to railroads to construction.

H: Then what did that progress to?

M: Then our company was taken over in a takeover battle. We had a company named McDermitt try to buy Pullman. We went out and found a white knight in the form of Wheelerbrator-Frye. Wheelerbrator-Frye came in and took over the company, so we merged with them. Very good for our shareholders. We started the takeover battle around \$24 a share, and we finally sold the company at 52 1/2, 53 1/2, I forget which. After we merged the two companies together, I decided I really didn't want to stay in that company. I received a phone call from people at Rockwell inviting me over for some discussions, and I did. After some period of time we agreed on a job, and I went to work for Rockwell, where I've been for the last 6 years.

H: Where were you living all during these years?

M: Well, when I retired I went to Jackson, Michigan, spent 3 years there. Then I moved to Chicago. That's where Pullman was. I lived there for 6 years. Then I moved to Pittsburgh, and I was in Pittsburgh, which is one of Rockwell's corporate headquarters, about 3 and a quarter



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years. Then I came out here to Anaheim, and I've been here for 3 years now. So I'm back in the aerospace business.

H: How do you like the difference between the east and the west?

M: I like the west better. I really do. I spent a lot of time in Washington working for Rockwell. Washington activities reported to me when I first came to Rockwell. I was in charge of strategic management which included acquisitions, divestitures, strategic planning, science and technology, engineering, and then later on I got all the Washington affairs. Moving out here to California, I've been working in the electronics businesses for the last 3 years.

H: Do you still have any affiliation with the Air Force?

M: Sentimentally, yes, and I belong to the Air Force Association, and I participate that way, but not anything on a day-to-day basis. We do a lot of work for the Air Force as contractors for them, and they are our biggest customer in our electronics businesses. I'm very careful to not get my former Air Force experience tangled up with my present business experience. Like I said, I'm very sticky about the ethical parts of those things. Still I have a very warm spot in my heart for the Air Force.

H: That's about all the questions I have. Are there any particular areas or subjects that I didn't mention that you'd like to bring out before we close out?

M: I think probably the really key thing is that my life was sort of at a crossroads when the Korean War started. As I

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mentioned earlier, I'd graduated from high school intending to go to college, didn't have enough money, worked for a year, went back to junior college for 2 years, got a scholarship to Michigan State, still didn't have enough money to even accept the scholarship, went back to work. It was with the intent of working for a couple of years. I think in reality if I'd really worked for a couple of years, I would have been 23 years old, going back to college as a junior, another 2 years, I wonder if I would have really made it through. It would have been very difficult. I could have gotten married along the way, and that would have been even more difficult. So when the Korean War started, I almost got in the Army and then that flash of brilliance in the middle of the night that woke me up and figured out a way to get in the Air Force. Those things really turned my whole life around, and they provided me the opportunity to do all the things I did. It made, I think, really a different person out of me than I would have been if I'd gone that other direction. However unknown it might be.

H: Have any of your children gone into the Air Force?

M: No. As a matter of fact, none of them have. My older son wanted to be a pilot very badly. He wanted to get into the Marines. A few things happened so he really couldn't get in. My younger son, when he graduated from high school, decided very abruptly that he wanted to go to the Air Force Academy, and he wanted to be a pilot too, and was accepted. He decided very late. Fortunately, he was a good swimmer, so I knew that if you are a good athlete the coaches have a lot of ways. Anyway, I called the coach, and he told me that if I had been an officer, which I had been, I could get a Presidential appointment, but we had to have the

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application in Friday. This was Monday. We found an application, xeroxed it, filled it out, sent it in. My son was accepted. He had his interviews and all those things. It was getting close to where he was going to have to leave in the summer. He was still in school, but very close to graduation, when one night he came down and said, "Dad, would you be upset if I didn't go into the Air Force?" I said, "No. I want you to do whatever you want to do. But would you mind telling me why you don't want to do that?" Because he really wanted to fly and he thought the military was good and all that. He said, "Well, I've been sitting up in my room thinking. I'm 17 years old, and I've got to spend 4 years going to the Air Force Academy. It would be a little while after I got out before I can go to pilot training. I've got to go to pilot training for over a year. Then I've got a 5-year commitment at the end of that." He said, "That's 11 years. Eleven years is over two-thirds of my whole life so far. I don't really think that I can commit to anything for 11 years. I like the Air Force, and I'd really like to fly, but I just don't want to commit to do something for the next 11 years. I'll be 28 when I'm through." I said, "Well, whatever you want." So he decided not to go to the Air Force. He went to Notre Dame instead and he's perfectly happy.

H: What did he major in?

M: Well, he was a business major. He started in engineering, switched to business, and graduated, and then went to law school, got a law degree. He's in investment banking now, and he thinks he wants to go back to school and get an MBA in finance and really be an investment banker the rest of

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his life. I've got another son, my older son, who is a business major. He's working for Braniff Aircraft Company in Dallas in Army missiles. My older daughter, Ann, is married to a fellow who works for Rockwell in Atlanta, Georgia, and they build air-to-ground, air-to-air for Army and guided bombs for the Air Force, so they've got a little association with the Air Force there. My youngest daughter, Katie, is a junior at the University of California, Berkeley.

Incidentally, I didn't mention along the way that I flew in space in 1965, and Katie was born a year afterwards in 1966, so she was the first baby that was born after her father had been up in space. So they did a few medical experiments with her when she was a young baby, nothing of any great consequence. A couple of pediatricians followed her progress very closely for a few years, and it was obvious she was just as normal as anybody else, so they all gave up on that.

H: Well, if you don't have anything further.

M: I don't think I have anything else, Jim. There's probably another 45 hours of rambling we could do, but there's the highlights, I think.

H: On behalf of the Air Force History Program I certainly appreciate you taking the time and interest in our program.

M: Well, I'm pleased to be of help. As I said, the Air Force and I are still friends.

(End Tape 6, Side 2)

(End OH Interview #1747)