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DONALD L. MALLICK
INTERVIEWED BY SANDRA JOHNSON
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JOHNSON: Today is February 18, 2015. This oral history session is being conducted with Donald Mallick in Palmdale, California, as part of the NACA [National Advisory Committee for Aeronautics] Oral History Project sponsored by the NASA Headquarters History Office. Interviewer is Sandra Johnson, assisted by Rebecca Wright.

I want to thank you again for coming to meet with us today, and to talk with us about your career with the NACA and with NASA after that. I'd like to start by talking about how you first learned of the NACA and a little bit about your background. I know you were in the military, and you also were, I believe, at Penn State [Pennsylvania State University]. So if you can just talk about how you first got interested in working for the NACA.

MALLICK: I finished up in the Navy, flying, in 1954, and I went back to college at Gainesville, Florida, the University of Florida, and the reason I went back into college, I only had two years before going into flight training in the Navy, and I wanted to finish in an engineering degree. I had taken two years of mechanical engineering at Penn State before the Navy, and when I went back to Florida after flying, I switched to aeronautical engineering. I had enjoyed the Navy flying and the challenge, and I did well, but I didn't like the Navy career for a family. Our first child was born while I was at sea, and I didn't see her for nine months. So, when we finally finished up our commitment to the Navy, the wife and I decided that we were going to work in

another area or field. I decided to go through the aero engineering, with the hope of becoming a test pilot.

I think it was at the University of Florida, in the aero department, where I first learned about NACA, because in the aero engineering department we used a lot of the NACA reports on airfoils and drag and coefficients of lift and design, so we were very familiar with NACA. They had been around for a long time and they were involved in this flight research, so that went right along the line. I don't think I was aware of the flight test department at NACA until about my last year in college, and then I started to send out inquiries to NACA, and aircraft companies, about a flying job.

It was pretty difficult for somebody like myself coming out of college, even with the military flight experience and the engineering degree, to go directly into test flying. Usually what happened was, you'd go into an engineering department at an aviation company or NACA and you would work there as an engineer for a while, research engineer, and then hopefully get into the flying slot. I had a reply from Langley, NACA Langley [Research Center, Hampton, Virginia]—Jack [John P.] Reeder was the Chief Pilot then—and he said, "Yes, we're thinking about hiring a pilot about the time you graduate." I'd given my history and what my experience was and when I was going to graduate. He said, "We'd like to have an interview."

Well, it was sort of interesting in those days, because companies were really after engineers; this was 1957, and they were hiring everywhere. They would come to the college and give you an airline ticket to their company, wherever it is, for an interview, so you could go there. McDonnell Douglas [Corporation] had actually done that with me, but they hinted like I might get into their flight test department as a test pilot. As it turned out, I took the trip but they

were interested in me coming in as their flight test engineer. I asked their Chief Pilot, I said, "Well, how many people do you have waiting?"

He said, "Don, I have to be honest with you. I have three ahead of you right now, Navy people, Air Force people, engineers, pilots working as engineers, waiting for an opening."

But when Jack Reeder came back and he said they were looking for a pilot, I thought, "I'm going up there."

At that time, I was flying in the Navy Reserve out of Jacksonville, and we could take airplanes all across the country, and I thought, "This is great; I'm going to zip up to Langley and see him." Well, the Navy was out of fuel funds. They cycled; some months were up and some were down. So I just bought an airline ticket. I really wanted to go up there, and I went up and interviewed with NACA Langley. At the time, they told me that there were several other people applying, and they'd let me know in two weeks either way. So then I went back to Gainesville, and I sweat for two weeks, but I got a telegram and they'd made me an offer. I sent them one back right away and I accepted. I was very fortunate to come right out of college with what I had and go into the flight test job. That's when I went into the NACA Langley.

For about a year I was a real busy pilot, because they had a lot of programs going, a lot of different aircraft, and they were hiring because they really needed help in their office. I went through a checkout that first summer, probably six or seven different airplanes where they got me qualified and flying to help support the office. That was my busy time. Then it was just a year, in 1958, NASA was formed up, and that was an interesting time. That was an interesting time at Langley, I'm sure at a lot of the other Centers too.

For a long time, or a certain number of months, there was a question in the country on who was going to have the space effort. After the Russians launched their Sputnik [satellite], the

military, the Air Force was looking at it, the Navy was looking at it. There were a lot of people who wanted to get into control [the effort], but I think the president at that time [Dwight D. Eisenhower] said no, it's going to be a civilian effort. It was natural for NACA to be selected, because they were a big civilian aircraft research operation at the time, they supported all companies and all the nation's efforts, so now we were NASA, like overnight, when they finally made the decision.

I can recall, at Langley, people were really busy trying to decide whether they were going to go into the Space Task Group, I think they called it then, or if they were going to stay—they were going to be NASA, but if they were going to stay under the aeronautics or go to space. A lot of the key people, the engineers and scientists, went into the space group, which everybody expected. It wasn't a choice for me, because I was just a brand-new research pilot and just getting my feet wet in the game, and the original seven astronauts that were selected were what we called two-tour pilots. They had been in the military at least six or eight years, and a lot of them, had completed military Test Pilot Schools, so they were pretty experienced people, the John [H.] Glenn and the Gus [Virgil I.] Grissom and those people that went in, the original seven.

They opened up the Space Task Group at Langley, but over in the Air Force area. They had some buildings over there that NACA, NASA now, had control of, and that's where they started before they went on to Houston [Texas, Manned Spacecraft Center, now Johnson Space Center]. So I was NACA for just a year, and then it was NASA.

JOHNSON: You mentioned it was a busy year with all those different types of airplanes. Can you talk about some of the different airplanes that you flew? And how many pilots were there and

how was it determined which pilot was going to fly which airplane? Or did you all become proficient on everything they were testing at that point?

MALLICK: Oh, no, there was quite an order to it. The level of experience determined what program you were going to go into. Like when I went in as a new pilot, I started out at some of the lesser research programs, one helicopter program and a couple of jet programs I worked on, plus a lot of support airplanes. Langley had a little amphibian [Grumman] JRF [Goose] and they had a Douglas C-47, Skytrain and they had a Lockheed 12-A [Electra Junior], which was a little airplane like Amelia Earhart flew, what she was flying, a little twin engine, and they did support work with those, flying back and forth to Wallops Island [Wallops Flight Facility, Virginia], to Washington, DC, and around.

That was a big initial effort that I got into because the pilots who were on the more senior research programs were busy with those, and they needed help in the support area. So the new pilot would come in at the bottom, you picked up the support flying and a few minor research programs, and then with experience you kept going uphill in research. I probably flew half a dozen or more airplane, different types, that first summer.

JOHNSON: What was the process of flying something you'd never flown before? I'm assuming you flew with someone for a while until they checked you out.

MALLICK: The older pilots who were qualified on those airplanes served as instructor pilots, and they checked me out. Of course I had the Navy flying experience, so I wasn't a complete novice or beginner, but it was nice to have these very experienced guys in these different airplanes give

you the checkout. One fellow on the amphibian, the pilot that checked me out, Bill [William L.] Alford, he was a [Consolidated] PBY [Catalina] pilot in World War II. He flew them all over the Pacific and tremendous background before he went into research. So that was the idea, that people [with more experience] were training the new people coming in.

JOHNSON: You mentioned the helicopter. You hadn't flown helicopters before that?

MALLICK: I had not flown helicopters before, and that was a new checkout for me there too, was flying helicopters. That was interesting, and that was a challenge. When I was in the Navy flying fighters, I thought the helicopter pilots were just to pick us up out of the ocean when we ejected, but then I found they did a lot more with helicopters and research, and Langley was doing a lot of helicopter research. One of the first programs I had was a little Bell 47 helicopter, and it was a hand-me-down program. It wasn't finished, but two or three of the other pilots had flown a portion of it. They put me on it to close it out, so I had to gather up all their data, figure out what was tested, figure out what I was going to flight test to fill in the blanks, and then get a report on it. That was one of my first applications of research in helicopters.

JOHNSON: Was that the first report you had written?

MALLICK: Probably the first tech [technical] report I was involved in, yes.

JOHNSON: After reading them when you were in college and then actually getting to write one.

MALLICK: That's right, and reports at NACA, and NASA, they were really massaged. When something hit the streets, was published, it had been through a lot of review boards, a lot of exercise, and a lot of critics and contributions along the way. It was an interesting exposure, and that was part of my training, part of my getting ready with the system. I went through the whole process with review boards and changes and updates and on and on.

JOHNSON: In your book [*The Smell of Kerosene: A Test Pilot's Odyssey*], you mention that—this is a quote from your book: "Accomplishing a task involves both art and science, especially true of flying." I thought that was a pretty interesting way of describing it, and I didn't know if you wanted to expand on that a little bit and explain what you meant about that combination of art and science.

MALLICK: Well, the science part is probably the knowledge of the equations, like in aircraft, equations in motion; the dynamics of aircraft; the numbers of aircraft; the systems of aircraft. And the art is the ability of a person to integrate this all into the flying inputs and the controlling of the aircraft and operating the aircraft. Just like driving a race car or other coordination tasks, there's variation between people. We all have to have a certain ability to accomplish a task, but there are variations in pilot's performance abilities. I used to refer to a pilot that learned quickly and adapted to the flight task, as a natural. It seemed like the art of flying was easy and natural for him. He was like the Smiling Jack, a cartoon aviator, who flew everything and did everything well. You'd look at a fellow like that and say, "Well, he's a natural." And there were people that were almost natural in the flying ability, or what I consider the art of flying.

JOHNSON: You did mention that in your book, too, those natural pilots, but I don't think you considered yourself a natural pilot.

MALLICK: Well, I tried to be realistic in my evaluation not only of other people, but myself and where I fit in. I was probably somewhere in the high-average but not a natural pilot. There weren't that many. I would say natural pilots, you might be talking about three or four percent of the people flying you could call natural. We had a few in the training command, and they were the people that all the mechanics of flying came to them naturally; they didn't have to exert themselves or learn or practice that much, and there weren't too many people like that. That's a small percentage.

JOHNSON: As you mentioned, there was Sputnik, and that happened right after, I believe, you started working for the NACA, or not long after, around the same time.

MALLICK: Well, Sputnik, I think, spawned NASA. When Sputnik went off, then the government got together and all the agencies and they said, "Hey, what are we going to do? The Russians are ahead of us. We're not even near that." And that's when they started NASA.

JOHNSON: As you said, the activities changed and people started dividing and going into the space side or staying on the aeronautical side.

MALLICK: It was interesting, too. Like I say, a lot of key people were in the Space Task Group, which you'd appreciate and you'd expect. The ones that remained behind, that stayed into the

aeronautics section, it changed a lot, too, and a lot of people didn't realize it really wasn't two real separate areas. It was mostly NASA, and even the ones that stayed in aeronautics like myself, we were doing programs to support the NASA effort. The emphasis was on NASA, I think the primary money budget was on NASA, no question, but there was still aeronautics going on. But, there was a lot of support within aeronautics to support NASA, that effort, the space effort. I worked on some of those, too.

At Langley we had a program on the Navy [Naval Air Development Center, Johnsville] centrifuge up in Philadelphia [Pennsylvania]. Some of the junior pilots were assigned on this program, including myself, and some of the senior too, but they were evaluating on a Navy centrifuge what a test pilot, or astronaut, could handle with high accelerations and still function in the cockpit. The Navy had used a centrifuge for other type tests, similar tests but not quite the way NASA was doing, so we ran programs up there on the centrifuge where we would be rotated around at very high G [force of gravity] levels, like they expected the astronauts to go under, and during that time we would be required to do manual functions in the cockpit, to move around the cockpit and turn lights off and do sequences and things like that. That was research to support the space effort.

We had others that were sort of harebrained, not too many, but there were some because it was really an accelerated period. Everybody was deciding what do we have to do to get into space, to make this work? We had one program they assigned me to I wasn't very fond of, but it was one of the things you did. They were concerned with a pilot's spatial orientation in zero-G [gravity] with no visual contacts. I'm not sure of all the details now of how they were going to do it, but they actually built a steel sphere, a pretty big sphere. I don't know the diameter now, 30 or 40 feet, and they built it behind a hangar building, out of sight, which I don't know why

they did that. But anyway, they were going to put a subject inside the center of this sphere with a breathing device and radio communication, fill it with water, so he was suspended in water like you're floating, and then change the orientation of him to see if he was able to physically determine what was going on without any visual [cues]. It was one of these, I thought, ideas even at the time that was sort of harebrained, but I think there were a few of those that were part of the evolution of people getting into the mode of what was really required, and there were some wild flyers, and that's what I thought this was.

I went through water training over at the Langley Air Force Base pool with a scuba diver. Another pilot and I were going through it. The trainer at that time, it was interesting, he was a NASA employee, but he was a certified diver for the state of Virginia. When he came to work, he had his tanks and his diving equipment in the trunk of his car, and he'd sometimes get a call from the highway patrol that somebody had gone off a bridge or something in a car, and he would go out and dive and try to rescue people. He was our trainer.

As it turned out, we were all concerned about the safety of this device, because you don't like to think about crawling through a hatch and being sealed in. Well, it had explosive bolts on the hatch, and they were going to fire these bolts in the hatch (if you got in trouble) and you would be out of there in a minute or two. As it turned out, the professional diver was actually serving as the evaluator on this device before the pilots got into it, and they about lost him one day. They got him out of there and they saved him, but that ended that project. To me that was an indication that some of the thinking went just too far beyond a safe boundary at that time for doing things. But there were other programs and we did that supported them.

I participated in a lunar simulation study at Martin Marietta, up in Baltimore [Maryland]. There was a pilot from Langley and a pilot from Ames [Research Center, Moffett Field,

California] and a pilot from Lewis [Research Center, now Glenn Research Center, Cleveland, Ohio] that were assigned for this. This one was a more realistic thing and study; it was a big sphere, it was built into a room like a space capsule, and it was a simulator. It had room for three pilots, and they had the program set up where we could fly different stages of the flight to the Moon on instruments and make corrections in course and other things. But the big study was a psychological study to see how the confinement of the people would be, how they would respond to this. Our longest mission was just about a week, or over a week. We had a little place where they put the food in, like you had frozen food, and we had a chemical toilet in the back of this thing, and we stayed within this thing for seven or eight days steady, taking sleep shifts and work shifts and flying the simulation to the Moon and back.

Of course, they had a psychologist in charge of the program, and he was monitoring. We had tasks to do even beyond the flying tasks that were checking our mental capability with time, to see if there was any deterioration. They had some really tough mental tasks as far as throwing 9 or 10 numbers on a screen for you, and then they would disappear quickly, and then you would have to find them with memory and put them back on, tasks like that. But this was all supporting the space effort, the coming-up space effort, that the Center was doing. That was sort of interesting. I liked that one better than I did the tank with the water in it.

JOHNSON: At least you could breathe, right?

MALLICK: You could breathe, yes. We ran several two- or three-day programs before the final one-week program. We worked up to it. Then the final one was the trip to the Moon and back.

JOHNSON: Did you find anything out about yourself? I mean, did you do okay with that?

MALLICK: Not too much. It sort of came out as the pilots expected it would. After a while—we slept in four-hour cycles, and that's the way it was scheduled. You always had the humming of the motors and instrumentation in the background to help you sleep, and at first you didn't sleep that well, and then later on you got used to it. We had sleep cycles, work cycles, all that was part of the program. I think everybody came through pretty good. The psychologist was sort of cute. He would interview everybody afterwards, and he asked the pilot from Ames, he said, "Why were you still taking your antihistamine pills? You know you were in a controlled environment, there was no dust in there." They had air-conditioning and all this going on. I think He was just trying to see if the guy would get upset, but he didn't.

He said, "I took them out of habit, I guess."

JOHNSON: Were there simulators for the different aircraft that you flew at Langley?

MALLICK: I started out with the [Bell] H-13 [Sioux] helicopters, HRS, which was a helicopter that we used to launch models of different military aircraft.

JOHNSON: I was going to ask you about that. That's interesting, that you took the models up and launched them from the helicopters?

MALLICK: They had a rig on the side of the helicopter, it was electrically controlled, it was a moveable rig, and it was retracted up and it would have an attach point, and they'd come in with

this model and they attach it when the helicopter is on the ground, and the models were radio-controlled from the ground. They were doing mostly spin tests, and they wanted to develop spin recovery techniques for new airplanes; even airplanes that were just being introduced into the military, they would have models of them. We would work with the military, they followed the programs.

Anyway, they would attach the model, check out all the control systems, there would be a man on board the helicopter that was controlling it, and there would be a man on the ground. Then when we took off and flew out, we'd actually lower that rig a little bit below the helicopter, that arm that would go down, so it was more out in the free air, and then we'd set the helicopter up at altitude, maybe 8,000 or 10,000 feet, out over a special recovery area, Plum Tree Island [Poquoson, Virginia] at Langley. The man on the ground would make sure he had control, they'd verify that he had control of it, and then we'd release it.

When we'd release it, they would normally release it and sometimes they would have a foil on it to put it into a spin; immediately it would go off and went into a spin. That little foil would then depart the aircraft, they'd have it come off the aircraft, and the man on the ground with their optics and their flight controls would put in recovery controls to recover this model from this spin. It was dynamically balanced, and the data that they were receiving worked and was appropriate to apply to full-scale airplanes. So that was some of the spin work we were doing. Flying a helicopter was just support. We were just getting it out to the range and launching it for them so they could do their tests.

JOHNSON: How high did you go to launch those things?

MALLICK: Probably around 8,000 or 10,000 feet. Langley was about sea level, so they had quite a bit of altitude. Then what they would do to recover it, when it passed through about 2,000 feet above the ground, they would deploy a parachute. They had a parachute in it to recover it so it wouldn't be damaged too much. Unfortunately, there were creeks that went out through this Plum Tree area, it was a swampy area, and once in a while it would land right in the middle of the creek, and then usually it was saltwater, and that took care of all the instrumentation. But if it came down in a marsh, it would be recovered and refurbished and used again later.

We also did handling qualities tests on helicopters; evaluating modified control systems. Flew the [Sikorsky] HO3S, and I think I had in the book that's the one that I rolled up with, Bob [Robert A.] Champine with me in the back. That one was a real early Navy chopper, and it had a bad habit of ground resonance. Some of the early helicopters, when you landed and it touched down on the ground, the generating moments from the rotor system going around would feed into the landing gear, and within just a few seconds it would get very harmonic motions and tear itself to pieces if you didn't get out of that area. When we encountered that resonance, I abruptly pulled the helicopter back into the air with the full collective pitch. I ran out of directional control, which the helicopter was sort of minimal in. We drifted rearward and sideward and we struck the runway, and rolled on our side. Neither Bob nor I were hurt. We were able to exit the helicopter on our own. That was my first and only big crash and it was in a helicopter. That was flight research in an early, highly modified helicopter.

I flew an [Sikorsky] HR2S, which was a big military helicopter. It had two R-2800 engines, and that engine was the one that was used in [Grumman F6F] Hellcats and [F8F] Bearcats and fighters. They had two of those in this big helicopter on two big pods. It was for heavy lifts, and the military used it early, I think, to pick up some of the Mercury capsules and

things that they were using, but we were doing flight research on the control system. I flew on that more as a safety pilot than an evaluator, and Jack Reeder and Bob Champine were the test pilots with helicopter test experience; they were evaluating various changes in the control systems on helicopters, all with the idea of applying improvements to future helicopters.

JOHNSON: You said you flew more as a safety pilot, and is that like a second seat?

MALLICK: Well, usually on an airplane, the research airplanes that we were modifying, if it was a two-place airplane you would normally take one station, one seat in it, and you would do the modification and simulation from that seat. You would try to keep the other seat in that cockpit connected to the basic airplane, or helicopter, and then if you got any problems with the test side, something that didn't turn out right, hopefully you would switch back to the basic helicopter and the safety pilot to recover it. Then in the case of the HO3S, I was the safety pilot in the front seat and Bob Champine was doing the evaluations in the back seat with a modified system, but I was flying it at the time from the front. It was a basic helicopter that had this bad harmonic frequency problem that we got into. It wasn't the research system we were looking at.

JOHNSON: Okay, that caused the accident. After those accidents, and there were other accidents that happened, there were always investigations to determine what caused that. After your accident, were the pilots involved in the investigation, other than being interviewed? Were you involved in trying to figure out what had happened?

MALLICK: I think it was pretty obvious what happened, because it was instrumented. The helicopter had all sorts of accelerometers and instrumentation installed, and it was obvious that it went into this state of harmonic resonance on the ground. In recovery from resonance, there were two modes of recovery. One of them was just to push the helicopter on the ground harder, which I wish I'd have done later. The other was to pull it into the air and get away from it that way, and that was the decision I had made. When I pulled it into the air like that, with the power and the shaking, I had run out of directional control and that's when it just turned off and we rolled over.

Back in those days, the accident review and report, was: I wrote a report on what had happened on it, and of course they had all the physical data. They could see what happened on all their tracers and their data instrumentation. That was about the extent of the accident board, except for the deputy, I think, at that time, Hartley [A.] Soule, he came down one day to the office and he just reviewed it with me. He had seen the report, we talked about it, and he thanked me, and that was it. That was the review in those days, of the accident.

That was just on the helicopter side, and on the fighter side I flew an [Grumman] F9F-2 Panther jet, and it was an unusual program. It had a modified flight control system in it. Now this was a case where the control system was modified, but there was just one pilot position in the airplane. So, that pilot did the evaluations through a modified system, but then he also had the capability of going back to the basic airplane to fly it. That was a philosophy of design, and a good one, because then you could take an airplane when you were testing borderline or questionable areas to an altitude where you had some safety, for recovery—so you could take off in a basic configuration airplane that had been flown all the time. You could go to altitude and

engage your test system and do your tests with the modified system. That was sort of basic philosophy through NASA and the aircraft design and test system.

This little fighter was unique because we had changed the fuel flow of the tank system in it to control the center of gravity, and we could take off normally, and as we climbed up we could transfer fuel back, get the center of gravity to the point where the airplane was unstable. What that meant was, if the pilot didn't hold onto the stick it would just go out of control. Then we would evaluate it through a separate flight control system with a side stick, and we used different commands, acceleration command, and rate command, on flying the airplane to determine what was the best future flight control system to handle something like this. Of course you didn't want to build an aircraft that was unstable like it anyway, but it was research to determine boundaries and limits. We did that with the little F9F-2.

Then we had visiting firemen come in. We'd have Navy evaluation pilots come in after we got our program so far and have them fly it, and others. That was another important aspect of having the basic airplane for takeoff and landing, and the other researcher configuration, to do evaluations, up and away. You could invite in other people who knew the basic airplane and could check out on it pretty quick, and they could go out and do an evaluation with the research parameters.

JOHNSON: That is interesting how they could do that. Another one that you worked on, and you mentioned people that went with the Space Task Group, and of course Chris [Christopher C.] Craft was one of those people, but you worked with him on the [Vought] F8U-1 [Crusader], I believe.

MALLICK: We did a sonic boom program on the F8U-3.?

JOHNSON: Chris Craft was the project engineer.

MALLICK: I know what you're talking about. That was an interesting time, because I was new in the office, a year or two, and that's before Chris left, he actually went to the Space Task Group, so it was probably within the first year. We had a loaned Navy F8U Crusader. I believe it was an F8U-1. Bob Champine was one of the older pilots who was flying the program. The airplane was relatively new in the Navy. The Navy had lost one or two of them when the wings came off in flight, when the Navy was flying them. They did not have an instrumented F8U in the Navy at Pax [Patuxent] River [Naval Air Station] at that time. They had finished this stage, and they were in the fleet, but they wanted to do some tests on one and they had bailed one to NASA. We had one on loan for other purposes, so they asked NASA to do the flight tests on this wing.

We had a camera on one side of the wing, and Bob Champine was doing high-G turns with it. I've forgotten all the details they were looking at besides the force per G and the flight controls, but they wanted to look at the junction of the wing on the F8U because the F8U was an airplane that for landing and takeoff they cranked the wing up. They actually cranked it up out of the fuselage to improve the low-speed lift. Then when it went down in the fuselage, they locked it, but they only locked it on one side. They had an actuator and the lock came around, and the other side just had a follower.

So the camera was on that actuator side, and Bob went off and did these tests for the Navy up to four Gs or something, turning, and when we looked at the film, this left side was

deflecting a little bit, about a half-inch. They thought, "Well, that's not good." They didn't expect that, the Navy, they thought there shouldn't be that much deflection. They wanted to go ahead and do some more tests on further G, and I was sent down to a briefing with Bob Champine because as a new guy, Reeder was getting me involved with the different briefings and planning, that was all part of my education.

So I sat down there and the team were pushing to go the next day because the Navy wanted the data right away--before they put a camera on the right side. There was a pause in the discussion, and it seemed to me, that Bob Champine was going to accept this. I think it was because he had the responsibility of the test pilot and he wanted the program to be completed. This bothered me, so I just popped up in the meeting, I said, "I wouldn't fly that tomorrow, without the other camera!"

And they said, "Who is this?"

I said, "I think you out to put the camera on the other side." That was going to take a couple of days. I don't think Chris liked that too much because he was the head of the program, but he was a dynamic guy, and he was a sharp guy, and he held up until the camera was installed.

They put the camera on, and when Bob went out on the next test, the right side was going up much further, than anyone expected. "Oh, tell the Navy quick, ground them or limit them." So they did, they put out a TWX [teletype message] right away that they weren't supposed to go to high-G in the airplane. They didn't anticipate the twist. Then Chance Vought made a modification, and on that right-hand follower they locked both sides. That was early in my career, but it just seemed real basic to me at the time that it wasn't worth doing that when the other side wasn't locked, and they didn't have any camera or any data. They had strain gauges, but they didn't have deflection data.

That was interesting, and after the fact I felt good about it, but it didn't seem like it was that much of a brainer; it just seemed like something they should do. It made a point with me, too, that you had to be careful when you were a project pilot—and I saw this all through my career—you had to be careful and not let your exuberance and desire to keep the program going and the rate and the speed and everything, to the point you ignored safety. It was always better to be a little bit safer than sorry. I think that started with me back at Langley and with some of the testing there.

JOHNSON: Also speaking up, even though you were just so young, or one of the newer pilots?

MALLICK: Well, I think I had enough background and experience flying Navy planes and knowing what they did with the planes in the service, that it wasn't a good thing to do until they really were sure what was going on.

JOHNSON: I think you mentioned, too, that the [North American] JF-100-C [Super Sabre] was another lesson. You were talking about flying difficult-to-handle aircraft over and over, and the pilots start compensating for that, which isn't helpful when you're trying to determine those safety issues.

MALLICK: It's interesting in that they used to claim that—and it's true—that the military pilots flew some of the airplanes during World War II, like the [Republic] P-47 Thunderbolt, and the ones that flew them in combat, they swore by them, that they were great airplanes, and they were. They did a super job with them. But on some of the stability and control tests, they were

borderline. The idea was, when a fellow flew something like that long enough, he adapted to it, he became accustomed to it, and he supplied the stability and control, but perhaps a new guy, just off the street or just starting, might not. So from the designer's standpoint, you wanted the best handling qualities you could design into the airplane, along with the fact that it could perform and do its mission too. That came up and it was obvious.

JOHNSON: I thought that was an interesting point, because people do tend to do that, and you compensate for things.

MALLICK: And test pilots do, too, I think, with time. You try to learn not to, you try to be very positive in your evaluations, but sometimes if you've been working with it for a long time, it sort of becomes old hat, you have adapted to it yourself. Doesn't make it that good, your handling of it.

JOHNSON: I assume that you would have to step back sometimes and realize that you're doing that.

MALLICK: You have to approach everything very critically and use the numbers that you see, the quantitative data, along with your qualitative data to verify what was going on.

JOHNSON: I can see where that would be a problem over time.

You also did some flying for the Little Joe project for the early rocket research. Didn't you fly some of those planes? You were carrying photographers, I believe?

MALLICK: I did photo missions for Little Joe, yes.

JOHNSON: Do you want to talk about that for a second. That's pretty interesting.

MALLICK: That the timing was rather critical on it. There was another one beyond Little Joe, too, that was even more impressive. Little Joe was a typical coordination where we had a [Lockheed] T-33 [Shooting Star] with a cameraman in the back seat, and we would fly out from Salisbury [Maryland] VOR [visual omni-range] towards the Wallops Island launch site where they'd launch Little Joe, and it was sort of tough because we had to be pretty close in to his trajectory. They wanted to get pictures of when he came over the top at about 30,000 feet, where the parachutes were coming out, the deployment. That was sort of touchy from the standpoint you didn't want to be on top of him where he'd come up under you; you had to be off to the side, but flying off to the side and timing it, you couldn't see very well without doing dips with your wing and timing them. Once he'd come off, it was okay. Once he was coming up, you could track it coming up. Little Joe had come over the top, and then it would program the chute deployment.

One of the missions I remember, they called the launch and I knew they were firing them, and I rolled up and I saw the rocket smoke and everything coming up, but all at once Little Joe leveled off and he went straight out to sea, he didn't come up to join us, and that's when one of their solid rockets didn't fire and the other ones caused it to go level.. But the parachutes deployed, and it almost completed their program because they had their tests at high-Q deployment on the parachutes. That was the purpose for that program, and the parachutes hung

in pretty good. They did okay, even though it was sort of a goofed-up test that did not go as they'd planned. That was Little Joe. That was interesting, the timing on it. Again, that was a support mission for the space effort.

JOHNSON: Did you fly a lot with photographers? I know for that one you had photographers, but were there other projects you worked on with the photographers?

MALLICK: There was one other project that was a real challenge. It was a night photo mission in a T-33, and they were launching a rocket from Wallops Island, it was a five-stage rocket, five different solid rockets. Three of them took it to real high altitude, extremely high altitude, and then it had stability where they were able to point it down, and they fired the other two solid rockets back into the atmosphere. They were interested in the ionization of the flow around this final entry sphere that was coming in, and the temperatures, of course. They had measured and they had a lot of telemeter, and they had a lot of cameras on the coast, on the surface, ground cameras, but because of the atmosphere they wanted to get pictures from about 35,000 feet, if they could.

I was flying this cameraman, we had a fellow from the photo division who was qualified in the airplane, had been through all the ejection training and everything. He was my cameraman in the back, and he showed up at the airplane and they were getting him strapped in the back with his equipment, and he was sort of grumbling on the interphone. I said, "What's going on?"

"Don, they wouldn't give me the color film I wanted." He said, "I needed high-speed color film." Because he was running his cameras at extremely high speeds to get real accurate and defined photos of this thing. The plan was, we were going to set up our track on this

airplane, and we were going to call the launch time, because we knew, from their launch time, when this thing was supposed to be reentering in our atmosphere above us and lighting up. We were going to be in a position out over the water, off the coast, where the cameraman could look up at a certain angle and see it and get pictures. It was really a lot of things had to go right in order for things work, and get pictures. .

So here he shows up with basic color film and he's real upset. I didn't have any choice but to go, because they were up there getting ready to fire. So, we fired up and went up, and we did our patterns and we did our timing. I had checked the weather and knew what the altitude winds were, and I knew my ground speed. We called the launch point as we went out, and we went out to sea and we had our clocks all set in the timing. I told him in the back, "You can probably start your camera now"—I forgot how many seconds he had—"because if they're right, this thing is going to be reentering in the next 10 seconds or so." So he got his cameras pointed up there and he's grinding away, and damn, it came in. Most beautiful sight we ever saw. It was blue and green; you could even see the bolt on the front of it, and we told them what it was shaped like. You can see the green glow around this thing up in space, coming in. Then it finally burned out. I thought, "Wow. How about that?"

We got back in, and we were both really excited about it. They debriefed us. The color film didn't come out worth a damn; it was too low-speed. We tried two or three times after that, and we never saw it again, and he had all the high-speed color film then they could buy, because of what we told them on the first one. Now, that was sort of a way point or data point: don't ever go off half-cocked with your instrumentation; do it with the very best you can, at the time, and they didn't, and they were behind. That was a shame, because where it went those other times, I don't know. I know when we saw that first one, there was a lot of luck involved, a lot of

timing with something like that. But we saw it, and of course they were taking all our descriptions and trying to color in their stuff, but they didn't have any film.

JOHNSON: That's a shame.

MALLICK: Disappointing.

JOHNSON: I can imagine. Coming from a military background, and of course you were on aircraft carriers, landing on aircraft carriers, and I'm sure you saw your share of accidents and pilots that lost their lives. In 1959 Bill [William L.] Alford died in an accident out at Langley. And being a test pilot, it's just dangerous. It's a dangerous field that you went into. Just for a moment, if you want to, talk about some of the toll that that takes on you personally, also family members, and the people you work with in those kind of situations.

MALLICK: It does. In the military, when I went through the training, at one base we lost five pilots, five cadets, in about a three-month period, and that was unusually large even for the Navy. But they were doing difficult training, air rendezvous, and things. Of those five pilots, I just knew one of them fairly well; there were quite a few across the group. That one was sort of tough, and I think a big part of it, it's almost like family, except it's like a family of flyers. If they're real close to you, it hits you harder, it's more meaningful. If they're distant, then they were just a number in some other group or some other squadron. It's the same, I think, maybe with family members if it's a distant cousin or great uncle compared to a child, or something like that.

Alford was tough on me because he checked me out on so many airplanes. The big thing was, you had to acclimate yourself and say, "Hey, that is part of the job." Even though he was a highly qualified individual in your mind and other people's minds, it happens. But I'm going to be careful, and it's not going to happen to me, and you go on. I think most of the pilots are like that. You almost have to have that. If you soul-search it too much or you're worried too much, I think that's going to be a danger, and I think most of the pilots know that.

Years ago, when I was out of Edwards [Air Force Base, California (NASA Flight Research Center)], this is sort of jumping ahead but it's a similar thing, we had the bad mid-air between the [North American X] B-70 [Valkyrie] and Joe [Joseph A.] Walker. I became real involved with the accident investigation and providing data and changing records and doing a lot of things. I walked in the office that afternoon and there was a flight schedule on the board the next day for an [North American] X-15, which had been planned for some time, but there were a lot of things going on, flights out to the crash area and calls, phone calls, just busy, busy. I was involved in it, and I looked up at the board and I saw it, and I said to the secretary, "Who in the hell scheduled that?"

The guy behind me says, "I did." It was Paul [F.] Bikle, who was the [Center] Director. He said, "Why?"

I said, "Well, I wouldn't have scheduled it if it had been me." I said, "We're going to be so damn busy here the next few days gathering up the pieces on this accident." He didn't say anything, but it came down off the board.

I talked to him about it a few days later, a week or two later, and I said, "Well, Paul," I said, "I hated to say that, but that's the way I felt about it. I know what was going on and what what's going to be required."

"Well," he said, "I was afraid, Don, that if we didn't keep going, or canceled it, maybe people would get cold feet or nervous." Sometimes the military did that in training, if there was an accident you didn't slow down too much to think about it. You went on the next day.

I told Paul, "You know, the people you're working with now, and the pilots have been in the system so long and done it so long that they're not going to shut down because they don't fly the next day." I said there was just too much to do technically. I think he was aware of it too, later, and I think he appreciated the input, because it was busy. The next few days or weeks were really tough. But it just wasn't the day to try to throw everybody back into a critical mission.

JOHNSON: And it wasn't the loss of one airplane and one pilot, it was more than that.

MALLICK: It was two services, the Air Force and NASA.

JOHNSON: It was quite a devastating loss.

Let's talk about your move out to California in 1963. How did that come about, and what made you decide to do that. That's quite a change in location, from Langley to Dryden [NASA Flight Research Center (later renamed Dryden Flight Research Center and now Armstrong Flight Research Center)].

MALLICK: One program I didn't mention, and a big program I had at Langley before I left, was the F8U-3, which was a Navy prototype. There was just a couple of them built, to compete with the [McDonnell] F-4H [Phantom], and the F-4H won the competition, for some reason. It was twin-engine, two [seats], a pilot and an observer, and McDonnell Aircraft had built quite a few

for the Navy earlier, [McDonnell F2H] Banshees and things. Langley picked up a sonic boom program, and that was becoming of concern, thinking about a Supersonic Transport, because when airplanes flew across the country supersonically, they were putting a big shockwave on the ground. Sometimes it would break windows, if it was real strong, but it was a startling thing for people, and it wasn't something they thought was going to be accepted, so they wanted to study it, they wanted to see what was going on with these pressure waves. Langley got these two fighters bailed from the Navy because they weren't going to develop them, they were going with the F-4H and they were available, but they were very high-performance.

Bill Alford and I were assigned to that program, and we flew runs off of Virginia Beach all the way to Wallops Island at Mach 2 up to 60,000 feet. We had pressure suits we had gotten from the Navy, and we were trained for it and the whole bit. They were putting a ground survey range at Wallops Island. They had a lot of microphones across the land right to Wallops, and they put boats out to sea to record them, and we were flying through that test area, test points at various altitudes at high speed. We finished that program.

Unfortunately, during that program was when Bill was killed. He was selected to go to England to fly a Blackburn 39 [Buccaneer] fighter. It was a new British Naval attack airplane, and that was sort of a plum offering because it was an exchange pilot, another country come in to evaluate their airplane. It was a boost for our office and a boost for them, and Bill was very senior. He went over there, and I finished up the sonic boom program, which I got a little more flying on that, which didn't hurt my feelings at all. Anyway, after that program, we finished ours, the sound people wanted to get a bigger airplane than a fighter. Our fighter was so big, but they wanted to get a [Convair] B-58 [Hustler].

The story is, that I heard from the sound engineer, Domenic [J.] Maglieri, they asked SAC [Strategic Air Command], who was flying B-58s, and SAC sent them to Edwards because they had a B-58 at Edwards. As sort of a plum to me, they allowed me to go with the sound group out to Edwards to observe the test that the Air Force was doing. That's when Fitz [Fitzhugh L.] Fulton was flying the B-58; he was the Air Force test pilot out here, when I first met Fitz. I sat in their briefings and I watched the operation, and it was very impressive, because they had all these test ranges out here. Everything out here was flight test. At Langley, we were the small group, we were one division, there were wind tunnels, there were structures and on and on and on, PARD [Pilotless Aircraft Research Division] and all the different divisions. Out here it was all flight tests, at Dryden. That was about 1961.

When I went back to Langley, there were things happening too. One of them was, with the formation of the Space Task Group, they were centralizing the efforts of the different Centers, NASA Headquarters [Washington, DC] was, and it was an economy thing too. They didn't want too much duplication going on. Before that, we may have been flying something at Langley while they were doing similar flights at Ames, maybe not the same airplane but the same area, and they were saying now they can't afford to do that. Langley was going towards V/STOL [Vertical and/or Short Take-Off and Landing] testing. Edwards was going to do the high-performance, I think Cleveland [Lewis Research Center] was going to keep concentrating in propulsion, Ames was getting big in simulators and some of their flight work associated with them and airline work. So at Langley we were losing our high-performance programs.

In 1963, there was an opening out at Edwards and they went out and invited the different Centers, if they had anybody interested. Of course I'd been out here a couple of years before, and I knew the area, knew the people, so I bid to come out, and that's when I transferred out.

Really, in my heart, I liked the high-performance testing best. I did the others, it was part of the job. Then when I came out here I wound up flying the LLRV [Lunar Landing Research Vehicle] because of all this prior experience, as one of the first big programs. But that's what happened, that's why I came out. I came out in 1963.

JOHNSON: It's quite a different environment from Virginia, and the trees and the hills, then you come out here to mountains and desert.

MALLICK: Another thing out here was different. At Langley there was Air Force on the base, but they were Tactical Air Command, they weren't doing research, and there was very little interchange between the two groups other than using the same facility, the air field and the fire trucks and things. Out at Edwards, they were doing flight tests, too, the Air Force, and there were some programs that were joint, and we had people going back and forth, so there was a lot of interaction between them, so it was one big facility going.

Now, some of the companies had test programs going at Edwards, but again, they were primarily doing military programs for the Air Force. The commercial companies could not come in to Edwards too easily to do testing, and I think the reason behind that was, they said, "Well, if we support Boeing, then we have to let Lockheed in and we're not designed for that." So it was strictly if the company was in there, they were developing an airplane for the Air Force, or perhaps the Navy. Sometimes the Navy would send out a detachment to do specific tests that were more appropriate at Edwards. It was all flight tests.

JOHNSON: From what I read in your book, the spot you filled out here was actually the spot that Neil [A.] Armstrong vacated when he went into the astronaut corps.

MALLICK: What happened was, Neil was going to the astronauts, the workload had increased in the office, and Fred [W.] Haise came out with me from Cleveland about the same time, within a couple of months. Fred and I went through the test pilot school together. He stayed on for another six months, and I think his eye was on the space program; my eye was on aeronautical testing. So after I finished my six months of test pilot school, I went back in the office and continued with the flight tests. Fred went on to the Space Task Group down at Houston.

JOHNSON: And you never had any desire to apply to be an astronaut?

MALLICK: I'd gotten, I think, into the point where I was sort of like some of the people along the way, by the time I became senior enough with enough experience to compete like one of the astronauts, I had made my decision to stay in aeronautics and not to go over, never even tried or applied. There were several of the original groups that I did not qualify for. Later I would have been able to maybe compete, but had no idea if I would have been selected. I just made the decision that I enjoyed what I was doing, and there were some of the things about the space program that didn't impress me too much. They didn't do an awful lot of flying sometimes. They were struggling to get their airplane type proficiency and going to a hell of a lot of meetings, a lot of travel, a lot of simulations, a lot of public exposure for them and their families, and I wasn't all fired up about that end of it either. So I never did try for that corps. I was happy to stay where I was.

JOHNSON: How soon after you came here did you start with the LLRV Program?

MALLICK: It was pretty quick. I went through the test pilot school. I came in ‘63, in the spring, I did a lot of checkout within NASA and the [Lockheed F-]104 [Starfighter], and then I went to test pilot school in the first half of ‘64, and the LLRV started, I think, in ‘65.

JOHNSON: I think the first flight was in December of ‘64.

MALLICK: When I came back from the test pilot school in about June of ’64 into the office, Walker called me, and it was back in the office, time for assignment. He said, “Now, Don, we have three big programs going. We’ve got the X-15,” which was actually phasing out, “we’ve got the B-70, and we’ve got the LLRV.” And he said, “How would you rate those in your priority or desire to fly?” That was sort of nice, because they considered the pilot’s desire to fly, just as I did later as the Chief Pilot, but you had to assign on program requirements as the first one. You tried to match them up to the background of the pilot as best you could. But anyway, I told Joe, “Well, X-15, B-70, and LLRV.”

He made note of that, and a few days later he told me I was on the LLRV with him, because they were phasing Joe out of the X-15. I think one of the reasons was there were a lot of new people—Air Force and some of the NASA people—in the pipeline, plus the fact the program was going to be phased out itself in a couple of years. That’s what occurred in that. I never made the X-15 or got in that line. He started me at the bottom, the LLRV, but it was a challenging program and probably one of my bigger contributions to the overall effort in space

and flying. Some of the others were maybe long-term and downstream, but as far as immediate contribution and an important one, the LLRV was.

JOHNSON: When you went to the test pilot school, was that something that you wanted to do, or you were expected to do as a test pilot out here?

MALLICK: It was a combination. To digress, when I was in college, a junior in college in Gainesville, I was flying in the Navy Reserve, and the Navy came to me and they said, "Don, we'll give you a regular a commission, we'll send it to your home, if you'll come back in the Navy." I had a Reserve commission at that time. That was a pretty good deal, if you were career-oriented military, which I wasn't, and I mentioned that.

I thought about it for a while, and I talked to my wife, and I said to him, "If you'll get me orders to Pax River, to the test pilot school, for my first assignment, I'll come back." Because that's how much I wanted to fly and get into flight test.

He said, "I'll get back to you." He came back to me at another Reserve meeting or drill, he said, "Don, the Navy does not need test pilots, they need fleet pilots." I was in a rank and a category where there was a bucket and a reduced the number of pilots available for the fleet. The Navy was trying to get the people who had gone through their commitment of four years, who were in the active Reserve, to come back in for a career, with regular commissions.

So the test pilot school was a desire for me, even way back then, so when Walker came to me, he said, "We've got billets for you over at the test pilot school, and Fred."

I said, "Great," because I knew it was a demanding school, but it was a very desirable school for a test pilot.

JOHNSON: Like you said, you and Fred Haise both went over there at the same time.

MALLICK: Fred Haise went with me, yes. They had two slots at that time for NASA, and I forgot how much it cost in those days, but it was very expensive, and NASA Headquarters came up with that money for that training.

JOHNSON: Chuck [Charles E.] Yeager was the Commandant at the time, wasn't he?

MALLICK: He happened to be the Commandant at that time, yes, at the school. We didn't see that much of him. He was doing a lot of politics. I never flew with him at the school. I flew with all the instructors and the pilots there, and he had a lot of talented people over at the school. I came back and flew over at NASA on the Lifting Body one day with Yeager.

JOHNSON: That's an interesting story.

MALLICK: Yes, that was sort of interesting. We each took our turn flying it.

JOHNSON: The LLRV, being that was such an unusual vehicle—the flying bedstead—and the fact that, to simulate landing on the Moon, they had other options and other types of simulators that they were going to try, but this one really, from what the other pilots and the astronauts said, this one is the one that simulated the actual event so well.

MALLICK: It was very unique. I had never flown anything quite like it before or after. When we first talked about flying it and getting in the program and the planning, there was a sort of question in my mind, was this thing really going to work or do the job? As it turned out, I think it did well, and the astronauts, some of the positive feedback to me was, some years later, when the guys had landed on the Moon and come back and said, "Yeah, we're happy we had that experience and exposure, it's important." Because for a while, they were thinking about grounding them. They had a couple of accidents in Houston, and the accidents were because it was a critical flying machine and it was sensitive to the winds and other things and you had to be very careful with it. If you did that, it really provided a good simulation of what the machine would have to do on the Moon, with the Moon's gravity and no atmosphere and everything. That was what it was for.

Of course we looked at other things. We were looking at minimum control powers that we thought the astronauts would accept on the Moon. You had to have so much thrust and have it do certain things at certain rates to make a safe landing here on Earth or on the Moon, so we did a lot of work along that line. We did development work because it was a brand-new vehicle. We had to develop the systems in it and make sure they were working and doing it before it went on for the trainer, for the astronauts. But it was an interesting program. It was a challenging program.

JOHNSON: And you as a pilot, you had a lot of input as far as how the systems were developed as it went along?

MALLICK: We had a lot of initial development input, Walker and I, on the controls in the front and everything, what we'd require or need. Some of them were obvious. Some of them were modified or changed a little bit before it went into the LLTV [Lunar Landing Training Vehicle] to make it more like the LM [Lunar Module], the one they were actually going to fly to the Moon. But, these weren't so much in the control systems or responses, they were in the visibility and the control levers that were changed in it to be more like in the LM.

JOHNSON: You had a close call in one of them with the peroxide trim switch, and then there were other accidents, one of which was Neil Armstrong when he had to bail out in Houston. You were on some of the investigation boards for those, weren't you?

MALLICK: I was on Neil's investigation board. It's interesting, on airplanes and development, new machines, sometimes they'll go through a complete test program and there'll be something that'll escape your view, or some problem in there, and it won't pop up until later in flying. I think that's what happened with Neil. There was a design in the LLRV that was bad, in that, in all these fancy systems, if you lost nitrogen pressure gas in your peroxide tank, you would lose your lift rockets, which were part of the simulation, but even more important, your attitude rockets. There was a lever, if you didn't have your lever in a particular position, this nitrogen source gas could leak out, and that's what happened on Neil, and he ran out of attitude control. It was a design problem that was in the machine that we had never run into or thought that much about, but in the application of the machine as a training device down at Houston, it popped up and it caught him. I think it was one of those things, once it was explained and understood and corrected, it was okay.

Now, they had other accidents. I think they had three. On our operation at Edwards, we were very critical on our operating conditions, and we could be. We had certain wind limitations; if it was above a certain level of wind we wouldn't operate, because we knew it was putting the machine at the limit of its control. We weren't in a training program trying to get so many astronauts through the training phase, so they were moving, I think, a little bit faster down at Houston on their operation, and they got into some wind shear problems on one of them. It was a research vehicle that was being used in training, I guess that's the best way to describe it. It really hadn't been through enough development to be considered a training machine, but they were having to use it like that, and they were doing it. I think that's where they had their problems down there. We had close ones out here, too, in our testing.

JOHNSON: Like you said, it was such an unusual vehicle to begin with, and so different than anything else.

Some of the other things, and you mentioned it before, was the M2-F1 that you flew.

MALLICK: The M2-F1 lightweight, and that was interesting too. When I came to Edwards, I was qualified in some of the airplanes already, like the old DC-3 we had at Langley, and so I was towing that lightweight lifting body when Milt [Milton O.] Thompson flew it, and I think Bruce [A. Peterson] and some of the others. I was one of the tow pilots. They asked me along the way if I'd like to fly the lightweight and I said sure. I had flown it behind a Pontiac [Catalina tow vehicle], I don't know if you've heard the story of the Pontiac, but that was an unusual machine itself. Anyway, I had several flights behind it getting ready to fly it behind a C-47, and then the test pilot school started, so I went over there, and I was busy over there.

I was sitting in class one morning at test pilot school, I think we had class in the morning and we'd fly in the afternoon, and Yeager came in. We hardly saw Yeager. He said, "Mallick, come on, we're going to NASA." I thought, what did I do? So I got up and I went out and I went over to NASA. Well, Yeager was real good friends with Paul Bikle, and Chuck had arranged to get a couple of flights in the Lifting Body. He wanted to fly it, and they knew I was in line to fly it, so we went over together to get our flights in it. So I did; I went over and flew it. When I came back to class, some of the students said, "What happened? Where were you going?"

I said, "Oh, I was over flying the Lifting Body with Colonel Yeager."

They said, "What the hell are you doing in this school with us for?"

I said, "I'm trying to learn all these equations, just like you're doing."

That was the Lifting Body. It flew nice. Again, as a research thing, it had a lot of things you had to be careful with in doing. You had to stay in certain envelopes and do them, but I'd done the ground tows and I was familiar with it, and the air tow. It was sort of fun. I'd flown gliders at Tehachapi [California, Mountain Valley Airport] in preparation for it too. I had gone through the little glider program [Skylark North Glider School].

JOHNSON: Then, like you said, you flew the C-47, towing it too.

MALLICK: Milt Thompson was the checkout pilot for me, and Milt was sort of cute. In the Lifting Bodies, one of the characteristics you had to be very aware of was that if you were at a low angle of attack or a higher speed in a Lifting Body, the rudders on it were extremely sensitive, causing it to roll. Instead of causing it to yaw, which you normally expect, it would

cause it to roll, so you had to be very light on your rudders and not do anything. You could use your pitch stick for flaring and rolling, but you had to be careful of those rudders. When Milt was checking me out before I went behind the tow plane, he said to me, "Now remember about the rudder sensitivity. Hell, just keep your feet on the floor, you don't even need the rudders to fly this thing." And you really didn't, you could fly it with the stick.

JOHNSON: You mentioned it earlier, the accident between Joe Walker's F-104 and then the XB-70, and that time after that. Then you actually became Chief Pilot after Joe Walker died.

MALLICK: What had happened, Joe was killed in a mid-air. Stan [Stanley P.] Butchart was senior to me. Stan was coming near normal retirement. Jack [John B.] McKay was next in seniority, and Jack was the Chief Pilot, I think, when Walker was killed, then I think Stan was in operations and then McKay went into Chief Pilot, but then Jack had a back problem. He'd had an X-15 accident years before, where it turned over and compressed his spine, and in later years that was bothering him, so he wasn't able to fly too much. He moved down to the Director's end for a while, but then he retired on medical.

We had Walker, Butchart, and McKay gone out of the office in a pretty short time. So Bikle walked in one day and asked me, "Would you consider being Chief Pilot?" It was sort of a surprise to me, because I'd only been out here about four years.

I said, "Yeah, well, I guess so." So I went into the Chief Pilot. Didn't change too much what was going on in the office, except I picked up a lot of the management details and the record-keeping.

JOHNSON: You just got more work, right?

MALLICK: Yes, got more work.

JOHNSON: You started also training on the XB-70 after that?

MALLICK: Yes, I started right after the accident when Joe Walker was killed. Fitz Fulton was one of the Air Force pilots; he retired, and he was coming to NASA. I really wasn't even involved with that process at that time, because I wasn't Chief Pilot, and I heard Fitz was coming in with the B-70 and the program was coming over. Then I was selected to fill in Walker's place with Fitz at that time. I went in pretty early after the accident. I did a lot of work, not on the accident board, but for the accident board. I was gathering records up, flight records for Joe Walker, and then I actually went through a revision of the records in the office.

Our flight records for the pilots were scattered, and after the accident, we had to provide the Air Force with a lot of records on Joe Walker's experience, and I decided we needed to get it back into some sort of a jacket form, similar to the military. That was my experience in the military. I started and I worked at it, and it took a little while, but we got the pilots' records all together in one area where they had their own jacket and their own qualifications, their own physicals and everything. We'd never had that before; it was here, it was there, everywhere. That was one of the big chores.

Then I started into the preparation to fly the B-70, and of course going through the accident investigation evaluation, that was all learning too, on systems and things, actually preparing for me for flying the airplane later on with Fitz. Fitz was a primary NASA pilot, I was

number two, Colonel Joseph F. Cotton was the primary Air Force pilot, and Lieutenant Colonel Ted [Emil] Sturmthal was assigned on a bomber test with Joe, so there were two teams, and it was a joint program. We took turns flying the airplane and doing the evaluation. It went about two years. I think NASA had money for about two years.

JOHNSON: You mentioned that's a joint program, and I know a lot of the programs out here, and as you mentioned earlier, were programs that NASA worked closely with the Air Force. When you were working with people that were more on the Air Force side and different pilots, was it pretty much just seamless, or was there a hierarchy, like, "Oh, you're a NASA pilot, you're an Air Force pilot," that sort of thing?

MALLICK: Not really. I mentioned earlier about the fact that they were doing those things. I was impressed with how smooth things were. It was impressive. I was out here a couple of years and something came up, or something needed to be done, and they asked me. I said, "Well, listen, go get John Armstrong to do that." Well, John Armstrong wasn't NASA, but I thought he was. He was Air Force, but he was on the X-15 Program, and he was over at NASA more than he was at the Air Force, because Air Force pilots were flying in the X-15 along with NASA pilots. NASA had the operational control. The X-15s were kept in the NASA hangar, the maintenance on them, the meetings and everything, happened at NASA.

The guy said to me, "You can't tell John what to do, he's Air Force." But he could have, all he had to do was ask him and John would have done it. That's how close things went, they were merged together. On most of the joint programs, they were operated out of NASA; the X-15, Lifting Bodies, and the Air Force contributions were usually flight crews and some

engineering. For a long time they provided the [Boeing] B-52 [Stratofortress] and the crews, and later on, they even bailed that airplane to NASA, and we took over the B-52 completely. It went real smooth, I thought. Because of the size and hangar requirements, the XB-70 remained down in the Air Force Area.

JOHNSON: One of the other ones you worked on was the Lockheed YF-12, the Blackbird, in the aerial refueling. If you want to talk about that for just a minute.

MALLICK: What happened was, after the B-70 was retired, it was a short program, it wasn't too many years that Dryden wanted to get back into what they called high-speed flight test research. They didn't have any vehicle to do it. The X-15 was phased out. So they were trying to follow some of the Air Force testing on the Blackbird, and I think they had some instrumentation but it was a classified program, there wasn't that much available, but they were following that. Then they got the request in and approved to get the two YF-12's, and that was a joint program. The Russians flew a Foxbat-25, and that was a fighter that was faster and had more performance than any existing Air Force fighter. The Air Force got a little bit sensitive, or concerned, and they had two of these YF-12's, which were Blackbirds, fighter versions, stored.

They said, "We're going to pull those out for research." The Air Force reconnaissance people were flying the SRs [Lockheed SR-71 Blackbird], but that was all top secret, and they weren't about to give up their airplanes for the test program. The Air Force knew they had these YF-12's, they brought them out of retirement, and NASA got involved. They said, "Hey, we want to be involved, too, with these airplanes." NASA had some money, and so the joint program was set up; the Air Force agreed to let us get into it.

On this one, initially we did a lot of the training, or I did, down at the Air Force, where they had their offices and their training on systems and things like that for the Blackbirds, and the Blackbirds were kept down in their area at that time, the YF-12s. The Air Force called back in mechanics and pilots who had flown those airplanes to start this test group, this joint test group, and then in NASA, Fitz and I had flown the B-70 and we were sort of naturals to go into the program and we were ready for a new project, so we were both assigned. Then we had two flight test engineers, William R. "Ray" Young and Victor "Vic" Horton, who were assigned to fly with us because it was two-place, it had a pilot and a flight test engineer. That's how we started into the joint program.

We flew probably a year or more jointly, because what the Air Force wanted to do, was to evaluate the Convair F-106, and the McDonnell F-4Hs against a Mach 3 target, which was this YF-12. It would go Mach 3+ and very high. They were concerned about, could they intercept these guys, the Foxbat, really, if they had to with their Mach 2 fighters and their missiles? That's why they were really in the program, and of course NASA put some money in. We were interested in getting the airplane for high-speed testing, propulsion, structures, heating, aerodynamics, and that sort of thing. That program went well. The Air Force brought in Major. William J. "Bill" Campbell, and Lieutenant Colonel Ronald "Jack" Layton—experienced Blackbird pilots. The Air Force also provided experienced RSOs [Reconnaissance System Officers], or back seaters, for the program. These Air Force crews then they trained the NASA crews. We worked with them, and we started to fly the two YF-12s.

Unfortunately, towards the end of their program, the Air Force phase, when their crew came back to land, they broke over the runway, and turned downwind to land. About the time they extended their landing gear and got slow for landing, they had a real bad fire in the right

engine. A fuel line broke and it was really burning furiously; so they ejected over the east shore and they got out safely. The airplane had a good ejection system; but, the airplane was destroyed. Now we were down to the one YF-12, and they (USAF) still had a few flights to finish, and they did, they used the one YF-12. Then they asked us, "Do you mind if we tack on to you for some of our tests when you're coming south on your last run from doing a flight test on propulsion and heating and the other things?"

We said, "No, that's great." So we helped them out and did that.

In the meantime, they said, "We're going to get you another Blackbird to replace that one." But, there were no YF-12s left, so they got an SR. It was an early SR, and they brought that in and they said, "Now you can't call this an SR because of the security classification. This is a YF-12-C." So, that's what we had, but they were a little different shape, different fuel capacity. The SR had a bigger cockpit; the YF-12 cockpit was small. Anyway, we had one of each, which was nice.

That's when we finished up our program, which went about nine years, off and on. We did all sorts of tests on it. And Fitz and I, even though we flew separately on them, we chased each other in 104s. The NASA management wanted the other Blackbird pilot in the control room. That was typical, but we didn't want that, and we talked about it. I said, "I'd feel a lot better if you're sitting out there on my wing, as long as you can stay with me." He couldn't stay the whole trip, but he could stay after takeoff until I started to go fast, and then he could catch me when I slowed down to land. He'd have to go change airplanes to get another 104 with fuel, and I did the same for him.

We found that it was really helpful; because when we joined up with a tanker, we didn't have all the fancy rendezvous equipment the Air Force had, that was gone from the airplane. I

think that it had some classification. So we had to do it visual, and sometimes coming back from a high flight in a pressure suit, it was difficult to find your tanker. You knew where it was supposed to be, and the chase plane would be flying with the tanker. The chase plane join with the tanker ahead of time, and we'd watch for the Blackbird. As soon as we saw the Blackbird we would call them and I'd say, "Hey, Fitz, we're at 10 o'clock level, 4 miles," and he'd call back, "Gotcha, gotcha." So we supported each other like that, too, beyond even looking over the basic airplane. We convinced management we should fly chase. That was nice. I enjoyed it. I felt safer and Fitz felt safer, I'm sure.

JOHNSON: You flew over 125 different types of aircraft over your career, which is a lot of different aircraft. Is there any one plane that you would consider your favorite?

MALLICK: I think the YF, and I think due to its performance. It was demanding, and you were busy flying it, but it was such a good feeling to fly a good mission in it and get your test data and get back. It was a feeling of accomplishment. It was a pretty impressive airplane, just getting it going and flying and all.

JOHNSON: What were you flying the first time you broke the sound barrier?

MALLICK: I was flying a Navy [Grumman] F9F-6 [Cougar] in the Reserve at Jacksonville (1956), and you almost had to go straight down to break the sound barrier. It wouldn't do it level, but we knew it would do it in a dive, and there was a particular profile you had to fly to get

the thing to go supersonic, and you were only supersonic for a few seconds. But it would put a good boom on the ground.

JOHNSON: I bet.

MALLICK: What happened, when I went into the Reserve in Jacksonville, they were flying [Vought F4U] Corsairs, Navy Corsairs, and that was sort of a kick because I'd been flying Banshee jets in the Navy active duty, and now I'm back in a propeller airplane for a couple of flights. I remember flying that thing and thinking; boy, those World War II pilots earned their keep, because the control forces were real high, it leaked gasoline, it smelled like gasoline fumes in the cockpit, and it was just like driving a truck compared to flying the jets with the boosted controls.

When we got replacements, they moved those out and we brought in Cougars, F9F-6s. They were swept-wing jets, but they were early swept-wing jets, and they were subsonic, and they only way you could get them to go supersonic was, you'd climb real high, at about 39,000 feet, and to get up there you're real slow. Then you had to slowly level off with 100 percent power and let your speed increase, and as your Mach number came up to about 0.9M, you had to rotate your attitude over smartly with a forward stick, almost till it was like zero-G, and get your nose down about 40 degrees. Then, as gravity worked on you and your engine worked on you, you're going supersonic down about 33,000 to 32,000 feet, and you just kept diving and it went subsonic at about 28,000 feet just from the thicker air. Everybody had to do it, you had to go supersonic. That was the first airplane I went supersonic in, the F9F-6.

JOHNSON: Also during your years here, the Space Shuttle was being developed, and of course they did the ALT [Program] flights out here, the Approach and Landing Tests, and then the Shuttle Carrier Aircraft [modified Boeing 747] and all the tests that they were doing out here. Were you involved in any of those programs?

MALLICK: The biggest support that I did on the Shuttle department was with our Lockheed JetStar. What we did with it, was we installed the microwave landing system that the Shuttle was going to use, and this was a final ILS [instrument landing] system). The Shuttle intercepted the glide path, around 12,000 or 15,000 feet, and they would fly it right down to the runway. They could not use the regular ILS systems that the airlines use, because they were limited in angle, so to get the steeper angle they had to go into the microwave type ILS system. New system, new development, and we helped develop that with the JetStar. To verify it and calibrate it, they put a reflective mirror under our nose, a diamond-shaped object with a series of mirrors all over it, and they would track our airplane in flight with a laser tracker, which was very accurate, down to inches in space. When we flew the microwave system and recorded the data on board; this data showed our position in space, relative to the ILS track. The laser tracker gave our exact physical position in space, allowing an accurate calibration of the ILS system.

We did tests down at the Cape [Canaveral, Florida], we did tests at White Sands [Test Facility, New Mexico], where they had a backup landing strip [Northrup Strip], and of course a lot of tests at Edwards AFB.

We tried to use the JetStar to simulate the Shuttle's glide, but with the design of the JetStar and the engines location to the rear, it was causing too much vibration on our tail. We had the JetStar instrumented, and we were afraid we were going to get fatigue cracks in the tail, so we did a few test flights and decided we couldn't use or apply the JetStar to train the Astronauts for the steep simulated, Shuttle approach.

Then they got a Grumman Gulfstream II and they modified it, and they could do it with that, and they used it as their Shuttle Training Aircraft for the astronauts. But they were flying a similar ILS system and doing that. So the biggest contribution I made on it was in the JetStar developing that landing system for them.

I think on all their landings they flew that down to final, but I think they made the final landing manually themselves and their landing flare and everything, but they used the ILS, to bring them to the final near the runway.

JOHNSON: Looking back over your career with the NACA at the beginning, and then again with NASA at Langley and here, what do you think you would point to as your proudest achievement or your thing you're most proud of?

MALLICK: Well, probably the biggest immediate contribution was work on LLRV, which started back at Langley with helicopters, and having that experience when I wound up out at Edwards and moved into the LLRV Program. I think the fact the LLRV training was significant in the lunar mission and the Astronauts getting there and getting back. Their comments that they appreciated, and benefited from that training, was meaningful to me, I think. That was a large contribution.

The rest of it, I think a lot of the work we did was long-term contributions to the development of airplanes and aeronautics in the country, otherwise maybe something we did on the Blackbird on our propulsion test and heating test, that might still show up down the road sometime when they develop a hypersonic jetliner. They're talking about building something that would go from Los Angeles, California to Tokyo, Japan in a couple of hours, real high-speed, high Mach numbers. Some of that might apply down the road. Some did apply, like to the SST [Supersonic Transport], which the French made, the propulsion and things like that. That sort of contribution, I think, is long-term. It's hard to point here or there. I think the LLRV was probably the most immediate, direct thing I can say.

JOHNSON: Is there anything we haven't talked about that you'd like to mention before we go?

MALLICK: No, not really on the flight thing.

JOHNSON: Or any people in particular that you considered your mentors as you were flying and as you were learning?

MALLICK: We were talking earlier about finding out about NASA. I don't think I'd really planned to write to NACA initially, but I found a brochure down at Gainesville, at the college, a little brochure that had a picture of a pilot on the side of an airplane at Langley, and it talked about flight research. I don't know where it came from, it just got to the college, like brochures would. At the time I thought, I'm going to write them, too, because I wrote to a lot of

companies. I had a lot of letters come back that were sort of discouraging, but when Langley came back, they said yes, they thought they would be looking for a pilot at that period. I had letters come back from Howard Hughes's outfit, and they were almost insulting. They said, "Why are you applying to our outfit? We don't hire anybody but PhDs." And I think that was true, because they were doing avionics and all sorts of wild things over at Hughes.

In later years, when I was Chief Pilot, I got a lot of letters and requests, and when we were looking for people, I honored them and we moved them into the system. But when we weren't looking for them, I took the time to try to answer them respectfully and responsibly, and even to vector them to other Centers if I knew they were looking.

JOHNSON: Because you'd been in that position.

MALLICK: Yes, I'd been in that position. I was sitting in the foot doctor's office after I retired, and this lovely gal who was helping me said to me, "I'm going to bring you in a letter you wrote my husband."

I said, "You are?"

She said, "Yes." She brought in a letter I wrote. He was a Navy pilot, he was working as an engineer at Lockheed. He had applied at Dryden sometime, and we'd just hired a new guy, but he was qualified, the fellow had been qualified.

I wrote back and I told him, "The timing is off. I just hired somebody and I don't foresee anybody for a few years, but you can check Houston." I gave him Joe [Joseph S.] Algranti's

name down there, and I told him I was sorry I couldn't help him. He saved that damn letter and she brought me in a copy of that letter.

JOHNSON: That's so sweet. Well, you know, it helped them and it didn't make them feel bad like you said those letters made you feel.

MALLICK: Some of them came back like, why are you bothering me?

JOHNSON: That's interesting. Well, it makes a difference. Thank you for sharing that, and thanks for coming out today and talking to us, we really appreciate it.

[End of interview]