

# ORAL HISTORY TRANSCRIPT

JOHN W. KIKER  
INTERVIEWED BY SUMMER CHICK BERGEN  
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BERGEN: Today is May 5, 1999. This oral history with John Kiker is being conducted in the offices of the SIGNAL Corporation in Houston, Texas, for the Johnson Space Center Oral History Project. The interviewer is Summer Chick Bergen, assisted by Kevin Rusnak and Tim Farrell.

We're glad to have you with us today.

KIKER: Thank you.

BERGEN: I'd like to start by asking if you had anything in your youth that triggered your interest in aviation.

KIKER: I can't tell you [because I do not know] why I was interested in aviation, other than the fact that from the time I [saw an airplane at] two or three years of age, I was always fascinated with birds flying, and I wanted to fly airplanes. I am presently seventy-three years of age and that's been a long time ago. [I remember] one occasion a barnstormer landed an airplane [in a field] very close to the little town where I lived, and my dad happened to have me in the car [with him] when he'd been to see his mother, which was a few miles out of town and [close to where his mother lived. He] stopped and let me look at that airplane... [The pilot] let me touch that airplane, and I said, "Some day I will fly airplanes," and I have never changed [from] that [great] feeling. I presently have an airplane, [however] I have to fly with someone who has a [current] medical and a license because I [can't pass] the medical anymore... The license...[is not valid without] the medical... [There are] probably

[only] a few people [that] ever go from [an interest at] two years of age and [then] spend their lifetime in what they [first] wanted to do, and I've accomplished that.

BERGEN: That's very fortunate that you've gotten that opportunity. So when did you begin flying?

KIKER: Well, that is another...interesting story. At the age of about fourteen...[I lived] in the little town of Wadesboro, North Carolina...[where I was born and raised. The] population [was] about 5,500, and they had a little airport, and the fellow [Charles Brigman] that ran that airport [also] built model airplanes... I just was so interested...[in the models that] I got the courage to ask him, to see his model airplanes.

Then [later] I was hired [by him] as what I would call an airport flunky. I cut grass, I pumped gas, I cleaned airplanes, and everything...[that needed to be done. He paid me \$5 a week.] A dollar a week...I used for Coca-Colas and moon pies, or later we had Pepsi-Colas and then a Bracer [drink], which was [made by] a local manufacturer, [it] was sort of like a Pepsi. The rest of it I would spend on...flying [time] in the airplane.

Then many of the pilots would take me up if they were just flying. They would take me up and let me fly. So I learned to fly that way [also], and I soloed in 1941. I was the typical [young teenage boy]—I was afraid of [what] my mother and dad [would say], because they didn't know that I [was learning] flying. I finally had to get a medical [to solo], so my dad was such a strict disciplinarian that I went to my mother and enticed her into letting me go to Charlotte [North Carolina] and getting a medical... And I did. I had a total of an hour and thirty-two minutes legal time and I soloed, but I had [also] ridden a lot of times [with other pilots who let me fly besides my instructor]. I still have that log book.

From that point, I [continued to fly], and then in 1943—and I brought with me for verification of it—I was [told that I was] the youngest flight instructor in the military, as a

civilian, and that was [after] I [had] just turned eighteen. You're supposed to be twenty-one...[After my civilian check ride] I had to take a check ride with a [Air Force] major, and he asked me, after we'd gotten down... how old I was, and then I didn't even think, I just said, "Eighteen" without even thinking about what [I said], and I had put down that I was twenty-one. He said, "Come to my office immediately," so I went to his office, and he said, "You flew very satisfactorily, and I'm going to go to Maxwell Field [Montgomery, Alabama] and see if I can get a waiver for you to instruct."

So he did do that, and I did get a waiver, and I was the youngest civilian flight instructor in the first phase of teaching the military pilots. It was called a civilian pilot training school, and they had Stearmans. That's how [the] beginning of my aviation career started. So I do have the piece of paper that he signed here where I [received] my instructor's rating in 1943.

BERGEN: Is that when you worked for the Georgia Air Service?

KIKER: That's correct.

BERGEN: What exactly was that?

KIKER: Georgia Air Service, that owned this flying school, were [located in] Atlanta, Georgia. They had other [primary Army Air Force] flying schools... [The company] later became Southern Airways, and then...[finally] were bought out and they became part of another airline. But I was hired [when they were Georgia Air Service].

And then what they did, I'd had a little bit of a funnies with my medical situation then, which I'll tell you about. But the situation was, is that they had such a demand for flight instructors that they sent us to a military facility. I went to an Army military facility

and got a medical, and then I was put on the reserve status, enlisted reserve status. So I couldn't be physically drafted while I was instructing, as long as I was instructing. So I did that. I instructed.

Then when the war was sort of winding down, they called me on active duty. At that point in time, there was a medical test that they called a Snyder, which was a German medical-type test, where you lie down for three minutes and then they get you up and you exercise for so much and run your pulse rate up to a certain thing. Then you lie back down again, and they take it like every minute. They have a scale. In my case, my normal pulse rate is about 80, where the normal is 72. That's an hereditary thing, nothing wrong, but it's just high. So I couldn't pass it to go in as an active pilot, but they changed that because I had been an instructor. So I did go in and I did not go through all of the normal flight training, but I did get a commission. So, after that, I got in and I was commissioned as a second lieutenant in the Air Force, and I flew B-25s.

After all of that training and all of the instructing, I was sent back because of my experience to be a part of a standardization board, and I flew check rides on students and pilots. So I didn't actually go overseas. It was a benefit to me, although everybody—I'm glad that I didn't, but I was sorry that I didn't. But they did, for the one time, the government did the right thing; they took a person that had the experience to do the job, and I had the experience. I had the experience in instructing, and I had the experience in riding check rides, so it was a good choice. That was located at Bennettsville, South Carolina, called Georgia Air Service at the time.

One of the fellows from down here at the Johnson Space Center [Houston, Texas] that has the aviator shop up here, went back to Bennettsville, South Carolina, recently and took pictures of all of the facilities that has now changed, and it's a local airport, but it was in the lobby, and he took pictures and made copies for me. So I now have pictures showing it like when I was there. He went through there as a student while I was an instructor.

BERGEN: Fascinating.

KIKER: We didn't know it for a long time.

BERGEN: So after the war was over, you decided to leave the Army?

KIKER: Yes. When I got out after basically the war was over, I was able to get out, and I kept reserve commission, but I did get out and I went flying for an outfit and working with then the little town of Wadesboro, with Wadesboro Ice and Fuel Company, and they also ran W&L Airways, which was a little fixed-base operation, instruction and charter and things of that nature. So I'd work half the time as that, and part of the time I worked—they had an A&P mechanic that I'd known in Georgia Air Service, and we bought a Stearman together, a surplus Stearman, together, and I was flying air shows with it and instructing in it, and then he maintained it, and then I was teaching him how to fly. So we ended up having the Stearman there at the same time, so we stayed there and flew. I stayed there and flew for about seventeen or eighteen months. I don't remember exactly.

But after that, we had a student that I had taught and soloed in the first Ercoupe, which is a low-wing, supposed to have been a safe airplane, where with ailerons and the rudders were linked together and it was supposed to be able to fly it like a car or drive it and fly. I let him go over town on Mother's Day. He had flown enough that he was okay. It was about three miles. He wanted to go, and he went over and, amazingly enough, and it never crossed my mind, he buzzed his house and pulled the power back, and his mother and dad were out there, and he flew through the power lines and was killed. It happened that my brother—my mother's home was very close to there—got to him first, and he might have been alive, but before my brother could get to him, it all burst into flames, so he was burned.

So after that, then they shut down that airport, and then I turned around and decided that I needed to go to college, which is what I did. I went back and got an engineering degree. So that's sort of the history of the flying.

BERGEN: Why did you decide to go into engineering?

KIKER: The engineering was entirely—I didn't want to be an engineer. I really wanted to be a test pilot. I wanted it to help me with the flying, so I went to North Carolina State [University] and I got a degree, a bachelor mechanical engineering degree with an aero option, so basically I had a mechanical and an aero degree. I was in the reserve, still, and I gained points by being there with the ROTC [Reserve Officer Training Corp] while I was in college. I just went to the drill and watched them and helped them a little bit there, wore my uniform, and so I was building up time as a reserve officer, is what it basically was.

So I graduated with a degree, and jobs were extremely difficult at that time. That was in 1951. Very difficult. I went and took a government engineer's exam, and there were, I think, only two of us out of the class, or maybe three, that took it, and I passed it and I got job offers from all over the country. But I was notified that I was going to be recalled, because then there was the Korean War going on. So I went to Wright Field [Wright-Patterson Air Force Base, Dayton, Ohio]. They told me to come to Wright Field, that I could just stay there. I could fly there or I could be there. So I did take the job with Wright Field, so I went there and I reported there the first day of July in 1951, after I graduated from State, in engineering degree. So that's how I sort of went from going through the engineering, never really expecting to use the engineering degree.

Then, of course, the upshot of that was that I stayed at Wright Field, and then I was there for nine years, a little over nine years. It was probably some of the most wonderful experience that a person could ever have. I had the pleasure of having a B-47, the first B-47,

for running tests on it. I [helped] put a drag chute and an approach chute on [it], working with the Germans. I was assigned to a bunch of Germans that [the USAF] brought over from the war, and they didn't know the military and they didn't know English very well either, and they certainly didn't know the military regulations. So I was assigned to [help] keep their writing straight, like, "This remembers you." And I said, "No, this reminds you." Then "Would you borrow me a dollar?" "No, I will loan you a dollar." A lot of German words. So I became very good friends with the Germans.

The reason I'm telling you this now is because they were in the Parachute Branch, and I got assigned to the Parachute Branch at Wright Field. I didn't select that; I was just assigned that. When I was hired, I was just put in the Research Section of the Parachute Branch when I went to work there. [My military reserve status] was how I went [to] Wright Field, [this] choice [was] mine.

Gus Lundquist came to State, and at the time he was a major, I believe, for a year to get an advanced degree in the Aero Department, and also in nuclear engineering. Gus and myself became very good friends. When he found out I was going to Wright Field, he gave me all of the big wheels' names to go see, since he had been stationed there and had flown there. Gus flew everything, practically, that you can think of. Fact is, they had a Spitfire that was brought over to evaluate, and they brought it over on a ship, and Gus flew it back across the water. So he said he'd show them how to get it back over, rather than putting it on board a ship.

But Gus was instrumental in getting me to the right people at Wright Field when I went in there, so I ended up doing a lot of flight-test work. I got assigned to [work with] these Germans and then we were into putting drag chutes on the airplanes. So, by and large, my time in the Research Section, I did a lot of things in parachutes. Every military airplane at the time[needed a drag chute]. The Germans would [help me each day]. They taught me

how to use engineering practically, and I, in turn, kept all of their social skills and their writing and their reports straightened out.

To this day, now, Theo Knocke, who is one of the primary fellows in that, is eighty-seven years of age, and he has written the bible on parachutes. This past summer, I flew back to California to see him. He lives in Carmel. He called me and said, "John, you must come to see me." Now, he's had cancers and he also has had a heart problem, too. He and his wife live there in Carmel. So I met one of the Rockwell guys that I got assigned on the Apollo Program, with his wife [to drive] up there, and I took my grandson. I don't do so well seeing at night and driving, so my grandson is eighteen, so he went out there with me, and we just had a great time with Knocke and staying at Carmel, and we talked parachutes and all [about] the time back at Wright Field and my association. He calls and he gets to talking, and he switches into German. A lot of German I know.

My son speaks German fluently. He graduated from [Texas] A&M [University]. I sent him to Germany and he studied in Germany. That's my second son. He's now married to a translator [who works at the Houston Intercontinental Airport], and he now switches between languages fluently. My older son also speaks German. His wife had German ancestors. So I have a German background and my dad did, but I know enough German to just get into trouble, not enough to really speak it.

BERGEN: During your time at Wright-Patterson, are there any specific projects that you worked on that stand out in your mind or that have real significance now in parachute technology?

KIKER: Oh, sure. One is, you've got an Orbiter drag chute. And at one time the first four flights on the Orbiter had ejection seats, and I put those on. I did everything and threatened to get fired by [Maxime A.] Faget if I said any more about ejection seats. We were going to



have an airline-type operations, so after the first flights I had to pull the ejection seats off. Unfortunately, we should have had the ejection seats on there, still, personally, [I feel].

But the first four ejection seats, we took an SR-71 Air Force high-altitude seat and we modified that. I got the permission from Lockheed and the Air Force. The modification primarily was on the SR-71, they don't have the inner module and the outer module, so on the Orbiter you've got pressure in a container, and then you've got the outer structure. So we had to cut both of those and we had to clear those out for the ejection seats. That had never been done before. So it took us a lot of time to come up with the inner one being smaller than the outer one, and then getting the two together. We had to put a series of connecting cables in the [two cut sections]. My ruling was, it had to be able to be ejected on the runway, not only in the air up to 70,000 feet, but if they touched down and had a problem, that they could still have a ground-zero capability.

So we did test that. We tested on a rocket sled. I was the only one that had a secret classified safe in my office. We didn't have any classified data out there. So we had some classified data. But the Air Force had made three successful ejections at 70,000 feet in the SR-71 at the time that I was into that, and at a pretty high mach number.

We had to do all the changes. The two seats sitting side by side, with the pilot and co-pilot for the two seats, we had to shorten the outer rail so when it came out, they would separate, so the outer one would come out. It would clear just a little bit before the others, so we would separate adequately on the ground. So we made changes like that.

Then the survival gear, normally if you eject at 30 or 40,000, you have enough oxygen and all to get you back down again, but we were talking ejecting up to about 70,000 feet. At the rate it was going, we not only ejected at that altitude, but we'd go up another 10,000 feet before we started back down. So we had to have a long-time survival equipment, so we had to change all of the survival, the oxygen and the other for that. So it was modified for that.

Bill [William W.] Lofland, who was an engineer that worked for me, was also at Wright Field as a lieutenant. I hired all the people that I knew and had experience with, basically, with I was here, when I came here. So he was the primary project engineer on that.

Then [James] Kirby Hinson ended up being my assistant, and he's now just recently moved back to North Carolina. But he worked for me as a—I hired him. Let me tell you about Kirby, because this is all part of the story, too. Kirby was in a family of—they had four brothers, and they didn't have any money. Family didn't own a car. He was a very smart kid. They all were. He won a four-year scholarship for North Carolina State [University], where I went to school, in engineering from academic test in the state of North Carolina, so he had that. But in the course of his going to school, he didn't have any money to sustain him or help him, so in the summertime I could hire him like a co-op. I could hire him for like the three months. At one time I believe he stayed six, where he dropped out and stayed a longer time period so he could have some for clothes and food and things of that nature. He had enough to pretty well get him through the school. So Kirby came with me, and he worked on the drag chutes and all. That was good. Then, of course, when he graduated from school, he went to Langley [Research Center, Hampton, Virginia]. Then we'll get around to all that in a little bit.

But you asked about other things. There were several things that I did that were very interesting. I did do the automatic opening devices for all personnel parachutes, and even at this time, if you eject, on the ground we finally had to—we didn't have a way of adjusting the time in the opening devices and the altitude properly, except I set the altitude on automatic opening devices for like 13,000 feet. That said if you ejected above 13,000 feet, when you hit 13,000 feet, then it's automatically opened. If you eject at lower than that, then I had just a timed delay. So you'd give like two seconds after you ejected, your parachute would automatically open. That was bad in some cases, because if you were at fairly high speeds, you really took a beating if you ejected. But we couldn't change the setup the way it was.

But the automatic opening device proved to be a very, very fine help in getting pilots out, and getting them out and getting them out okay, especially if they ejected at high altitudes.

Now with the technology, they can do most anything, really, to electronic timing and its senses of speed, so it could delay the inflation of the parachute. So we did some parachute changes to sort of help get by that. So that was one of the things that was different.

The other is, and probably the one that I prided the most and still couldn't really tell anybody about it, is that we had a B-47 that we put a drag chute on, and that had a 32-foot [diameter] drag chute. The reason for that was, it had six jet engines on the B-47, and when you come in to land, it had such a flat glide angle and they didn't have any spoilers or anything that they could slow it up, they pulled the six jet engines back to idle power, which was about 60 percent of the engine, and the glide angle was so flat that touching down, we used a 10,000-foot runway. So they tried to put spoilers on it, they tried to do everything, and so I said, hey, I'll put a small parachute on it in addition to the 32-foot chute, so they can use that for drag, like I was putting out flaps or putting speed brakes out.

They wanted to put speed brakes out, but they had two 9-bottle JATO [Jet Assisted Take Off] racks on the side of the airplane, so if they wanted to get off with a full load, they could do it and get out of a short runway, and so they couldn't do that. The wings, they were so loaded down with the engines and all, that there wasn't anyplace they could put a spoiler or flap or anything. And so I ended up cutting the tail off of the B-47. I had a [B-47 number] 0004, which was the fourth airplane off the assembly line for test purposes. And I cut the tail off, and I went in and I modified it, and I put a small—it was roughly a 16-foot approach parachute. And I flew tests with that chute and it just worked fine. They could hold about 80 percent power with that drag chute out, and they could come in without any trouble. If they needed to go around, they could go around. They had the power. They didn't have to wait for that eleven seconds to spool up the engines to go around. And they could climb 500 feet

a minute with five of the six engines operating. They could lose one outboard engine and still make the go-around. So that was the requirements to do that.

Well, [the Air Force was] doing atomic bomb tests, and I had a magic word, and the magic word, I could go in and could get anything done without any paperwork or anybody approving it or anything. So I went in and I modified the B-47 that they were going to drop the atomic bomb out [of] at Eniwetok [Proving Grounds, the U.S. nuclear test site in the Marshall Islands of the Pacific] out of, and I put that approach parachute on it. Then I had another one on the side, so I had two small parachutes. Then I had a 32-footer. The reason for it was, is the airport that they were flying from, every day they would have heavy rains, and if they flew early and got caught, they only had a Jap strip that was 4,000 feet long and water on both ends, that they could go to as an alternate if they were running low on fuel in the testing process. Well, sure enough, that happened, and they went into that little Jap strip and they put out all of this parachutes that I had, and they got stopped.

So then the aircraft lab—and we had tested this too—developed another 33-bottle JATO [pack] that we could strap underneath the bottom of the B-47. Flew that over and they put it on there, and they flew it out of there with those 33 bottles and the two 9-bottles, and they got it out of that 4,000-foot strip, flew it back to the States, and they made the test.

So they got back, and the major that was flying it called me up to thank me for saving the airplane and saving his neck. General Boyd wrote me a classified commendation for it, which I could never show to anyone. But I did all right as a result of it. So that was probably one of the highlights of all of my operation at Wright Field, was to have the major to come back.

And I flew with them. I flew in the B-47 a lot, so I spent a lot of time in it. I had to ride an instrument seat. Then the first B-47s didn't have ejection seats, and so it took the first 400, and we had a lot of pilots that refused to fly them. So finally, on the 400th airplane, [the USAF] put a downward ejection seat in the front and then we had upward ejection in the

other two, and they were slightly angled to miss that big vertical tail. So one would go to one side and one would go to the other side. Then one of our people in the Parachute Branch, one of the military guys, a sergeant, made the first downward ejection seat down in Florida, to make sure that the downward seat [would work. This was bad at] low altitude... I would ride in that front seat very often, [I knew] that I couldn't get out. On the airplane I didn't have ejection seats until very late.

So we had a door that you would blow off and you had to jump through that little [opening] to get out, and you had a lanyard that you'd snap on the ripcord. What they did was, they'd recover your body if it was above about 180. So what I did was, was spray the bottom of the airplane with water, but I put cake coloring dye in it, and then I dropped dummies out of that, and I showed all the way—it put all of that dye on the dummies. Below 180, I could get out, but I couldn't get out above that. So when I got in the airplane and knew I was flying, I'd just take my parachute off, because I knew I couldn't get out of it.

So then when we finally got ejection seats in the airplane to fly, then on takeoff [one day] we had an emergency on the B-47 on takeoff, and fortunately we got back okay. I said, "Listen. If you say 'go,' you roll at 90 degrees so I can get out the bottom and y'all can get out." [Laughter] Pilot talk. I'll quit talking about that.

BERGEN: Did your experiences at Wright-Patterson make you change your mind about what you wanted to do?

KIKER: I got up every day wanting to go to work, and I had so many interesting experiences at Wright Field. General Boyd would come there and wanting to fly, and I wouldn't be necessarily flying. I had a pickup truck and assigned where I could go on the flight line. I'd say, "General, come on and go." And I'd just crawl in the back and put his parachutes in

there, in the flight test. I was flying out of flight test, and take the pilot down and we'd take him to the airplane.

So I would say that in all of it, and there were so many interesting experiences, as an example, we had a lieutenant that had been a lieutenant, and he was bald-headed completely, and he was always trying—he said, "John, I've got to get the hair out of my eyes so I can see to fly." General Boyd called and wanted to fly to Seattle [Washington], to fly the first B-52, and so "Pappy" Campbell, I called him, the lieutenant came and they were flying the B-47 that I used for test purposes out there, and then they were going to fly the B-52 and then turn around and fly back. I was there when they loaded, and Pappy said, "Hey, John, I'd better get a little food," which he did, and he got some sandwiches and stuff to take with him, and they flew out.

They flew the B-52 and then they turned around and came back. They got in sort of late, and I was there again to take the equipment, some equipment off there. The general, when he got out, he said, "Lieutenant, you did a fine job. I really appreciate it." So he goes on in to leave, and I said, "Well, Pappy, you'll be a captain now," and the next morning he was a captain. [Laughter] And Pappy said, "How did you know that?" I said, "I know General Boyd." He treated me so well.

Kirby would take parachutes out there and load them, and I would, and we were treated—we went out there one day. Then I'll get off all this because I'm taking all your time. But we had the airplane ready to go, and the general wanted to fly at eight o'clock in the morning. That meant that he wanted to be off the ground at eight. He didn't want to be waiting on anyone. We got out there, and it was about, I'd say, a quarter till eight that he fired up the engines and taxied down to take off, and he ran up the engines, started running up the engines. Then all the power comes off and he starts taxiing back. I says, "Oh, no, we've really got trouble." So he pulls up there on the flight line, and I release the hatch and I call up and I said, "General, have you got a problem?"

He said, "Yes, I've got a sticking throttle on the outboard engine."

So I go down to the crew chief and I says, "Hey, the general has got a problem with the engine. He's got a sticking throttle." So I said, "General, why don't you come and let's just go and get a cup of coffee and donuts," which I could have then.

He said, "John, y'all just go on over there. I'll just wait for the crew to check that engine."

And I said, "Yes, sir," and so we got in the truck and we went over and we got a cup of coffee, and we were back in about fifteen minutes, and they were putting the cowling back on. Somebody had installed a bolt backwards and it was dragging on the throttle linkage and it was dragging the cowling. Normally it would take them four hours to pull that cowling off and put it back on, and in thirty minutes' time he fired up the engine and then they flew all the tests for us and came back, and I picked him up. I picked up the general and took him back, and I went back out to the flight crew and I said, "I now know how fast you can take that cowling off and fix an engine, so don't give me any more of this four-hour stuff on my airplane." [Laughter]

BERGEN: While you were at Wright-Patterson, the Soviet Union launched Sputnik. Did that have any effect on you at the time, being at an air base?

KIKER: I left Wright Field in '59 and I went to the Army. And let me tell you all of my reactions, and I'll tell you why I went to Wright Field. I was eligible for a GS-13, and I had the time in, but they only wanted to make supervisors GS-13s, so I applied for other jobs at Wright Field, being married and my wife had polio and was in the hospital for two years, and I needed money. So I went to my boss, and he was a really good guy, and I said, "Well, hey, Shep, I think I deserve a 13." And he said, "Well, yeah, you do, but you know we don't have any supervisor positions open right now."

So I found a position in the structures lab where they had structural problems with the B-47 and the B-52, low primarily because of their low-altitude flying, so they had to limit that and they had to limit the speed. I thought that would be a good career change for me, was just to go to the structures operation. So they promised me the job, and they cut the paperwork for me, and I had to go to California on a B-52 accident, and I was gone two weeks. When I came back, my boss came in and he laughed, he said, "You thought you were going to transfer. While you were gone, the paperwork came in and I wouldn't approve it."

And I said, "Well, Shep, I have two choices. I stay here, and I like the work, or I can find a job somewhere else." So the people at Fort Eustis [Virginia], I went around and I got job offers a number of places, but my wife, from the polio, I needed the warmer weather and I needed water for a physical therapy-type thing. We really had suffered of that. So Fort Eustis promised me a job flying and promised me the promotion and I could get a helicopter rating, which is what I wanted. So that's why I left Wright Field and went to the Army.

I stayed there one year, and the promotion didn't come through. "We're going to get it tomorrow," and tomorrow and tomorrow, and, "We're going to get the helicopter rating," and I flew a lot of helicopters, but they would have sent me to helicopter school so I could fly and I could be a civilian test pilot for the Army. That's what I was looking for.

So in the course of all of that, and then we'll get around to the Sputnik and all, lo and behold, Kirby Hinson was at Langley, who had been with me, and he comes over with a fellow from the Space Task Group, and they said, "We called Wright Field and we needed somebody with mechanical and parachute experience and flying experience, and they said, 'Well, John Kiker's at Fort Eustis. Contact him.'"

So they came over. I had taken all of the parachute drawings and stuff with me, so I had all of the parachute data and the manuals. When I went to the Parachute Branch, I went to the shop and I says, "Okay, fellas, I want y'all to teach me how to use every sewing machine, and then I want to learn how to pack every parachute." And none of the other



engineers did that. The people down at the shop said, "Well, we haven't had anybody ask that." I said, "I want to know how to make—" because we had to make the drawings. I says, "I want to know what you can sew and what you can't, what type machines, and then I want to know what I'm involved in with packing the parachutes." So I did that.

At Fort Eustis I wasn't really scheduled to do that. They did want an ejection seat for the military planes and I did go through that process in that one year's time. So I had that. So then Kirby and this guy comes over, and so in about a week they called me up and they said, "Well, why don't you come over and we'll hire you. You just come to this Mercury Program."

I said, "What's Mercury?" So then they told me, and then, of course, from Sputnik. My reaction was that it was the most unbelievable—I mean, I just couldn't even think in terms of putting something up and go into the velocities that would be in orbit and then coming back okay. Then when they told me they were going to do Mercury, you know, they were going to put a man in the thing, I said, "You're going to do what?"

"Yeah, we're going to put a man in space and we're going to do this."

And I said, "Well, I can't get a promotion here," to myself, and I went in to the boss. The boss just died with cancer. The boss was in, and I remained very good friends with he and his wife over the years. Unfortunately, I found out he had cancer about six months ago, and he didn't live but just a short while after that. So I said, "Yeah, I got to stay here a year, and I don't have long to finish that year," because they paid my moving expenses and I had to stay the year for them to pay the moving expenses.

So I stayed the year, and then I immediately transferred to the Space Task Group at Langley. So that's how it all came about.

BERGEN: When you first got to Langley, what was your impression of the whole project and what was going on?

KIKER: Well, let me tell you that I was one of the few, and probably, basically, maybe the only one that I knew that I did a lot of wind tunnel testing for the Air Force at Langley, and fact is, I did the first supersonic parachute testing, model testing, at Langley in that ten-by-ten supersonic tunnel. I also went to the NASA-Cleveland [Lewis Research Center, Ohio—now Glenn Research Center at Lewis Field] wind tunnel and I tested a bomb with a parachute, stabilization, in their ten-by-ten, because they could go up to higher mach numbers, and I wanted to be able to test that.

The reason for doing that was at Wright Field, out of the B-47 we had a 50,000-pound capability. We could take one bomb 50,000 pounds or we could take a stack of other bombs, but the other bombs, we had a flow problem when we dropped them out, and they'd go every direction with the fins. So the accuracy was pretty poor in the bombing.

So if we took the fins off and put a parachute stabilization on the back of that, we didn't have that problem. Later, the aircraft lab put a spoiler arrangement, so on the B-47, when you open the bomb bay doors, you have flow straighteners, what I call flow straighteners, where, like in a tunnel, you put all the vanes. So that dropped down and then that made it possible. But they did use the bomb stabilization, and I have not seen it, but I'm sure that it's not classified now. But when you drop an atomic bomb, unless you're at very high altitude, if you want to come in low to the ground, you do what they call a labs maneuver, which you pull up vertical and then you come over in an Immelman, but as you're coming up vertical, you release the bomb. The bomb goes up and the parachute comes out and it comes down, and then the airplane does an Immelman and then it's clear by the time the atomic bomb goes off.

So I was into that, and I was testing the basic parachute particulars, stabilization system. One of the things that was sort of in the background of being involved was, how could we do that. Unfortunately, the B-47, they were practicing down in Florida and doing

the labs maneuver—and we did it at Wright Field, we took the water tanks for a big day where they had all the military guys to come down, and they used colored water in the wing tanks, and it was beautiful to see it come across and pull up and do an Emmelman with the colors. I've got pictures of that. But they went down to Florida and did that, and when they got right at the top and came across, the wings came off and the pilots were killed.

So they went in and they had to modify all of the B-47s, and they put about a three-quarter-inch steel plate all through the fuselage and out the wing, and if you see any in museums now, you'll see that it's been modified. A few of them had those metal plates. I can remember that part of it, too.

But going to Langley, my reaction to Langley is twofold. Number one, at that point in time the Langley people were notoriously—Langley Research Center, promotions and everything was based on doing research and writing reports. If you wanted to get a promotion, you had to do some form of wind tunnel testing or come up with some project, and then you might run data for so long, and then you sit down and you'd write a report. The NASA reports would have to go through a Review Board. I mean, when they got through with it, it was really reviewed, and you probably wouldn't recognize the report by the time they got through with that. But the NASA reports were worldwide known at that time and even today, the Langley reports, for their being good, good data, and for everyone. I mean, everyone can use them. General aviation, whatever, they do that.

When the Space Task Group moved in, they took people from all of the Centers and they brought them in there, plus the Langley people, and there were some what were there for a short time and some that ended up moving there. Then they had the Canadians [AVRO engineers] to come in, and the Canadians' aviation world and aircraft world collapsed, so they had all of these engineers, so they were brought down. They were hired and brought down, and they moved down, and they made a very good contribution. They made a good contribution in several ways. Number one, where Langley was short on experience and

building like aircraft, or building things, they had a lot of people that had been building airplanes.

Fact is, the Canadians came to me while I was at Wright Field, and I tested their drag chute system for one of their last fighter airplanes, and they put it on. I have a picture of it that they sent to me after they put the parachute on. I had a B-26 Wingless Wonder. I had a B-26 airplane...[with] the wings off of and...a spoiler strip on there, and then I put a parachute compartment on the back of it. Then I could test all sizes of parachutes up to 32 feet. I'd go down to the end of the runway and then we could get to 150 miles an hour at midpoint of the runway. Then if the parachute didn't come out or we had a problem, we could just get stopped by the end of the 10,000 feet. So that was the way we tested the drag chute. So we had that capability.

The other thing that was at Wright Field that was sort of a carryover for me is that we made our own drawings, we took them down and manufactured the parachutes. Then we took them over to Wright Field and we tested them. This was true with personnel parachutes and all. We had a drop zone and we'd drop them and test them there. Then the drawings would be given to a manufacturer, and they would make their own drawings and then they'd manufacture them. That was true with personnel chutes as well. Although we had the parachute manufacturers, basically the designs were done at Wright Field. They had engineering capability at that time. So that's a little bit of the background.

So when it comes to the Space Task Group, there was a small group of people, there was pretty much unlimited money. We had the test facilities. We had Ames [Research Center, Mountain View, California], where you could go out and test also in big wind tunnels. They had Edwards [Air Force Base, California], where all the flight testing could be done. We had Lewis, that was propulsion, and we had everything. Wallops Island, where we could test Mercury, with booster rockets. Of course, Dr. [Robert R.] Gilruth and [Maxime A.] Faget and Caldwell [C.] Johnson and all had been put in a group called PARD,

Pilotless Aircraft Research Division, and they did a lot of the testing. By helicopter, they did parachute testing of the Mercury chutes right there in the back bay, right there from Langley, because it's right on the water. I mean, it sits right there on the water.

So the thing I liked about it was, is it was a small organization and you could get things done. There was a lot of ease to see the bosses. The bosses were very competent. Dr. Gilruth was one of the finest individuals you could ever expect to know, and Dr. Faget was the best engineering director. He was so smart, and he understood people. He wasn't as good at managing people as he was technically. He was really good technically. I have to say that I was treated absolutely superb. In a nutshell, I was in the right place at the right time, with the right experience, and every day I couldn't wait to go to work.

Langley always had a monthly meeting where someone would have to give a big presentation, someone out of Langley, and you'd have a little sort of dinner and all. The director of Langley at the time would always come in and he'd ask one question. He'd say, "What is the Reynolds number effect?" And so you could just know anybody that was giving a talk, they'd ask you what the Reynolds number effect was, whatever you were doing. That was always of interest to me.

But it was a very fine place to work, and I didn't want to leave Langley. Obviously that becomes another whole story about how Johnson Space Center was selected, or Houston was selected. But at Langley and the NASA people, by and large, all of them were very well qualified and did a great job and we had great support. I still just love to go to Edwards. Milt [Milton O.] Thompson died with cancer. He got the drag chute test done while he was out there. He just let me go do anything. I'd go to the shop and make something if I needed it. Of course, I spent all my time with the Air Force there, you know, so I knew him from my Air Force testing. I tested a lot of things for the Air Force out at Edwards, spin chutes and a lot of other things.

So my feeling about NASA was, it was great. And it was great to come down here. The choice of coming to Houston certainly has been all right. It grew by leaps and bounds and gave everyone, like me, authorization to go hire whoever I could hire that I thought was qualified, and I hired people from Rice University. I went all around the country to universities. We had some really fine people. It was a very dedicated group of people. A lot of times it was a lot of rivalry and trying to take everybody's job or get recognition for something. I'd have to say that from my perspective, anything that I have done, anything that I have done is because I had such fine people and such fine support from everywhere.

The only thing that does not fall in that category is the [Boeing] 747 Orbiter piggyback [concept] was done only and entirely by me. Fact is, I had to send a—I wrote up all of that. I came because I knew airplanes and how to modify them, and I had done things at Wright Field and [seen] dropped things out of airplanes, F-84Fs out of the bottom of B-36s. So I had all of the experience and I had the mechanical experience, and I ran through all of that situation.

Unfortunately, that ended up being a big problem in getting approved, but I sent a letter and called a fellow at NASA headquarters, and I said, "Send a directive to the Johnson Space Center to do the 747 Orbiter piggyback, because that's the right way to go." I had written it up, and I had made all the drawings on my desk, and I'd done all the analysis, and no one knew what I was doing. Even my own people didn't know. I had forty people, and I'd give each one a little job to run some numbers for me, but they didn't know what I was going to do. Then when I had it all drawn and agreed to, I got one of the guys in the office—and I started to bring the drawing for you, where they signed it.

Then my friend at NASA headquarters, now lives in Boulder, Colorado, he sent the TWX [teletype transmittal, pronounced "twix"] down to do it, and Dr. [Christopher C.] Kraft [Jr.] called me in and says, "Well, it looks like we're going to have to do what you want to do with the 747 Orbiter piggyback." And that was the right way to do it. That's the only way.

If it had landed out at White Sands [Proving Ground, New Mexico] like it did, and we hadn't had it, it would still be sitting out there as a monument.

BERGEN: If we could go back to your time at Langley, what were your first responsibilities when you got there, working in the Mercury Program?

KIKER: Well, primarily the Mercury Program was in progress. Now, believe it or not, I had been contacted relatively to some of the parachutes, a potential parachute from Kirby and what they were planning to use before I left Wright Field. So I had had a little indications of some of the things that they were thinking about. The company that ended up getting the contract to build the Mercury parachute did a lot. I had done a lot of things with them and had known them in other areas, so I had had experience around.

So I guess I would have to say that John [B.] Lee was sort of the big man, and he was sort of an assistant to Dr. Faget. There was Bill [William W.] Petynia, and I can't remember the other guy's name. They had three studies for Apollo all going on while the Mercury—I mean, sort of thinking down range from the Mercury standpoint.

The Mercury parachute system was built by Radio Plane [Company, Burbank, California], and Radio Plane was started by Reginald Denny [phonetic] into remotely piloted vehicles. He started it out as a movie thing where he had a radio-controlled model. Shirley Temple was in the movie and in an airplane flying thing, and he had this radio-controlled model. He got into building and selling model airplanes, and then it generated into the Radio Plane Company. It was the Radio Plane Company, and then he got out of it. It was sold. I don't know who, actually, bought out, who the people bought it out.

But this is the final project report on Mercury landing systems qualification, part one, Salton Sea [California] drop test program. Now, this is the thing that no one has wanted in all of the other data. It has everything in here about it. The Salton Sea is very close to El

Centro [California]. Going from L.A. [Los Angeles, California], it's about 200 miles down to El Centro.

The Salton Sea is just over the mountains. They expected that to be a great resort area, and they poured concrete. They were going to build all these houses. That concrete's still there, but there's no houses there. The salt water was so salty that couldn't any fish live in it. Then they found a fish that could live in there, and they stocked it with that. I think it just goes great with these particular fish. But that's about, I suspect, 80 feet below sea level.

You fly right over it if you're going from L.A., or you do, going down to El Centro, you go right over the mountains or you can go down the coast to there. But El Centro is probably 130 or 40 miles or 50 miles west of San Diego. Many times—I made like twenty-two trips out there one time in about a three-month time period. I'd fly out early and I'd go into L.A., and then you take a puddle-jumper and you'd land a couple of stops and land at San Diego [California]. Then you'd fly over the mountains and land at El Centro.

El Centro was a small place, and there's some big area of the Navy and the Air Force test facility at the time for parachuters, a naval test facility and the Air Force test facility. There was a corridor down the building, and the Air Force was on one side and the Navy on the other side. Unfortunately, Howard Fish, who was head of the Navy at the time, he, for some reason, didn't put any effort into doing the job for NASA, but the Air Force did. So the Air Force got all the work, and when I went to Apollo after the Mercury days, I went back [unclear] Apollo, and he wasn't seemingly interested at all in the Air Force [unclear] Knocke left Wright Field and went out there as the director of that. So he was director.

The fellow that I got all the parachute knowledge from, he was the director of the Air Force and he moved quite a few people from Wright Field, transferred them out there to start the Air Force parachute test facility. So you had all the airplanes and everything there, so that was the primary test facility for the parachutes. Now it's been moved up to another area, and the Navy runs all of that now. So anytime you want parachute tests, that's where. China



Lake is the other place. But El Centro has—and that's where the Blue Angels train when they want good weather. The Navy had a big contingency and they still have some Air Force operations there, but I'm not sure just exactly about that.

This is the typical-type document and this is the outfit. It's one of those things that the Radio Plane Company changed names to Northrop-Ventura, and the Northrop-Ventura, it was all the same operations, but this place was located at Van Nuys [California], right there on the airport at Van Nuys. Then they bought a lot of land and they moved out close really to Carmel. They have a big facility, a beautiful facility, and they are out in the middle of nowhere now, just all built up around it. They built a very fine facility and they did the parachute work there, the engineering thing.

The parachute manufacturing was located in El Paso [Texas] at that time, and El Paso was the location because they got cheap Latin American or Mexican labor, and they had a very good parachute facility. The guy that was in charge of that later moved out of there and they moved that facility and did away with it. He later became head of Irving's Parachute outfit, and now they've changed that again, so he's no longer there. They moved their facility. Irving's moved their facility from California, now up to Fort Bragg, Bedford, North Carolina. So it's all been moved around. Pioneer still stayed in the general area where they are, and they're doing this X-38 parachute system, the engineering part of it, but they moved their production to Jackson, Mississippi, I believe is where they're located now. So that's a little bit of the background.

BERGEN: So you went to El Centro quite often to oversee tests?

KIKER: I have a different philosophy from what is done now. You have a contractor inspector, like Northrup-Ventura or Radio Plane had to have an inspector when they manufactured parachutes and when they were getting ready to do any testing. They had to

have an inspector to do that. Then the government would have an inspector to check that. Now, all the procedures for what should be checked were supposed to have been submitted, and were submitted, to like my people if it was a parachute like Apollo. They had to submit a document and we'd have a big review, and we'd go through everything and change it, include a redo or whatever.

And besides that, I wouldn't let anything go unless one of my men signed it or I signed it or I checked it. And that's not true now. The X-38, the people out here, they have all this parachute business and they have a flight readiness review, and they do it over a telephone. I say, how many of you have packed a parachute, looked at a parachute, seen a parachute, handled a parachute, tested a parachute, and all the associated hardware related to it? Drop it out of an airplane, extract it out of an airplane? There's a technique in extracting a load out of an airplane or dropping it out of an airplane or dropping it out of a B-52. They are hiring a lot of support people to do these things now.

So it's changed. It's changed down here now from a "Do it, NASA," to, "Hire somebody to do it, NASA." And I'm not saying that's at all wrong, but I ask the people, "If any one of you three would go out and buy an automobile?" Well, you don't even go look at it or do any planning, you just say, "I want a car," so you just take the car. Now, if it's me, and I have a two-year-old car and I have a Toyota Camry, I went and I listed all of the automobiles, the gas mileage, the trunk space, the safety. I got every data and I put them all down. Then I went to the computer and I got the prices and all of the taxes and the shipping and all, and I had all of that. Then I had a color and a car and what I wanted, and I bought what I wanted.

Now, how, when you've got—I'll give you an example—three people to come back from a Space Station, you say that, and you're going to bring them back and you're going to hopefully put a gliding parachute out successfully, and hopefully you're going to land on some spot successfully and you're going to attenuate them so they don't get killed from that.

How can you do the job if you haven't looked at the hardware, if you haven't built hardware, if you don't understand hardware, along with the other areas? Or else you've got to have some mighty fine people signing it off.

So the area now is, from my perspective, is at the time I was in NASA with Dr. Gilruth and Dr. Faget and Dr. Kraft, I was given a job to do, and I'd get a phone call from Dr. Gilruth to come to his office. I'll tell you one example of what he did. Dr. Faget would sit down around the table, and when I put the Orbiter on top of the 747 and do that, he picked up the phone and called his aerodynamics people and talked to them. He had them on the speaker phone. And when he got through, he said, "John, I should hire me a high school aerodynamicist around here to do that job for you." So that was the only time I ever heard him make a derogatory remark. He was very put out because they hadn't done the job.

At the time I provided them with about twelve boxes of data from Boeing on their propulsion, their structures, and the aerodynamic data, and I provided the same on the C-5 from Lockheed, and I got it because of my contacts with the flight tests of the two groups. They sent me that without any piece of paper or anything. I said, "I want your aerodynamic data, your propulsion data, and your structures data, but I'm not going to tell you what I'm going to do with it." And they sent it to me, delivered it to me, aerodynamic data and propulsion data. Wouldn't anybody look at it. Said, "You can't do it." So I just took my own people and did it.

So isn't it interesting. Times change, and now it's the situation, is that they want to manage things and there are a lot of good people. Carlisle [C.] Campbell, who's still out there in the landing gear on the orbiter out of school and he has two degrees, he's just a fine individual, and he can do any kind of job. He can do analytical, he can do hardware, he can do testing. He just knows the gamut. He knows the people. But they are few and far between now. He just loves his job and people sort of leave him alone because he's the only

one who really knows what to do, and he has the wheels, tires, and breaks under him now. I mean, he oversees [everything].

But it was all done by the Air Force. The Air Force did all the testing and now they're fixing to shut down their facilities up there. They're going to go to contract. So they're wondering what they're going to do with testing wheels and tires and brakes and landing gears for Orbiters or anything, because that's where the best facility is, as far as I know, in the world.

So that's sort of my personal feeling, and everything I'm saying is strictly John Kiker, no one else.

BERGEN: That's fine. During the early days, you seemed to be able to get your hands on the hardware and really get into the data. How did this help you when you went from Mercury into Gemini and Apollo, as far as the landing and recovery systems?

KIKER: Well, I can give you a specific example. In the first place, I had access from my office, about as close from here to your people videotaping all this and recording it, every file on every military airplane classified and otherwise, ones that were planned, ones that were flying, and it was a big area. I made a chart, and in school I learned this too, from a professor there who had been in industry. I made a big, big chart, and I listed all of the data on the airplanes. I listed the wing areas, the tail areas, the weights, the engines, and when the spec was written, what they predicted, and what they flew.

And from what was the original specs, the B-[47] was scheduled to fly at 120,000 pounds, and that was it. They later changed that to 190,000 pounds and they air-to-air refueled it, and then they couldn't land till they got down to 120,000, so if you had any problems, you were there. I mean, you had to fly it out. You couldn't get rid of it. So I looked at it.

It had grown so tremendously and then they wanted other performance figures and they had to modify it, and that's typical of all airplanes. So the B-52, it started out at a fairly lightweight, I'll say 250, [to] about 300 [thousand] pounds, and now it flies like at 425,000 pounds, roughly that. So it was a big increase. So then they had to do beefing-up of structure and you had to change things.

The Mercury capsule, I think, was originally scheduled to be like about, I would to say, like 1,700 pounds, maybe, total, and it ended up flying like about 2,775. The Gemini, McDonnell was very good, very good, one of the best contractors I've ever worked with. The Gemini vehicle, they ended up saying they were going to fly at about 4,400 pounds total, and they flew it about that. So they did a very good job and they learned from the Mercury days, and they did that.

The Apollo weight was to be 7,800 pounds for three people and all of this, and I had plotted all this and I had about a 30 percent increase from what had been predicted to where you were going to fly. So I go down to Caldwell Johnson and I talk to him, and I said, "Hey, you better send them a TWX out there and design the parachute system for 10,000 pounds."

He said, "Ten thousand pounds?"

I said, "Yeah, you'd better change it. We'd better do that."

He said, "That's too high." So he sent them a letter saying to go to 9,500 pounds ultimately they went like that. I said, "Hey, I'd do that."

[Joseph N.] Kotanchik then, the course, it was split off and Caldwell went one way with the design group, and then Kotanchik had Structures and Mechanics Division, and I was left in the Structures and Mechanics Division. Then later Caldwell go me transferred back over his division, so I went over to Spacecraft Design Division. But Kotanchik, he didn't know anything [about chutes]. I call him a bean bender. He still, if he was living today, he probably would hit me over the head, and he wanted to, because that's what I call the structures world, were bean benders. He said that he had two bad guys working for him.

One was Kirby Hinson and the other one was John Kiker. But I knew too many people and I did a job, and they liked what I did. He sort of left me alone, you know. He really was a very dedicated man.

He ended up dying with a heart attack out there at the Center. I knew that he was having some illness, but he wouldn't admit to it. I asked him, point blank, if he was having some trouble with his heart and all, and he denied it. Then it wasn't more than a couple of weeks after that, that he did die out there from the heart attack.

But what it did for me was, is that it gave me a feel for what is put on paper to sell by a contractor and then the requirements that you put in, and then as you get smarter you add to those requirements to do things or increase it or whatever, and it grows, and you find more things you can do for the benefit of others with that. So I foresaw, and I guess maybe other people did, too, but they maybe didn't complain as much as I did, but that the parachute system, I was really in a box to put it in the three compartments on the top of Apollo. I could not meet one requirement that way. The requirements, up until that time with Apollo, was that everything would have a redundant system. Like Mercury had a parachute, but if you had a problem and you could get rid of it and you could put out another parachute. That was the rule of the game as best you could do that.

Came around to Gemini, and Gemini was going to go with a paraglider, which I got very involved in and very vocal that they would never make the paraglider work, nor could they package it and put it in there. They ended up going with the Mercury-type parachute. In fact, it's the same people built that, and it was just bigger.

So in the course of all of it, on Apollo it was so. I had all the data from Wright Field, because I had pressure-packed parachutes there for special weapons, so I knew I had tables with all of the volumes of parachutes and how big they were and what kind of package I thought I could get them in.

Apollo, when they started out, then it started creeping up. It went up, you know, over 8,000 pounds, then it went to 9,000 pounds. Of course, the thing that—and finally it was increased to actually over 13,000 pounds, and we made an actual flight where it was at least 13,000 pounds, and it seemed like it was a little bit more than that. It was very close to that, anyway.

So it started out in the first parachutes and all were really being designed for the light weights. So then all of a sudden, with the way we had to put the three parachutes, I wrote up the requirements. I had done cluster parachute testing that any two would do the job. So I had one backup, but I didn't have a full backup, like it should have been two parachutes or it should have been ejection seat. It should have been something if you said you had to have complete redundancy.

But in the Apollo, it was set up so that with three parachutes, if you lost one, you would have a rate of descent that everything and the crew would survive okay. As you probably know, one flight, one parachute was burned off and it did land on two and it was fine, although the crew said it sure was a mighty strong thump when they hit that water. Of course, it was hung at a 27-and-a-half-degree angle, so for impact it would deep dive. That took the attenuation.

Plus, the crew seats, at least under me which had been—they had attention there, you had a stroke that would go forward. You had a stroke that could go sideways, and you had a stroke that could go through vertical, and, of course, lying down, the way they are, they could take these loads as an optimum. That was the best position they could do.

So going with the three parachutes, it presented a real problem from the parachute standpoint, because normally you pull a pilot parachute out and then you pull the other parachutes with that, and you have a cluster. Well, the only way you can get three parachutes out together successfully, basically is to have, in the three parachutes that I deployed, and I've deployed as many as four in test behind a B-47, I had one bag with three parachutes in

the bag, and one pilot chute. You could pull it off and it stripped all three, and they all came out together. Now, I did differently with the approach parachute, but all the skirts even.

Well, on the Apollo, if I had put pilot chutes out, I'd have had three pilot chutes streaming back, and the chances of one going inside the other. The Russians lost astronauts because they had a parachute that entangled within a parachute. They had a malfunction and one put out and it went within in, and they lost a crew. So what we did, this was a logical thing to do, was we put three mortars in the three compartments and we fired them out 90 degrees to line stretch. If one went out 90 degrees and one went out 90 degrees and one 90 degrees here, and it didn't matter where it was, then they would swing back and by the time they swung back, they were inflating and they didn't entangle. Then after they were inflated, when you have three parachutes inflated, the flow around one and the flow around the other one, they moved forward. You ended up, they sort of bounced around a little bit, but there's not any together, it just stays there.

You know, and the military will put out as many as eight or nine 100-foot-diameter parachutes with big payloads. They'll go up [with] a bulldozer and they'll drop it. Fact is, they've got a big chart. Depending on what the weight is, they've got attenuation that they put on this crushable honeycomb and it's in layers. So if they got a jeep, they put like three layers of crushable honeycomb and then they'll put out a 60-foot chute, and then they'll drop that. Then they'll come with a bulldozer and down at Fort Bragg, and I spent many hours down at Fort Bragg in the Army. They'll go in there and they'll say, oh, that weighs 20,000 pounds, so we need to put six parachutes, so they just grab six parachutes and then they're all deployed out with one pilot chute, so that's how they do it. So, Apollo, that [was a different requirement and problem].

Then we ran into another problem at that same time that we later had to do something about it, and we were sort of fat, dumb, and happy about it. I was. When that apex cover is blown off, it is blown off pyrotechnically, and it's just a perfect, stable vehicle, it goes off and



then it turns upside down, and that cone shape is just perfectly stable. So on one of the missions, the parachutes all inflated, and all of a sudden on the film, you can see that apex go whizzing by, right by parachutes, it doesn't hit the parachutes, but you could see it and it was pretty close. So we went back and put a parachute to recover that apex cover at a slower rate of descent than the others. So we learned a lot of lessons, all from testing and seeing. That was an actual flight that we'd run into [the apex cover problem].

[End of interview]