ORAL HISTORY TRANSCRIPT

WILLIAM R. POGUE
INTERVIEWED BY KEVIN M. RUSNAK
HOUSTON, TEXAS – 17 JULY 2000

RUSNAK: [Today is July 17, 2000. This interview with Bill Pogue is being conducted at the] Johnson Space Center [in Houston, Texas] for the Johnson Space Center Oral History Project. The interviewer is Kevin Rusnak.

I'd like to thank you for joining us today and taking the time out to do this oral history with us.

POGUE: My pleasure, Kevin.

RUSNAK: If we could start out, what were some of the things you were interested in, growing up, that may have led you into the career that you chose?

POGUE: Well, I was always fascinated by aircraft, airplanes. Did the usual things, flew models and made models and watched them in the air. One of my earliest recollections is a Ford Tri-motor flying over the house and landed in a field about a mile and a half away. I and a couple of my friends ran over there, and they said they were going to loop a Ford Tri-motor. Well, I didn't know much about airplanes, and I was only about eight or nine years old, but I thought this would really be a feat. So we stayed around there and got sunburned waiting for that Ford tri-motor to take off. [Laughter] He did a loop, well, a sort of a loop. He pulled it straight up and then pulled over the back, but he did complete the loop.

RUSNAK: That is a feat in itself. Those planes weren't really known for maneuverability in that sense.

POGUE: Had to be careful, too.

RUSNAK: Into high school and then going into college, I understand you went into secondary education.

POGUE: Right. I was going to be the schoolteacher, math, physics teacher, but before I graduated, the Korean War broke out. I took the examinations and the physical for aviation cadet training. I went to a small college. It didn't have ROTC [Reserve Officer Training Corps] or anything like that. And eventually enlisted because it looked like I was going to get drafted. I knew I'd already passed the test and everything to get into pilot training, and actually went through a tech school. I was going to be a gunner on a B-29 or a B-50 in Korea, B-26. Then they froze me and [prevented reassignment until they] sent [me] to flying school. That is, they held me after I graduated from the tech school, held me at Denver [Colorado], Lowry Air Force Base in Denver. Then I eventually went to Bartow [Air Base], Florida, in October and started flying school in 1951. That's how I got into flying.

RUSNAK: Did you have particular aspirations to be a pilot?

POGUE: Oh, yes, but my father was a schoolteacher. I had taken lessons. My first lesson was in an old J-3, which I think everybody did at that time, started out in a Cub. So I wanted to fly, but, you know, it was economically unfeasible at the time.

RUSNAK: What sort of experiences did you have in Korea?

POGUE: I was a fighter bomber pilot. I flew straight-wing F-84s and mostly interdiction [and] close air support. We bombed trains and also went in for close air support. That's when you supported your own troops in the front lines. So I did that for about six weeks, before the armistice, but I got forty-three missions in, in a very short period of time.

RUSNAK: What did you gain out of that experience on a personal level?

POGUE: On a personal level? Well, I gained confidence, one, that you could survive, even though you're getting shot at. The other was, I was amazed that we ever won a war, when you watched the way bureaucracies work. I figured the only reason we beat the Germans and Japanese, either we just totally outmanned them, or they were just worse than we were, but I don't have a whole [lot of] respect for bureaucracies.

RUSNAK: Well, that's understandable. After the armistice, where did you go?

POGUE: Well, I stayed there until I rotated back to the States. It turned out they had an arbitrary limit. If you had over forty missions, you got to come back in December. So I

came back in December 1953 to Luke Air Force Base, Phoenix, Arizona, and was a gunnery instructor. That was fortuitous because they had just started up an acrobatic team called the Thunderbirds, and they were based at Luke. After being there, I think about not quite two years, I was asked to try out for the Thunderbirds. So that really helped my career.

RUSNAK: The Thunderbirds obviously now is a well-known organization. What kind of experiences did you have with them?

POGUE: A lot of good ones. It was a lot of fun. No paperwork. All we had to do was fly, and we traveled all over the country. We went to Bermuda, places like that. Got to meet a lot of interesting people. Met a lot of really topnotch people like Bob Hoover, who was chief test pilot for North American. Bob is still—well, the FAA's [Federal Aviation Administration] giving him a hard time, but he's still a highly competent pilot, even though he's older than I am. He's really a great guy and he gave me a lot of pointers on how to fly airplanes.

RUSNAK: As far as the public aspect of being in the Thunderbirds, did you find that that experience helped you at all with later being an astronaut and being in the public eye in that sense?

POGUE: Only in the sense that you kind of got brownie points for having done something like that. How it really helped me was that when you got off the Thunderbirds, they would, if they could, give you your choice of assignment. I wanted to go to grad school. At that

time I figured there's never going to be another war. We have everything pretty well under control, and so I'll go back and get my master's or whatever. I thought, well, I could maybe teach math at the Air Force Academy.

So when I got off the Thunderbirds, that happened. I was reassigned to Oklahoma State University [Stillwater, Oklahoma], got my master's degree, and indeed did go to the Air Force Academy [Colorado Springs, Colorado]and taught for a couple of years, two and a half years, but by the time I got there, I had already decided I would like to get into the space program and went in and talked to the professor of mathematics. This was kind of a tricky operation because you had a five-year tour there. A lot of them, you know, really held your feet to the fire, but I went in and explained what it was I wanted to do. He said, "Well, if that's what you want to do, I'll help you." So he sent me to UCLA [University of California-Los Angeles] in the summertime to special courses and so forth—really a nice guy—and ended up giving me a very good recommendation and so forth. So that worked out quite well.

RUSNAK: Around the same time you were going to the Air Force Academy is when we had some of these first events of the space race. You have Sputnik going up.

POGUE: Right.

RUSNAK: What do you recall of these?

POGUE: I remember that quite well. I [had just] finished my tour on the Thunderbirds. This was October 4 in '57, or something like that, if I recall correctly. I was teaching a radar systems in the Air Force Fighter Weapons School, which was like the Top Gun School in the Air Force. I recall that when this happened, we were all really amazed that they were able to pull this off. It was quite a surprise even though they said they were going to do it, and they kept their word.

At that particular time, we had really nothing to counter. In fact, we did, but it was being held back. The [Wernher] von Braun team, which essentially was an Army team, had a rocket ready and they were ordered not to orbit that thing, even by accident, or heads would roll, or words to that effect. So they were just sitting there with this thing. Could have gone, but instead they opted for the Vanguard rocket, which was essentially a civilian, even though I think it was built by the Navy. The Vanguard tried to launch in early December of '57, and it was a total catastrophe, a debacle. Maybe, if you look back on it, it could be blessing in disguise. It was so humiliating that we never really fully got over that until we landed Apollo 11. I think that was the time when we finally got past that Vanguard failure, because it was right in front of everybody and it looked so ridiculous. But, yes, I remember that period very well. It was agonizing to watch all that, really painful.

RUSNAK: Did you see America as perhaps being behind the Soviets in terms of technology? As someone in the military, obviously you're sort of on the inside in terms of our prowess and might. So what did you think of all this sort of propaganda?

POGUE: It was very effective propaganda, and [Soviet Premier Nikita] Khrushchev knew this, and that's why he backed everything to the hilt in the Soviet Union. And, yes, it looked bad for us. I mean, we were having trouble launching anything. Of course, it was only about seven weeks, six or seven weeks, after the Vanguard failure that they launched the Explorer 1 with von Braun's rocket from [Army Ballistic Missile Agency] Huntsville [Alabama]. Well, actually at the Cape, but they built it at Huntsville.

So you could not possibly have created a rocket—well, of course, they borrowed the satellite, which essentially it was from civilian, and there was no possible way you could do that in seven weeks. They had to have had the capability already. They were just being held back by administration policy.

RUSNAK: With all this going on the world, what was going on then in your life?

POGUE: Well, I had, in the meantime, received orders to the grad school. So I went back to graduate school. The first year—I think it was, yes, '58, '59, I think they made the selection of the astronauts in '58, and they reported in '59. This was a whole new career field, so I became really intrigued with that. A friend of mine, who had also just gotten off the Thunderbirds, was also at Oklahoma State, and we talked a lot. We flew together. Bob MacIntosh was his name. Bob and I would drive over the Vance Air Force Base, Enid [Oklahoma], to get our flying time in. We'd talk a lot about the space program. He was in engineering and I was in mathematics.

I said, "Gosh, I don't know if a math degree's going to help me." He said, "Oh, yes, it'll be fine," because he had already checked into that, and it included mathematics as a

qualifying degree. So we were thinking about it back then, right after they made the first selection.

RUSNAK: So then did you come with a deliberate plan to try and be a—

POGUE: Well, I had a problem. One is I had a directed duty assignment to the Air Force Academy, and that's one. As soon I reported in there, I started telling them what my—first time they asked me what my career plan was, I told them. So my immediate supervisor was helpful and also the professor, full colonel, the professor of mathematics was very helpful. So that turned the tide there on that part of it. Although that did keep me from going to test pilot school for a couple of years.

RUSNAK: But eventually you did make it to test pilot school.

POGUE: Right. I went to the Empire Test Pilot School, which is located in [Farnborough] England, and it still is. It's moved, but it's still in southern England. That was very interesting working with the Brits. Very competent air crewmen.

RUSNAK: What sort of experiences did you have there at Farnborough?

POGUE: Flew a lot of different kinds of airplanes. Mostly I'd flown fighters. I had a little B-26 time, C-119 time, which I didn't really want on my record, to tell you the truth, because you'd get a bad reassignment. When I got to the Empire Test Pilot School, we flew a little bit

of everything. We flew fighters, we flew transports, I flew Viscounts. The Canberra, Hunter, Vampire, Meteor, a Piston Provost, a little twin Devon, light twin, and eventually flew a Shackleton, which was a four-engine patrol bomber, and I got time in a lot of other aircraft. There was one called the Varsity. The Chipmunk. Three types of sailplanes.

The thing about it was, if you asked to fly it, they would let you. They would give you the book. Well, actually it was in the plane. I recall many times coming in to land an airplane, before I'd make my letdown, the first time I'd flown it, I'd have to look on the back of it, and fortunately on the back of these pilot's notes, they called it, it listed all the air speeds for approaches. [Laughter] So I'd memorize the two or three air speeds and then come in and land, and fine. They were great to work with.

RUSNAK: It sounds like you got to avoid some of that bureaucracy that you didn't like.

POGUE: Oh, yes. I had trouble understanding [them]—we didn't have any navigation instruments in these airplanes, most of them, the fighters and the strike aircraft. Scimitar was one I flew, and a Buccaneer, which was really a terrible airplane, I thought, because of all the different systems in it, but it was a lot of fun, it was challenging.

RUSNAK: What about working with foreign pilots, since they had people from other countries there as well?

POGUE: Yes, they did. No problem. All of them spoke English. They were fluent in English. Italians, one from India. Gosh, I don't know. I think we had one French, although the French didn't send very many over. They have an excellent test pilot school in France.

RUSNAK: So how does it work that you end up going from there to Edwards?

POGUE: Well, after I finished the Empire Test Pilot School, I stayed there a couple of years and did work, test work, with different airplanes, and it's mostly weapons systems. Then when I got ready to rotate, one of the wing commanders there asked where would I like to go, and I said, "Well, I'd like to go to Edwards." So he knew some people at Edwards and called and so forth. I ended getting [in] fighter ops, but they had nothing for me to do. They only had [a few] programs coming up.

In the meantime, a friend of mine, Bob MacIntosh, who had been in grad school with me, he said, "We need somebody to come down to the test pilot school and rewrite the math notes, [in] vector notation." I said, "Oh, yes, I'd be happy to do that." So I was only in fighter ops, I think, for about a month. I transferred down to the test pilot school and taught operational mathematics and then in the meantime translated all of the mathematics notes or the text into vector notation, which they wanted done. I finished that about three or four weeks before I went to JSC here, came to JSC.

RUSNAK: So then this is still part of your overall plan.

POGUE: What do you mean by overall plan?

RUSNAK: To get into the astronaut corps.

POGUE: Oh, yes. The day I reported in to Edwards, I told Don Sorley, who was the commandant of the fighter ops, I said, "Don—" I had read in the *Stars and Stripes* about, just before I came back from England, that they were going to have another astronaut selection. I looked at the date cut-off, and I was about six weeks under the date cut-off. So when I reported in, I told him that I was going to apply. Did he have a problem? He says, "No, everybody applies. Go ahead, you know, take a shot." So I did. Anyway, so I had already applied the day I got in to Edwards. At Edwards, I started filling out the paper work.

RUSNAK: Go ahead and tell us about the application process and the interviews, these types of things you went through before you actually found out that you were chosen.

POGUE: Well, as I recall, [we] had to apply [through our] of service. I had done this when I was in England, but everything got jammed up, and I'm not even sure my application ever got—I called—here. This was back in, I think, '63. '63 I think it was. They said, "We don't have your paperwork yet," the guy who was in charge of selection, so I never knew quite what had happened. But anyway, the paperwork goes up through the military and they decide who they think are good candidates, and they forward those names to NASA, and then NASA sends you all this paperwork, and then you fill this all out, and, you know, every place you ever lived and all that sort of thing, which was very difficult to do. I had old checks and so forth that I was looking and calling my folks and all that.

Anyway, so I filled all that out, and finally what they do is they call you up for a physical. They screen those records. Then they call you for a physical, actually physical, psychological, and intelligence testing. This was at Brooks Air Force Station in San Antonio [Texas]. That took about ten days. I was really amazed that it took that long, but I didn't realize until I was halfway through that a lot of the tests that they were performing on us, the medical tests in particular, weren't really for the astronaut selection. They were [just] using us as a bunch of guinea pigs, which I didn't mind it so much but I thought that was kind of tacky.

But, anyway, after that, they evaluate the tests and then based upon the outcome of those results, their evaluation of the tests and so forth, and the recommendation of the shrinks and all this and that and the other, then they call you up for interviews. We went to the old Rice Hotel downtown [Houston], back in April, I think it was, or maybe it was late March. As a matter of fact, it was the same week that Elliot [M.] See [Jr.] and [Charles A.] Charlie Bassett [II] got killed in St. Louis [Missouri], a landing accident. So these were interviews.

Then after the interviews, I assumed—I've never been a part of an astronaut selection, so I'm really not sure how that works, but I assume that then they took the evaluation of the interviews, compared that with the rest of the results and they made their final selection. In fact, as I understood it, they weren't going to select but about twelve or fifteen. Ended [up] selecting nineteen. I never did understand why. So I was lucky and made that selection.

RUSNAK: Do you remember who you interviewed with?

POGUE: All I remember is Mike [Michael] Collins was on the board and Chuck [Dr. Charles A.] Berry.

RUSNAK: In the meantime, had you been paying close attention to what was going on in the space program?

POGUE: Oh, yes. Well, all of us out at Edwards were following it daily, and, of course, at that time they had a magazine called *Missiles and Rockets* and you had *Aviation Week*. We all subscribed to those magazines. That kept you up to date. Finally *Missiles and Rockets* went down the tubes, but it was a good magazine for several years, because they concentrated on the space program.

RUSNAK: Did you know any of the other members of your astronaut class?

POGUE: Yes, Al [Alfred M.] Worden. In fact, Al went through the year after I did at the Empire Test Pilot School. I got his house for him when he showed up at Heathrow Airport in London and took them to the house. So I knew Al pretty well. I knew Ken [Thomas K.] Mattingly [II], Ed [Edgar D.] Mitchell, Stu [Stuart A.] Roosa, Joe [Henry] Engle. We were all at Edwards at that time. Of course, Joe was hot and heavy in the X-15 program and doing a great job there. I met Stu at fighter ops before I went down to the school, test pilot school. Al, of course, I already knew. Ed and Ken, Ed Mitchell and Ken Mattingly, were in an aerospace research pilots course, second course. At that time they had it divided in two.

They don't do that anymore. But they were finishing up the space part of the Space Research Pilot School.

RUSNAK: How did your family feel about you becoming an astronaut?

POGUE: They were fine. They were all for it.

RUSNAK: Were you looking forward to moving to Houston in particular?

POGUE: Yes, but I had mixed emotions. I just loathe the weather here. [Laughter] The first time in the fall, I thought, finally got a cold front through, I went out to work in the yard, and all that crud from Pasadena came down here, so I just closed the door and walked back in. But I was delighted to come to Houston because of the work.

RUSNAK: How was the reception here for your astronaut class?

POGUE: We were well received, I think. They knew that they needed help. I mean, we were going to be galley slaves for a couple of years. Now, some of the guys lucked out and got right into a lineup for crews, but, in fact, we had a lot of work to do on Apollo. Of course, then when the fire happened, why, there was even more work to do.

RUSNAK: Before you actually came in, what kind of work were you expecting to get right into once you became an astronaut?

POGUE: I didn't know. I really didn't know quite what to expect. We knew we'd be working in support of missions and that sort of thing, but I didn't have the foggiest idea that I'd be writing procedures for Apollo 7. We had a flight data file. These are all the books and procedures. At that time, of course, everything was hard-copy. We had seventy-five pounds of procedures. After the fire had happened, I was actually on Apollo Applications [Program, AAP] working for Al [Alan L.] Bean, after I had finished my training, first part of my training. So I was working Apollo applications.

A man named Ed [Edward G.] Givens [Jr.], who was on the support crew of Apollo 1, got killed in a car wreck, and they needed somebody, and they asked Al. I had already been writing, doing analytical work for Al, and I think it was Al that recommended me. But in any event, I was assigned to Apollo 7 to support mainly Walt [R. Walter] Cunningham and Donn [F.] Eisele, and ended up working closely with both of them.

But we had seventy-five pounds of hard-copy and I was able to reduce that to thirty-five and also introduce a new format which would be more suggestive as to what you had to do, for instance, a little square, little block diagrams, they were similar to what it looked like on the DSKY [display and keyboard], display and control console of the computer, and I was able to do that and also simplify some of the approaches for working with the systems, the environmental control system, that sort of thing.

RUSNAK: As a support crew member, what were some of the other types of things they had you doing?

POGUE: You go to meetings for the crew, participate in spacecraft tests for the crew if they can't make it. Anything that they wanted done. You're just sort of a "go-fer" for the prime crew. The backup crew were very busy, too—Tom [Thomas P.] Stafford, John [W.] Young, and Gene [Eugene A.] Cernan on Apollo 7. They were very busy. At first the prime crew had tried to do the spacecraft test. If they couldn't, they'd get a backup crewman. If they couldn't get a backup crewman, take one of the support crewman.

Ron [Ronald E.] Evans and Jack [John L.] Swigert and I were the support crew. Ron was specializing in test and check out at the Cape. How do you check out the spacecraft? Jack Swigert was busy with certain other operational aspects and checking out. He was going to be the launch capcom [Capsule Communicator] and so forth. But we all were very busy.

RUSNAK: You had mentioned earlier the Apollo 1 fire that put NASA off track for something like eighteen months before they got back. What do you recall of that particular tragedy?

POGUE: Well, everybody was just crushed, I mean, devastated. We didn't know quite what was going to happen. There were people in Congress yelling and screaming for, you know, discontinuing the space program and so forth. As it turned out, we recovered quite well from it, aside from the tragic part of it, the tragedy. We actually, I thought, recovered very quickly. Frank Borman really helped an awful lot, representing the crew interests.

RUSNAK: Did you play any particular role in the recovery?

POGUE: No, I did not, other than working on Apollo 7, trying to get that ready. In fact, Jerry [Gerald P.] Carr took over. He did my role on Apollo 8, for Frank Borman, got the procedures ready. Jerry said he never realized how I was—I was explaining, you know, some of the problems that I'd had. He said, "I didn't really realize how much trouble you had doing this until I had to for Apollo 8." But he did that for Frank for the first circumlunar flight.

RUSNAK: How was the Apollo 7 crew to work with?

POGUE: Very good. Wally [Walter M. Schirra, Jr.], of course, you just couldn't help but love the guy, except I've heard disparaging remarks with him, but he just sits, tells it like it is. So with Walt [Cunningham], it was very efficient, and Donn Eisele's a sweetheart to work with, of course, but Walt's very businesslike, but he has a light side, too. I liked them all. I flew with all of them at one time or the other in the T-38.

RUSNAK: Schirra was, of course, famous for his "gotcha" games where he'd play tricks on—

POGUE: Oh, yes.

RUSNAK: Were you guys the subject of that ever?

POGUE: Oh, yes.

RUSNAK: Any that you'd care to share?

POGUE: No, I don't think so. [Laughter]

RUSNAK: That's okay. Apollo 7's going to be the first now manned Apollo launch. Explain the days leading up to that and what your roles are and what your expectations of this mission—

POGUE: Well, we thought we were all ready to go about a week ahead of time. So I was doing the procedures. We started getting changes for the procedures, the systems operations. At that time we didn't have word processors, okay? So every time you changed a page, you had to re-do the whole page, because they had to retype the whole page. Well, the problem was, you corrected the error that they had found, but had they introduced a mistake or a typo someplace else? I'm telling you, my eyeballs wore thin checking this stuff out.

Finally just before the launch, I had to actually make ink, written cursive changes to the procedures. Then I recall having to go out and put the little old—we had cue cards. You're familiar with cue cards. They even use them on the Shuttle, of course. Put all the cue cards on the instrument panel before flight. I can recall going out there, I think it was the morning of the launch, and making a change on a cue card. It wouldn't have been critical. It would have caused some confusion. I recall it was hectic right up until the moment of launch, even though a week ahead of time we were all relaxed and feeling pretty good about everything and then these changes started coming in. Of course, Frank Borman just screamed bloody murder on 8, when they started sending these last-minute changes in. He

really got upset. Well, he was in a position to get even more upset than I was, but that was what really surprised us.

RUSNAK: How did the crew take to these changes?

POGUE: They just rolled with the punches. They were pretty loose. Now, that was probably one of the coolest crews we ever launched.

RUSNAK: Really? Why do you say that?

POGUE: Because of Wally's attitude. I mean, everything was business. Don't get me wrong now. Wally's professional. I mean, if it wasn't fun, you don't do it, you know, if there wasn't some enjoyable aspect to it. That was his attitude. "Take an even strain," I think was an expression that he used. Everybody like working with him, unless you got crosswise with him.

RUSNAK: Then what was your role during the actual flight?

POGUE: Well, I had the shift of capcom, I think from eight or nine in the evening to six o'clock the next morning. Jack [John L.] Swigert relieved me. I relieved Ron Evans.

RUSNAK: So as capcom, I've heard crews describe them as really an extension of the crew. How did you act as the interface between the mission controllers and the crew themselves?

POGUE: Well, actually, of course, everybody heard the transmissions. There was nothing secret about them. But when the crew wanted something done or whatever, they'd tell you, and if there was some sort of aspect to that, that perhaps a console operator didn't understand, you could explain that. On the other hand, you would look at instructions that were being sent to the crew, and if there was something in there that was confusing, you could recognize it from the crew's standpoint and then get it clarified before they sent it up. A main function.

RUSNAK: When on 7 there was some disagreements between the crew and the flight controllers—

POGUE: Yes, that's putting it mildly.

RUSNAK: What do you remember of that?

POGUE: Well, the one I remember most was the first night. I went on duty and we'd had a problem with an accelerometer, and about two o'clock in the morning, Deke [Donald K.] Slayton [Jr.] was there and a lot of the flight controllers. We went in this thing called a PIPA, pulsed-integrating pendulous accelerometer. Gosh, how'd they come up with these names? Anyway, so it was supposed to put out mistakes. You know, you expected it occasionally to put out a spurious input. When you weren't accelerating, okay, it'd give you an input anyway.

Well, it wasn't putting out anything, and they thought it was broken. I said, "Well, it may be a perfect PIPA." They said, "No way," you know. So what they did was, they said, "We'll try a test burn stimulating that PIPA and see what it does."

Well, this was, I think, about four o'clock in the morning Houston time, which meant then they were working on that diurnal cycle up in the spacecraft. So they instructed Donn Eisele—in retrospect, I probably should have said something. I think I failed the crew there because if I'd said, "Hey, don't fire the engines unless you wake everybody up." I didn't say that. So they fired just an RCS [reaction control system] engine, you know, to translate. It'd be like an ullage burn before a major thrusting maneuver.

So they fired these RCS engines, and, of course, they make a lot of racket. They're really noisy. It sounds like someone's outside just hitting with a sledge hammer. Boy, Wally came roaring out from under the couch awake, and he had a cold, anyway. He was not really very well disposed toward that. Then he really got his back up, and I couldn't really blame him. I should have said something, say, "Don't do that until you at least tell them to wake everybody up, that they're going to do a burn." Well, you're always wise with 20/20 hindsight.

RUSNAK: What really came out of that mission in terms of relationship between the controllers on the ground? Did they get things ironed out or changed the procedures to accommodate for these types of issues?

POGUE: I think it wasn't that procedures. It was attitude that it changed. Of course, Wally took a lot of heat because of his actions not only with that burn, but also because of a

television program they wanted done, which he refused to do. So there was a considerable shakeout after that flight regarding the subservient crew position. [Laughter] No, there was. We all got slapped on the wrist. We were working for Chris [Christopher C. Kraft] or Dr. [Robert R.] Gilruth or whatever. Going off and exerting that much individualism probably wasn't too popular. So we got the message. I think it also served a purpose, because he showed that, by George, when you have a commander, that's a reason you have a commander, to command.

RUSNAK: That's true. In between times where you were on support crews, did you have an astronaut technical assignment like they gave to most people?

POGUE: No. Some had general assignments, like boosters or something like that. I didn't. I went straight on Apollo Applications, which was general in a sense, because we were supporting everything, laying out instrument panels, whatever for the Space Station. Then when I got on 7, it was procedures. When I got on 11, it was the lunar surface procedures. When I got on 14, mainly it was the rendezvous procedures.

For 14, by the time we got to 14, we were getting smarter. We determined how many different abort modes we could have coming off the Moon at an odd time, for instance. If you had a leak in the fuel, one of the propellant tanks, you had to launch. There was no two ways about it. This is in the ascent stage, of course. So you launched.

Now, you get into orbit, but you're way out of phase with the command service module. Now how do you get back together? Good Lord. I was working mainly for Stu, and we had a big book. It was like a cookbook, and I laid this out, and it was like, go to page

43, you know, get this far and so forth. It was because they had identified so many more rendezvous options by that time, that I spent an awful lot of time in the crew procedure simulator, for rendezvous and hours and hours in there checking out these various rendezvous options, some of which required the command service module be active and some required the lunar module to be the active vehicle for the completion of the rendezvous. That's in lunar orbit after the liftoff.

RUSNAK: If we could back up just a little bit. You mentioned being on the support crew for Apollo 11. When did you find out that these were going to be the first guys to go to the Moon, to walk on the Moon?

POGUE: Let's see. I think when I got off of 7. In mid, late October, early November, I think we knew it then. We knew that 8 was going to go circumlunar. That was a fairly late decision, as I recall. Nine was going to check out lunar module in Earth orbit. Ten was going to do the dress rehearsal down to 50,000 feet, and 11 was going to land. I think I knew this sequence before Apollo 7, because I got in trouble one day because—that television program, I had just totally shelved that because the crew said they weren't going to do it, because we were getting ready to do the rendezvous with the S-IVB stage.

That, to me, had the highest priority to establish the fact that you can rendezvous. So that's why I denigrated the value of this television program which Chris was very interested in having done, because they got agreement to be carried in prime time, or early morning. Not prime time, but one of the major news programs. I was thinking that we've got to get this rendezvous off because that's important for—you know, it's kind of a domino effect if

you didn't get it. And the S-IVB orbit was degrading, see, so it was going to come in and burn up, so I knew we had to get that off. Apparently I knew about it before 7 because that was in my mind that morning.

RUSNAK: Then you were on as the support crew there. You said you were doing surface procedures.

POGUE: Yes, and I was working on Fred [W.] Haise [Jr.] and Buzz [Edwin E.] Aldrin, and I was spending full-time down at the Cape. Again, there were changes. I was working with a group of young ladies down there who were redoing everything. So we had—I forget, T plus 50 seconds abort and so forth. At that particular time, we did not have these elaborate other rendezvous procedures, so if you missed the T plus 50 or something like that—this was a long time ago, thirty years—but anyway, you had to wait. As I recall, there was a period of time there when you had it. You probably wouldn't make it.

I remember checking—I got some simulator time, but mostly Fred Haise was checking it out in the lunar module simulator down at the Cape, the LM [lunar module] simulator, and then Buzz was checking it out during mission sims. So between the three of us, I was kind of the go-fer again for, you know, getting the documents done, and they were actually verifying the procedures to validate the procedures.

RUSNAK: Being on a support crew, did you see that as sort of the gateway to getting onto a backup crew and then as a prime crew member?

POGUE: Well, I did at first, but after having been assigned to three support crews, I was wondering if I was [ever] going to get the high-wire act. But as it turned out, they had everybody lined up, and I was going to be on 19 with Fred Haise and Jerry Carr. Eventually I was taken off of 14, the support crew, and put on a phantom backup crew, they called it, for 16. They did not want to announce us, and for good reason, because it looked pretty bad in Washington, as far as the budget was concerned.

So, Deke, he never said this, but I think what he was thinking was if he announced us as a crew, it would be embarrassing to say, "Well, we're going to reorganize that crew." So what happened was that we were in training, and we're going on geology field trips, and we were out on one in Arizona. Fred and Jerry and I were backing up the 16 crew. We came in back to Flagstaff, stayed at a motel. That next morning I got up, I slept in a little bit and Fred was already up. I walked out the door of the motel, and Fred was holding this newspaper, and it said, "Apollos 18, 19, and 20 Canceled." So that's how we found out about it. Then eventually Deke said, "Hey, you can't fly on Apollo. Do you want to fly on Skylab?" and of course we all said yes.

RUSNAK: Fred Haise obviously was a member of Apollo 13.

POGUE: Right.

RUSNAK: Did you have any role in that mission?

POGUE: No, except I did a couple of sims, I think, before I was displaced by some of the people that had more experience than I did. I was going through simulations. But eventually Ken got involved in it, of course.

RUSNAK: You said Deke tells you, "Do you want to fly on Skylab?" This is kind of bringing you full circle around. You were on Apollo Applications to start with.

POGUE: That's right. I did. About six years later I'm back on it. [Laughter]

RUSNAK: What point was the program at then, and what were you thinking you were going to be doing on Skylab?

POGUE: Well, at that point we were still waiting to fly 14. This is after the 13 problem. Then when I was shifted over to Skylab, I started looking at Skylab, and it was really an overwhelming task. Of course, I was already fairly well trained in the Apollo spacecraft, but didn't have much simulator time in it.

Then we had an entirely new vehicle, which was the Skylab Space Station, with some fairly sophisticated systems on board, and the centerpiece of the Skylab was the Apollo Telescope Mount [ATM], which was an archaic term, a relic from the time it was going to be flown in the SIM, the Scientific Instrumentation Module bay, SIM bay, of an Apollo's service module. It was taken from there and actually put on the assembly. It had its own particular location on Skylab and a special, big, huge barrel that rotated around and you could point it.

Anyway, so I started looking at this, and it was really an overwhelming task to train for the hardware and the procedures and everything, and then for the science that was going to be required, for scientific observations and especially with, again, that solar observatory called the Apollo Telescope Mount.

RUSNAK: As you start training for these things, there's going to be experiments in a couple of different fields, the Apollo Telescope Mount, as you suggested, and also Earth resources and medical stuff. How did you train for all these different areas?

POGUE: The Apollo Telescope Mount, I mean the solar physics, we had special instructors. One was from the University of Hawaii, and I don't recall his name, but we were instructed in that. Solar physics, we had several books. In fact, Ed [Edward G.] Gibson wrote one book called *The Quiet Sun*, which we used as a text. What that means is the sun is quite dynamic, but when it's stable and quiet, it's easier to study the theory of the sustained thermonuclear reaction or whatever, fusion reaction on the sun. So we studied Ed's book, and then we would be instructed in the dynamics, the bipolar nature of sunspots and what to look for—and this we didn't know—how to recognize when a flare is going to occur. This was almost like black magic. Eventually we finally got a flare rise on our flight. That was the solar physics part of it. We had a lot of excellent instructors on that.

One of the more challenging aspect of operating the solar telescopes, the solar observatory, was the thing called a JOP, a J-O-P, a joint observing program. Now, this meant you had to operate three, four, maybe five instruments simultaneously. Now, some features—it didn't require but a couple of these instruments. What was challenging was,

there was none of this that was automatically sequenced. You had to do it all manually. You also had to position the diffraction gratings inside some of the instruments, which was tough. In [the] sense [that], you couldn't reverse it. Took five or six minutes for this thing to cycle to maybe some point, and if the ground calls you at the wrong time and you left that thing on, it'd go past the point and you had to go all the way back around again. So it was really frustrating.

But in any event, I started laying out a big sheet for all six of these instruments, and for each JOP we'd have a different sheet and we had a lot of, I'd say, about a quarter of an inch space or maybe three-eighths under this sort of table. You could pull these out and get the right one, slip it in position, and then you could use that as an aid. Al Bean and I worked on that. In fact, I had a magnifying glass that I carried along for some of this stuff. So that was one of the challenging aspects of operating that.

The Earth resources instruments were somewhat mechanical in that you had a procedure to follow. You just turned this one at this time. The only one that required operator input to any degree was called the viewfinder tracking system, and I think it was [S-191]. I can't remember the name exactly, but I don't know if that's right. But in any event you had 105-power zoom telescope which you could control with a joystick, like playing a video game. You could move this around and you could actually look ahead—of course, you zoom out to get a big, broad view. You pick out the feature that you're going to watch or record, say, like the throat of a volcano, a crater of a volcano in Central America. You get that pretty well located. You zoom in until you get the right volcano, and then as you come over this thing, you control it until this viewfinder tracking system, the cross-hair are right down in the crater.

You turn on the instruments at the right time because you can then throw a switch, and at a certain point that thing will track that for you. So that was nice. So we recorded that, and what that was doing is getting the signature of this particular material, the lava or the cinders or whatever's in the throat of that volcano. Then they take that particular signature, compare it with a low-altitude response of the same type of instrument from an aircraft and [it can determine what the] atmosphere is doing to that spectrum. That's developing a space signature for that particular feature. So that was kind of interesting. The rest of it was pretty mechanical.

Now, the medical experiments were something else. Some of them weren't very pleasant. The lower-body negative-pressure device was not that bad, but it could actually induce syncope, they call it, make you pass out. The rotating litter chair I thought was going to be a bummer, but it turned out to be a nothing. What it did, you were in this chair—it looked sort of like a dental chair, barber chair, whatever—and it rotated and you moved your head while you were rotating. Well, this is supposed to make you sick as a dog, and it will on Earth, but we noticed after your adaptation period in space, a person's almost immune to motion sickness. That was one of the discoveries that was made on the first mission—Pete [Charles C.] Conrad [Jr.], Joe [Joseph P.] Kerwin, and Paul [J.] Weitz—that after the initial adaptation period that a person was almost immune to motion sickness in space.

Another thing we found out is that people who are susceptible to motion sickness, particularly susceptible, on Earth appear to not be in space, and vice versa. Someone like me, I went through the full limit of all the rotations down at Pensacola, at the naval facility, moved my head and they finally just stopped. They never could make me sick. Who got

sick first on Skylab? I did. The other two, it didn't even bother them. It was really weird. Sort of an inverse relationship.

RUSNAK: At what point did you find out that you were on a crew and who your crewmates were?

POGUE: Actually, we had a pretty good idea, but nobody else—I mean, Deke had told us, "Can you fly with so-and-so? Can you fly with so-and-so?" So we pretty well knew that we were going to be a crew. We didn't know which crew, or whether we would be a backup or a prime, although the suggestion was that we were going to be a prime crew, and it turned out to be true. So we knew that almost, well, I won't say from the start, but we had a good feeling about it.

RUSNAK: The three of you were the first all-rookie crew since Gemini VIII, I think. Was there any trepidation about that?

POGUE: Not particularly, although it turned out it would have been nice to have somebody that had a little experience because of my vomiting. That was very embarrassing. I just, actually I upchucked. In fact, there's a little difference, to me. I had a headache, and Jerry said, "Eat something." All I had left was stewed tomatoes. I won't tell you the rest. I think you can guess it. They didn't stay down very long. [Laughter]

RUSNAK: The three of you, did you divide responsibilities in terms of somebody's going to focus in this particular area of experiments or whatever?

POGUE: That was decided, I think, by other people. In other words, obviously Ed's going to focus on science. Jerry, as commander, was going to focus on that aspect, you know, overall management of things. My area of specialty was the Skylab itself, and I knew quite a bit about the Skylab and how it worked, and so when things went wrong with Skylab, especially on the inside, then I was the one responsible for doing the repair.

RUSNAK: How much time did you spend with the folks at Huntsville on that?

POGUE: Quite a bit of time. I went down there. They built special tools for me down there. I recall one procedure for a space walk, an EVA [extravehicular activity]. We had a radar antenna, which was one of our Earth resources instruments, and it'd gone into hard stops and it wouldn't move, wouldn't respond to commands. So they worked up a whole flow chart for a procedure to go out there and troubleshoot this thing. One of them called for removing a control box, and so I went through the procedure and it had four—this was not meant to be serviced in space. So they had the engineering model just like flight. That's when I knew, don't ever believe that if you hear them saying, "This is just like flight equipment." You don't believe that. They're just never going to be just like flight equipment. Anyway, as far as the drawings were concerned, it was just like flight.

To take this thing out, I had to use a blade screwdriver, and it was tough. So I said, "Well, you know, when I was a kid in workshop, we used to have Yankee screwdrivers, they

called them. You could push up and down, and in zero G this will be great. Also, it holds the blade into the screw, in the slot of the screw." A big sheet, it was about four feet wide and about three feet high and it rolled up and it had all the tools that I was going to use in space. So they said, "Are you coming down? Are you ready to check it all out?" I said, "Yes." So I came down there, and they said, oh, they were real proud of this thing. I roll this thing out, and there they were. Here's this screwdriver that says "Dixie screwdriver." people But it worked, except for one screw. That one screw is right up against a piece of metal. Ed and I both had to work on this intermittently with the little screwdriver, just a regular manual screwdriver, and finally got it out.

But, yes, we worked with Marshall, of course, in water training in the water tank and for special tools like that, because essentially they were following the workshop.

RUSNAK: What did you think of the spacesuits?

POGUE: Well, what's to say? They're hard to work in. One thing that we discovered on Skylab was, we took the first full set of body measurements. I'll get back to the spacesuit in just a second. One of the things that we determined was that the body length increased about two inches after about three days in space. Now, our spacesuits had been very carefully custom-fitted at [International Latex Corp.] Dover, Delaware, in 1-G. So when we got up in space and our bodies had increased in length, it was not only difficult to get into them, but you got back after working six or seven hours outside, you'd have cable burns on your shoulders because from crotch to shoulder you'd grown two inches and that put a lot of pressure on the shoulders. But other than that, we had trained for enough time that we knew

what to expect. So the training at Marshall was excellent, as far as training you for the space walks, except for the unplanned stuff.

RUSNAK: Obviously unplanned stuff isn't—

POGUE: Ed was very good, by the way. He had one sample tray that we were supposed to pull up. They'd been put out by the second crew, I think. He worked on that thing for an hour, I think. I didn't think he was ever going to get it out, but, boy, he was persistent and he finally got it loose. But some of that stuff was really hard to work with.

RUSNAK: While you're in training, I guess, they launched the Skylab unmanned vehicle. Where were you when they did that?

POGUE: I went down for the launch. Yes, we'd invited a bunch of our friends that just returned from Vietnam, had been POWs, and so we were hosting them. The launch, looked like it went beautifully. We were escorting them around, and one of the POWs had a little radio. He says, "They've got a problem." I said, "What do you mean?" He said, "Well, there's something gone wrong," and I thought, "Oh, gosh."

So we hustled back and I made a call back to talk to Hank [Henry W.] Hartsfield [Jr.], who was back at the crew quarters, and I asked him what was going on. He said, "Well, looked like we lost one whole panel of power, basically not getting anything from it. Actually, the only power they're getting is from the panels that extend off of the Apollo

Telescope Mount." Gene [Eugene F.] Kranz tells a really good story about this. I won't go into detail on it, but it's really good.

In any event, we had found out real quick that something had happened, of course. The meteoroid debris shield had peeled off of it because the air got under it and there wasn't a aerodynamic seal or cover or shroud to prevent that from happening. Of course, then Pete Conrad and Joe Kerwin and Paul Weitz went out and fixed it. There's a lot going on in between there, a lot of effort, and eventually it was corrected, but there were mixed emotions. Feelings ran the full gambit on the day of that launch of the unmanned Skylab.

RUSNAK: What role did you have in analyzing a fix for it?

POGUE: [I had absolutely no role.] Rusty [Russell L.] Schweickart did a lot of that work, and I can't remember who else was involved and went down to Marshall. Then the people here built the parasol and got that all ready in short order. If you had been doing that under a regular program of development, developing that parasol would probably have taken two or three years, and they did it, I think, in less than a week, or just a little over a week, and did a great job. It worked. It tied up our so-called solar SAL, solar airlock. We had several instruments that were supposed to be installed. We had to use it to recover from that problem. But that worked well enough for a while and then the second crew put out the solar sail, it was called, and that gave us better protection. It still got awfully hot under that area when you were what they call a [high] beta [angle].

RUSNAK: How closely did you follow the first manned mission?

POGUE: Pretty closely, yes. Watched that closely. We were the last crew. First crew dominated the simulators when they were training. Then when the second crew was getting ready, obviously they had to spend a lot of time in the simulator, so we were doing peripheral stuff. We'd go wherever they weren't, getting trained. Whichever simulator or trainer they weren't using, well, we would use. Then, of course, as soon as they launched, we got three months of highly intense training on the simulator.

RUSNAK: The second crew, they had a couple of problems up there. Particularly I'm thinking with the reaction control system on their command module. They might have to send you guys as a rescue crew.

POGUE: Actually, Kevin, what happened was that they trained the backup crew. Vance [D.] Brand and Don [L.] Lind, we continued our training for the nominal mission. Then they took our booster, moved it out to the pad, fueled it. It was standing by for a rescue launch. In the meantime, they had determined that the problems had not aggravated on board the service module in orbit and that there was a work-around. They could go ahead and use it for a re-entry. When they did this, I think Vance and Don still trained, but they pulled the booster back in the barn, the VAB [Vehicle Assembly Building].

The booster had sat out there several days being maintained in the fully fueled status. Unbeknownst at that time, this had created a problem which would crop up before our launch, with the cracked fins. That's what they attributed the cracked fins to, was having all that weight on the fins for so long.

RUSNAK: Let's talk then the weeks leading up to your launch.

POGUE: Well, we were continuing to train. As a matter of fact, I think they had to slip a launch for some operational reason. We were supposed to launch on Marine Birthday because Jerry was all excited about launching on a Marine Corps Birthday, and that slipped. Then I guess maybe the cracked fins caused that, but when they found the cracked fins, we were ready to leave, actually. I had my flying suit on and filed a flight plan, but before I found out about the cracked fins. They said, "Go ahead and go down the Cape anyway and talk to the people," so we went down there and talked to the people who were going to do the repairs and all.

Then we came back, and we had to train for a new launch-abort procedures, because, of course, the launch azimuth changed and so forth with the delay. So we came back and retrained and then we went back down the Cape for our November 16th launch. Then an inspector found stress corrosion cracks in the interstage truss structure. Saturn I-B, it was a two-stage rocket. It was not the big Saturn V Moon rocket. It was a smaller Saturn, I think about 230 feet, something like that, tall.

Said he found stress corrosion cracks, and we were all crushed because we didn't know what was going to happen. Well, it turned out they finally decided that those stress corrosions cracks had been for a long time, and all the other boosters had launched, so they went ahead and cleared it for launch. So we launched.

RUSNAK: Was the experience anything like what you had trained for? Describe what was it like to be sitting on top of the Saturn IB and going uphill.

POGUE: Well, it's all very exciting. As a matter of fact, I thought I was pretty cool, and a fellow, one of the doctors, a NASA doctor, a guy named Fred Kelly, asked me, he said, "Were you excited at liftoff?" I said, "Doc, I thought I was pretty cool." He said, "Well, that may be true, but your pulse rate (I had a pretty low pulse rate) went from pulse rate 50 to 120 at liftoff." So it was pretty exciting.

In fact, I didn't think we were going to launch. You know, we'd had so many problems. I was sitting there, and finally when we were at thirty seconds, I thought, well, maybe. It's a lot of noise. Everybody likes talking about a launch, and it's exciting. Of course, the first minute and a half or so, it's really exciting because you have all of the lower-altitude turbulence, wind shears and all that sort of thing. The thing is shaking you around something.

My job was to follow the launch profile in a procedures book and using the graph to anticipate possibly a depressed trajectory or lofting trajectory, which would eventually put us into a bad position. If we had to abort, then to determine which mode abort we were going to use. Well, I mean, the first forty-five seconds or something, I mean, my hand was shaking. I said, "Gee," and I just held it in my lap. I said, "Okay, [if it] shuts it down. Then I'll look at it," because I couldn't read it, you're shaking around so much.

But once you go supersonic, the noise stops, because the shockwave attaches and you no longer get the air noise. Then after you get above about 40,000 feet, the turbulence cuts down considerably. Then by the time you hit 60, there is none. Then the sky turns black and

so forth, and you're on your way. But it's a real soft ride after that. The most exciting part is in the lower part of it.

RUSNAK: What types of activities are you looking forward to on your first day in orbit?

POGUE: Just activating, get everything set up for the operation. They actually dumped the pressure down to a quarter psi between missions on Skylab. Then they re-pressurized it so you could have a nice, clean atmosphere on the inside. I recall, even though I had been sick the night before, that when I first moved into Skylab, my first impression was, "Boy, it's cold in here." It felt really good, you know, especially after having the nausea event.

It was big. Of course, I knew it was going to be big. I have already worked in it in the trainers. But mainly it was trying to get all of the right books, to find the right things to use. That seemed to be the immediate problem. We worked till about 10:30 p.m. Houston time, the first day, trying to get caught up and whatever.

RUSNAK: Aside from the initial bout of nausea, did you then recover quickly?

POGUE: Yes, I had no more problems.

RUSNAK: The decision whether or not to report that becomes sort of a controversial issue.

POGUE: Yes. There was nothing controversial about it. It was wrong, and we admitted it and took our lumps and Al kicked us all in the butt, and we went on.

RUSNAK: It's good that you guys can just get past that and start with these activation procedures.

POGUE: Well, we were staring three months in the face. [Laughter]

RUSNAK: That's right.

POGUE: So, yes, it was tough, though. It was humiliating.

RUSNAK: I understand you had this nickname prior to that, the "Iron Belly" or whatever, where you hadn't been sick previously.

POGUE: "Lead Ears," "Iron Belly," whatever. They called me all kinds of things. Yes, it was a surprise to me and everybody. Well, what I felt worse about was that it showed the doctors didn't know their ass from third base, if you'll pardon the expression. They had this medication, they had all these theories and everything, and none of them worked.

RUSNAK: I still think it's not an exact science even today with all the experience we've had.

POGUE: Well, I don't know that they've corrected it, but, boy, I tell you, if they [have] thrown out money at anything, it's that one, and justifiably so. I'm not criticizing NASA for that, because that is bad. I mean, if you can get to the point where you don't have to have

worry about nausea, I mean, the other adaptation things were minor, you know, all that, but if you will have to be concerned about a crew member becoming incapacitated, then that's bad. That's a serious problem, and it needs to be faced, and NASA has worked that thing to death. As I say, I'm not sure they've fully solved it.

RUSNAK: You're in the Skylab. You're getting things activated. What are some of the first experiments and other activities that you have to do?

POGUE: Well, one of the first things that I had to do was photograph a barium cloud exploded by a rocket launch from—I think from somewhere in Alaska. This was, I think, just one of the first few of two or three days—in the first place, I had an awful finding the mount for the camera. It was in one of the lockers. At that point, I recall realizing I should have done a better job of memorizing where all these lockers are, numbers. To make a long story short, I mounted the thing, put the camera in there, and finally pointed it, moved everything to the right angles. I watched my watch and so forth, and I was ready, all ready to click—and incidentally, I had to manually do this—and it was time zero and nothing. Then I looked over and over to the side. Where's the barium cloud? I missed it, again. I don't know why none of the numbers worked, but in any event, I missed the cloud. I think I finally took the thing out and held the camera by hand and took a picture, but I don't if it was worth anything or not.

RUSNAK: What other sorts of experiences during your first couple of days or weeks on orbit were either unexpected things that were maybe easier to do or harder to do than you had trained for?

POGUE: It sounds rather mundane, but one of the most frustrating things I did the first few days on orbit was transfer all of the film cassettes, magazines, from the command module and stow them in the drawers in the film vault. Now, you know what a barracks bag looks like, a laundry bag. They had been put in a floppy, loose bag, and they were all loose. So I took this barracks bag, or big laundry bag down there, opened it up, and, of course, everything just floating around in there. Of course, I had to identify each one of these. There was a sort of systematic number system. It took me, I don't know, a lot longer than it should have, to transfer those magazines into the drawers in the film vault.

One of the things I remember thinking is that, really, there's a flaw in this system because you could get the tops mixed up. There ought to be a number on the side and a number on the top, this 35-mm can, and ought to be matching numbers on both side and top and whatever. It wasn't that bad, but that was a time period when I thought, boy, it would have been nice if I'd had a tray and I could just pick them out. Because these things were all floating around loosely in that bag.

RUSNAK: One of the things you got to do was your first EVA, on Thanksgiving, if I recall.

POGUE: Right.

RUSNAK: Can you describe that experience for us?

POGUE: Yes. Again, this is one of the cases where we didn't have any handrails or foot restraints in the area for where we were going to try to repair or put back into operations this radar instrument. So what we finally did, there was a pipe which was a dump line for the molecular sieve, to dump the carbon [dioxide] and water vapor, we hand-over-handed through the area and we had a portable foot restraint which we could attach to the truss work, the existing truss work on Skylab, put that in position, and went through the procedure.

This was a Dixie screwdriver operation. The procedure started in the upper left, and then depending on the degree of the complexity of the failure, you end up in the lower right corner, so to speak. The flow went down and it got worse and worse and worse. Of course, we ended up down in the lower right corner. It was the worst possible failure, and I had to really move that junction box I told about earlier, using the various tools that we had. It also called for plucking off the aluminized mylar. This is aluminum-coated plastic, and the only way to get to this box was just to tear this blanket apart, which I did. So we did that, and we finally got the thing fixed.

While we were waiting, actually we went into dark before we got the job finished. So I was looking up at the stars, and Rusty Schweickart said, "Just look up there and see how many you can see, you know, when you're outside on EVA." Took me a while to recognize constellations, but I finally recognized a few. It was just a couple of minutes, because although we were in darkness, it was dark on the Earth below, we were still in sort of a twilight.

Ed said, "Golly, look at that. What is that over there?" He said, "Are those UFOs?" I looked up and I looked over the side and I saw thousands of little purply metallic twinkling objects floating around. I said, "Gee." So Jerry turned out the lights on the inside system, peered out the window. [Laughter] And I said, "Oh, I know what it is. It's all that aluminum." We were still in a little bit of light up there, scattered light, and it was really weird.

We went ahead and finished the EVA and fixed the thing so it would work, at least—well, actually we pinned it. It couldn't work; we didn't recover full operation of it, but they could still get some data from it.

So we went back in and we got out of our suits and everything, went through all that procedure and started eating supper. My seat at the table or place at the table—you don't sit in space—was right next to the wardroom window. So I pulled that thing [the window cover] open and looked out, and you could still see those things, those fireflies twinkling around out there. They, of course, eventually blew away.

RUSNAK: That was only the first of four EVAs that you eventually did, the second and third of which were for the comet [Kohoutek].

POGUE: Well, I only did two EVAs, but there were four EVAs total, yes, on the flight. We shifted off on these. I think that the Christmas Day EVA was the one Jerry and I did, and that's also the day that he tried to fix this telescope filter. I took some pictures of the comet because it was approaching the sun. It was very close to the sun. As a matter of fact, I took this instrument outside to take pictures and images of the comet. It was kind of tricky

because I had to use one of the solar panels off of the ATM to shield the sun, because it was so close to the sun, it's approaching the sun. So I finally got this thing into position and kind of eyeballed it so that the solar panel would be shading the sun. There was one on the cover of *Av Week* that was taken with that instrument. But I was doing that and finally I finished.

Jerry was working away and talking to ground, so I didn't want to interfere, so I thought, well, this would be a good time for me to go and really get a really good view of the Earth. So I crawled on the end of that Apollo Telescope Mount, and I put my feet in the foot restraints and leaned back and, boy, you get an unobstructed view of the Earth. It was really magnificent.

All of a sudden, I heard Ed mumbling to himself, you know. When Ed and I were out on the first EVA, we lost one of the three control moment gyroscopes. So we were working on two gyroscopes, and in theory it works fine, but in practice it was kind of difficult to get these things to handle the attitude. So I could tell by the comments he was making that he was having trouble maintaining attitude. I thought, oh, crap. I was out on the end of this Apollo Telescope Mount. Well, the Skylab suits had an umbilical located—it had a pressure control unit here—the air came and went through the suit and out an exhaust. Well, this is like a little rocket, like letting the air out of a balloon. And there I was out on the end of this thing, which was a long lever arm, and [Ed] said, "Bill, where are you?"

I said, "I'm out on the end of the ATM, and I'm moving back." Because he had figured out about the same time that I had, or actually but probably before, that the PCU [pressure control unit], the exhaust was causing the problem, because it was just overtaxing the gyros.

Then I moved down to help Jerry. His foot restraints wouldn't let him get to the point we were at. I got in the foot restraints and held him and just shoved him into this door in the solar observatory so he could get to this telescope.

RUSNAK: So overall, pretty successful EVAs then.

POGUE: Yes, we lost that filter, but it hung up anyway, so we couldn't use it. So he just punched the filter out is what he did, so the wheel was free to move.

RUSNAK: Back inside the Skylab, you guys are doing the sorts of experiments we talked about before when we were discussing training, and this is where the issue comes up with timing in terms of what the crew is able to do and certain time slots that create some tension between the ground and the crew. If you could elaborate on these events for me.

POGUE: Well, we didn't find out until about halfway through that we had been overscheduled. We were having trouble. Some of them were very time-critical, some of the observations, because we were asked to do [astro]physics experiments and they gave you a certain time and certain angles and so forth, and you'd get that certain star. Well, if you don't do that on time, the angles and everything don't do any good. I mean, they're passé.

But, anyway, we were just hustling the whole day. It was hard to stay up with the schedule, and then discovered that we had been scheduled at the same rate that the second crew had achieved at the end of their flight, which explained why we were having so much trouble staying up with the schedule. When that was observed or acknowledged, by that

time, of course, we had achieved a certain skill level and could do the work better. Everything smoothed out after that one conference.

I recall the last six weeks of the flight were very pleasant to me, for two reasons. One, because we'd achieved the skill level sufficient to do the job, and the other was that I had suffered from head congestion for about the first six weeks of the flight. It didn't bother me that much, but it's like having a low-grade headache, you know. It's doesn't really hurt all that much, but it decreases your efficiency. That's about the way I felt. But as I recall, the last six weeks were great. I felt good. I was able to do the work fine. We all had a really much better feeling about the whole flight toward the end.

In fact, they asked us would we stay up for another ten days. [James C.] Fletcher, the Administrator, had even suggested. The problem was, we were already mentally prepared to come back. We said, "Well, we don't really have any food left," which was true technically, but we probably could have scraped together enough, you know. But anyway, but that's the way that worked out.

RUSNAK: Is there anything else you want to talk about in terms of the on-orbit operations before we get ready to come home?

POGUE: No, we had gotten pretty good at working with everything. Some of the nagging problems were, the urine dump would freeze up. We finally got the ground to—I said, "You know, it's only a fifteen-watt heater, for crying out loud." We wanted leave the heater on all the time, and ground wanted us to turned it off. They were wanting to manage power. But on the other hand, when the thing froze up, it took an inordinate amount of effort to get the

thing unplugged. So, nagging things like that which didn't amount to a hill of beans. They were just irritations. It really didn't affect the operation.

One of the other things that happened was, we were scared to death our trash airlock was going to hang up. Well, we took all of our trash and we put it in this device and sealed it, and we shoved it down into what would have normally been the liquid oxygen tank. It was about 2,500 cubic feet of volume down there. There was a mechanical operation involved, and it started hanging up, so it didn't work, and the only way you could get it to work right was, I would hang onto the grid ceiling and shove myself down and stomp on the lid of the trash airlock while Jerry moved this lever, and that's the only way we could get it to work. But if it had not continued to operate properly, we would have been loaded up with a lot of trash on the inside, and a lot of them were urine bags and so forth, so it would have been a mess. But we were able to keep it working by that sort of bizarre barnyard operation.

RUSNAK: One of the other things that you tested inside was the astronaut maneuvering unit, the backpack for flying around. Can you describe that for me?

POGUE: Yes, that was a lot of fun. We flew it shirt-sleeved and suited. I think Jerry's the only one that flew it suited on our flight. We were running low on nitrogen gas. We flew around through procedures, and then we evaluated the controls and did a pretty good job. Maybe I did fly it suited, because I remember it was very difficult to reach the rotation hand controller and the translation controller with the hands when you're suited. And it was a simple matter of redesign. Bruce McCandless [II] took all of our comments and redesigned it. It worked great, apparently, for the Shuttle.

But the only exciting part of that was that Jerry was doing his last suited run, and I was the observer and taking pictures and so forth, and I kept trying to tell—of course, we couldn't communicate. We didn't have any sort of remote radio or anything like that. I could see Jerry's oxygen on his bottle—I guess on his right leg—was running low, and I kept pointing to that, and he said [gestures that] he wanted to finish. Well, he kept going and finally he got real close to finishing, and then finally I saw him getting red in the face, and, boy, I said, man I slammed him down there and I pulled the release on his helmet, popped his helmet off. He was really sucking air, but he was really determined he was going to finish that thing. I think he probably did finish it, but, boy I was sweating bullets because I could see him. It looked like he was—CO_2 saturation, you know. Well, anyway, that didn't work. I mean, that was no big problem. At any time, you know, I could pop the helmet, but I was just mother-henning him to death there while he was sweating and puffing.

RUSNAK: Well, before we finish up, if we can pause to change out our tape.

Okay. We were just finishing up talking about some of the stuff you were doing up on Skylab. Let's talk about shutting down the workshop, since you're the last crew that's going to be up there. What types of things did you have to do to deactivate Skylab?

POGUE: Ground did a lot of that. What we did was go around and reconfigure the toggle switches and then take pictures of the panels so that they could see when we got down what we had done, make sure if there was a problem, they could look at the pictures and say, "Well, you forgot to do this" or whatever.

We powered-down everything and buttoned everything up, like in the waste management compartment, did a one last shove of trash down the trash airlock. Mainly, it was a very mundane procedure—put this here, stow this over there, close this up, and take all the cameras and put them in this thing and whatever, get all of the film out of the film vault to bring back. Then I closed the hatch and we went back in the command module.

We had lost a coolant loop between the second and the third mission, so that was one of the first things I had to do was to replenish, recharge the glycol solution into this coolant loop. It was the one that we used for our water-cooled long-johns in our suits, our liquid-cooled garment. So I was really interested. We got that one fixed real quick. But just as I closed the hatch, the other loop failed. They wanted to know if I wanted to go back there to fix that, and I said, "Why?"

Anyway, so we got in the command module and went through a long involved procedure. We were almost euphoric all during this period. Of course, we did a fly-around, and I took about seventy-five pictures of Skylab as we went around for the last time. Then we separated, did a separation burn, it's called, [with] the RCS, and pretty soon we could see the Skylab going away. Then we did the first de-orbit burn, which brought us down to about 125 miles, I think. I remember thinking at the time, after having been at 270 miles, looking at the Earth from that altitude, when you drop down to 125 miles, it was almost like hedge-hopping. You perceive the ground going by a lot faster and that sort of thing. But everything worked out quite well.

We did have a problem with the reaction control system in the command module. One ring was deactivated. The official record says that they told us to put on oxygen masks, but we never heard the transmission, so we didn't put them on.

We had a problem after we had separated from the service module. I looked over and Jerry was moving the hand controller to get the entry attitude, which we had to do, and nothing was happening. I yelled and screamed, "Go direct," which means you go into hard stops, bypasses all the black boxes and just puts the juice right out to the solenoids on the rockets, and that worked. We got close to the entry attitude, threw it into autopilot, which steered us during re-entry. No problem.

When we got down on the deck, we were hoisted aboard the aircraft carrier. Everybody was pretty good shape. Then later we found out that Jerry had inadvertently pulled all of the circuit breakers to the command module instead of the service module. You were supposed to pull the circuit breakers to the service module, so when the guillotine cut all those wires, there wouldn't be any arcing. They were one right above the other, the biggest, I mean, the most common mistake one can make, and human factors [would] say you don't put those there if you have that kind of a procedure involved. You'd separate them. So it was real easy. It was dark, and he just pulled the wrong ones. But it turned fine. But that was the biggest excitement during re-entry, was when he moved that hand controller and nothing happened.

RUSNAK: Yes, I can imagine that was pretty exciting.

POGUE: Anyway, re-entry went fine.

RUSNAK: How did you feel once you were back on Earth, physiologically?

POGUE: Oh, you feel like you weigh a ton. I remember I had the Hasselblad camera in my lap because I didn't want it to break, and I rolled over on my side. It felt like once side was crushing in on the other just from the weight. This Hasselblad felt like it weighed about twenty-five or thirty pounds and that your perception of heft, mass, weight—well, mass, of course, is the same, but, anyway, you go through all that and your balance is off, whatever.

The adaptation period, they had us scheduled for tests, I think for about eight weeks, but after five weeks they discontinued the tests because we had returned to what they called pre-flight baseline. That was it.

RUSNAK: Pretty quick recovery for having spent eighty-four days up there.

POGUE: Well, see, with each flight they focused more on exercise. The second crew exercised more than the first. They were in better shape than the first crew, even though they were up fifty-nine days. We were in great shape when we came back because they had devoted more time for the exercise.

RUSNAK: Was there anything else in these post-mission debriefings or anything that was particularly remarkable?

POGUE: No. I criticized one system in particular. It was part of the environmental control system. We had a heat exchanger which cooled the air. We also had a condensing heat exchanger in another part of the loop which pulled the water out of the air. That's what it's supposed to do. It was colder, and it chilled it down to dew point, and they [wicked] it away

with chamois skin. The regular heat exchanger, which is supposed to cool the air, did not have an upstream filter. In other words, the air approaching that from the cabin did not have a filter in it.

What happened was, you slough off skin, dead skin, all the time once you're in space. You go to a filter after two or three days, it'll be covered by this gray sort of coating, which is dead skin. It's everywhere. It got into that heat exchanger and the little apertures, the little holes in the radiator, so to speak, were very small, and eventually clogged it up. So I spent a lot of my time down in the hole, reaching down, and I had to make special vacuum cleaner attachments with rubber ends so I could press them up against this grid, the heat exchanger grid, trying the suck the bugs out of the radiator, if you'll pardon the expression. It never did work fully, although ground said, "Great job." It would loosen it up, it would increase the flow enough so that it would [continue] it.

But what was happening was, it was slowing down the air flow sufficiently to turn what would normally be just a regular cooler into a [condensing] heat exchanger. In other words, air was going through so slowly that it would chill down to dew point and release moisture and get on the inside. I criticized that one because it caused real problems, and ground was always concerned about that flow.

But, shoot, talk about something that was very successful, Skylab was successful. I mean, it was the first space station, focused attention on long-term reliability of systems. That's one of the things that Skylab really did. Go up on Apollo flight, eight days, ten days, whatever. That's one thing. When you stay up there for months, you're going to expose all those systems to all the problems that are going to be realized or faced in the zero gravity or

space environment. So then you can see how difficult it is to make a system that is going to be reliable for something as long as a Mars mission, which is nominally about three years.

RUSNAK: What about with the science? Did you have interaction with the principal investigators, the people whose experiments you were doing up there?

POGUE: Mostly before the flight. On the Apollo Telescope Mount they would tell us specifically the sort of thing they wanted, and I mentioned earlier, the flare-rise. Once the flare starts, we had all kinds of good data, but the scientists, the solar physicists, were specifically interested in the flare-rise itself, that, I guess, several seconds prior to the rise.

Owen Garriott had come up with a procedure that he thought was good, and he explained it to Ed. When I was operating it, if I started getting something cooking, which we could recognize with our little proportional counter for X-rays, if it looked like it was going to be a flare, I would call Ed. I did not want to take the responsibility for putting this thing in flare mode, because you could use up 80 percent of all of your film in some of these cameras when you went into flare [mode]. So you wanted to make darn sure you had a flare coming, because I just didn't want to do that.

But Ed had studied this, and he finally got a flare-rise, I guess about toward the end of the mission, based upon what Owen had told him and what he had observed and what we all discussed and so forth about the flare-rise. That was what I think was a premier accomplishment on our specific mission for the Apollo Telescope Mount. Of course, they had all these consolidated other corollary experiments, the student experiments, all a bunch of fun, especially the water-drop experiments.

RUSNAK: What type of work did you do for NASA after you got back from your mission?

POGUE: Well, first I started on the Shuttle and did a lot of work. Joe Engle and I flew the supersonic transport simulator at Ames Research Center [Moffett Field, California], which had been converted to the flight parameters and control equations and so forth of the Shuttle, or what they thought were going to be. So I did that for a while, wrote reports on that. In fact, that's what I did for, I guess, most of '74 and '75, until I left, but came back when it looked like it was an opportunity to do some work in Earth Resources. Worked in the Earth Resources [Program] Office for a man named Cliff [Clifford E.] Charlesworth. He was a really nice man. He was one of our Skylab flight directors. My job was to put together an instrument package for STS-2. STS-1 was up and back to make sure you can get that thing to fly, as John [Young] and Bob [Robert L.] Crippen had their hands full of that.

So the second flight was going to be a little longer, and we'd actually have a chance to do some science from the payload bay. I worked on that, and I had all kinds of ideas but no kinds of money. So that ended up very frustrating. In the meantime, I was called back to work on Shuttle and was back training on the Shuttle again when the doctors grounded me for high blood pressure. So eventually the doctors said, "You really ought to go do something else for a while." So that's what I did. So I left.

RUSNAK: What types of work have you been doing since then?

POGUE: Different types of consulting work. I worked for a public utility that was trying to build a nuclear powerplant. This was back in early ’79, I was approached. At first they wanted me to do PR [public relations]. I said, “Forget it.”

They said, “Well, how about doing technical consulting for program management?”

I said, “Well, now, I can do that. If I can’t, I know who can. I had a lot of friends at NASA.” I took the managers and so forth, I brought down here. Gene Kranz briefed them. Dr. Kraft approved everything and so forth.

The thing about it was, though, in between the time I had started on this and so forth, the Three Mile Island nuclear disaster occurred up at Harrisburg [Pennsylvania], and things were doing to hell in a hand basket fast.

By the time I got down here, we knew what we wanted to do, but nobody would let us do it because everybody was scared to death about a meltdown and all that and this and the other, even though we were in the early stages of construction. That went on for a year and a half. I thought I had made a contribution, but it was totally frustrating because eventually they canceled the project.

In the meantime, I’d been approached by Martin Marietta Aerospace in Denver and worked with them for about three or four years. Toward the end of that work, the Space Station Program was announced, and Jerry Carr and I decided to team up to provide services for contractors, and Boeing made us an offer we couldn’t refuse, so we went to work for them. We went to work in the summer of ’84 and I worked right through until February of ’98.

So we went through all the agonizing changes in the Space Station, the redesign. It was terribly frustrating. I've never seen a program so beset by troubles that actually became a active program and operational as we are now. But that was very interesting work.

RUSNAK: How relevant was your Skylab experience to that?

POGUE: Well, I thought it was highly relevant, because we had very few people that had both EVA experience and long-duration space experience. Nine people is what we had. A lot of them are tied up in executive positions. Al Bean, meantime, had retired and become a highly successful artist, so he was out of pocket. There weren't very many people around. Paul Weitz was here, still, in the management structure. So we had hands full. What we were essentially facing were engineers, aircraft engineers, who had only the most rudimentary knowledge of working in space.

One of the first things we did was we looked at some of the artwork that Boeing had rendered for the Space Station, totally innocent. Had everybody standing straight up in the aisles of the Space Station module. I said, "Well, you don't stand up in space. You're in a semi-crouch." That's ridiculously mundane, but it does show that you are divorced from the reality of what it's like in weightlessness.

We did a lot of briefings. We had what they called brown-bag lunches, where people would bring their lunch with them and during the lunch hour we would talk to them. We would just get up and talk to them and explain how it is. Like, if you're going to do this, this is what you need. You need foot restraints. You need this or whatever. Tethers, you've got to keep everything tethered so it doesn't float off, and so forth. Boeing got educated. Boy,

they really approached it very professionally. Did a lot of work in the water tank down at Marshall Spaceflight Center and supported Jerry and me thoroughly in our efforts. So we thought we were at least useful there.

We tried to represent crew interests, too, because they're not going to buy this. You know, it just won't happen. So one guy said, "We'll shove it down their throats."

I said, "Forget it, for crying out loud." I said, "That attitude is unacceptable. It just won't work." You get the picture. I mean, it was fun, interesting.

RUSNAK: If you look back on your career from the Air Force and at NASA and with the contractors, what do you think the biggest challenge was for you?

POGUE: I think the biggest challenge was the training for Skylab. There were 3,300 hours of at least formalized instruction. It was a fairly heady pace. We had to take the medical training, the paramedic training. We had to learn to suture—which I just hated, loathed—that sort of thing. There was a wide variety of preparation.

RUSNAK: In the little bit of time we have left, I wanted to give you a chance to make any final remarks before we call it a day.

POGUE: Well, the only final remark, my attitude has been, since I've left NASA, is that I had an opportunity that very few people have, and I tried to respond to public requests as much as I can. I think that most of the other guys and ladies that have left the program feel the same way. Some have been abused by the public more than others, so that some of them have a

little more negative attitude, but, again, nobody knows who I am anyway. So, I mean, I can go out and talk, and whatever. Then I can leave and have my anonymity back. Some of the people that are more recognizable, I can understand why they shy away from all this.

But I still speak in schools. I restrict my school appearances to my local community. Then there are always the civic clubs, and, of course, you make a hell of a lot of money doing this. [Laughter] Like zilch. But it's fun. And again, it's the only way I can pay the American people back for the fun and the accomplishment that I realized while I was with NASA.

RUSNAK: You certainly had a remarkable and interesting career here. I'd like to thank you for agreeing to participate today, and I've certainly enjoyed speaking with you.

POGUE: Thank you, Kevin.

[End of interview]