

NASA JOHNSON SPACE CENTER ORAL HISTORY TRANSCRIPT

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T. RODNEY LOE
INTERVIEWED BY CAROL L. BUTLER
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BUTLER: Okay. Today is November 7th, 2001. This oral history with Rod Loe is being conducted for the Johnson Space Center Oral History Project in the offices of the Signal Corporation in Houston, Texas. Carol Butler is the interviewer and is assisted by Kevin Rusnak and Kirk Freeman.

Thank you very much for coming in and joining us today.

LOE: Thanks for having me.

BUTLER: To begin with, maybe we could talk about how you became interested in aviation, aerospace engineering, and what led you to your career at NASA.

LOE: I graduated in mechanical engineering from Lamar University over in Beaumont [Texas]. Right out of college I got married and took a job with Boeing [Co.] in Seattle [Washington]. I got accepted on the Boeing's Engineering Development Program where they moved young engineers around to various parts of the company.

One of the parts I got to work on was Boeing's proposal on the lunar module [LM]. I've told people since then that we were in a big scramble back then to try and save weight. If I had just had the common sense to say, "Why don't you take the seats out," something that simple, there's no telling, who knows, Boeing might have got the contract back then. But anyway, we

didn't get the contract. Some smart guy somewhere said, "Why don't you take the seats out," and saved a bunch of weight.

Anyway, Boeing did the contract to build the Saturn IC, the first stage of the lunar vehicle, and that was being done at Michoud [Assembly Facility] in New Orleans [Louisiana] where the external tank is built now. My last assignment within the Engineering Development Program was to be in Tests, which is where I really thought I wanted to be all along. They were in the process of developing the Mississippi Test Facility [now Stennis Space Center] in [Bay St. Louis] Mississippi, right outside of New Orleans, where they were going to test the S-IC.

So anyway, so I got a chance to transfer to New Orleans, so I did that. We had loved Seattle and the Northwest, but this was a little closer to home, and I was excited about being in the test area. We got to New Orleans and found out that we were a long way away from ever testing any hardware. In fact, the test facility was just barely under construction. So I was helping write service manuals for the ground support equipment on the S-IC.

I happened to be home at Christmastime and ran into a friend that—home was Beaumont—and ran into a friend that I had gone to college with. He was over in Houston working for NASA and doing what sounded like interesting stuff. I talked to the people at personnel in Boeing, and the Saturn IC was Boeing's first step into NASA contracts. Always before we had been producing missiles and what have you for the Air Force, and my sense was the Air Force didn't have near the oversight that NASA required because NASA, of course, was going to put a man onboard.

So the personnel people at Boeing thought the name NASA on a résumé would really look good. So we decided to come over here and interview. I interviewed [Eugene F.] Kranz, I think Milt [Milton L.] Windler in Landing and Recovery, and possibly Wayne [E.] Koons. I've tried in later years to think of who all that I interviewed. Of course I know I interviewed Gene, because that's who I ended up going to work for. He was a very impressive guy, and the job he

offered me was in the Gemini systems area. Gemini was just getting started, and it was remote site kind of work, which sounded great, a lot of travel.

So anyway, so we accepted the job and came over here and did my interview I guess a little after Christmastime, and then we were over here, moved over here in March, I guess, of '64 and went to work. My section head was Arnie [Arnold D.] Aldrich. At the time I got here, the Center wasn't open yet. We were up in the Stahl-Meyers Building, which is the Oshman's [sporting goods] warehouse up on [Interstate] 45 and Highway 90. NASA was all up and down the Gulf Freeway in all those office buildings, Petroleum City, I think it's called. Even had friends, some of the engineering folks were over in apartments over off Telephone Road. NASA had just rented every available building they had.

We moved down to the site then in May, so I wasn't up at Stahl-Meyers too long. I think it was May when we moved down. We were in the admin wing of Building 30. We had the control center right across from us.

BUTLER: What were your first duties in this role as you were in this process of everything coming up to speed? You said it was Gemini systems.

LOE: It was Gemini systems. I was studying the electrical environmental-type systems. We had remote site teams where we'd have a CapCom [capsule communicator], a person from the systems area, a systems engineer, an aeromed [aerospace medicine], a doctor of some type, usually military. Then our sister ship, our target ship on Gemini was the Agena, and so once the Agenas got to flying, we'd have an Agena systems person out there.

We had a remote site down at Corpus Christi [Texas], and we'd go down there for training. So I was down there for training for a while. Then we had a—it was called NS-1, Network Simulation 1. It was a simulation of the first Gemini manned flight. I was lucky enough to be able to go to Carnarvon, Australia.

BUTLER: That must have been interesting.

LOE: It was. It was. Australia was a great trip. The people over there are still fascinated with the space program. I guess they still remember when the city of Perth turned on their lights for John [H.] Glenn [Jr.]. I think there's still a lot of World War II holdovers. They like Yanks from even back then. So that, yes, we got treated just like royalty over there, and the folks were absolutely great.

My CapCom was Dan [Daniel S.] Hunter. Then they started sending out astronauts along with them too, so Pete [Charles] Conrad [Jr.] went out with us. The other systems guy was a fellow by the name of Gene [F.] Muse, M-u-s-e. He's dead now. Then I remember our medics were all Australian medical doctors.

One of the real interesting things about the trip was that we flew from, of course, San Francisco [California] to Sydney, laid over there for a night or two and then on in to Perth, which is on the opposite side of the continent. Perth is on the west coast, and our tracking station was on the west coast. It was about 600 miles north of Perth. There was a plane that went up there once a week, but there were no rental cars up there. So we had to rent our cars in Perth and drive the 600 miles up.

BUTLER: Oh, my.

LOE: That was just a fantastic trip. It was good to see the countryside and the people, and it reminded me a lot of what you might think 1930s U.S. would be like. Anyway, a very good experience.

BUTLER: You said this was just a simulation for the entire network.

LOE: Yes. Yes, and we had teams at all the sites, one at Hawaii, one out on ships. What would happen, the simulation people that were with us, when it was time for the spacecraft to pass overhead, they would start a tape, and the tape would play in spacecraft data. Then they would play the part of the astronauts so our CapCom could talk back and forth to them. They had a script that they were following on what to say, what problems they might have, how they would describe the problems, everything. So, quite an experience. I guess we were there a couple of weeks running the sim.

BUTLER: Now, how did that work with—since you said they would play tapes for what was happening, whereas in later years you were able to use the computers and the computers were able to react to whatever changes you would make or comments that would have, how would that work with the tape running? Would there be times that a decision that the controllers would make that would conflict with what the simulations people were expecting to happen or would things go pretty—I mean, how much information was on the tape, I guess is what I'm asking, and how well would that correspond to the simulation?

LOE: Your standard telemetry, cabin temperature, cabin pressure, battery voltages, currents, and those values, I think were capable of being tweaked somewhat by the simulation guy. But they were also part of a script, so if some voltage was supposed to fall off at such and such a time, it was already on tape that it was going to fall off at that time. But I do think that the simulations folks had a certain amount of capability to tweak some of the values and stuff.

BUTLER: Would you run a simulation for the mission from start to finish then for this particular—with everyone going out to the different remote sites for—

LOE: Yes. Oh, yes. The mission was only three orbits, so that was over with pretty quick.

BUTLER: Did you run it more than once during that time?

LOE: Oh, yes, yes. We would run it day after day after day and different scenarios, of course, each time.

BUTLER: So you said you stayed out there for a couple weeks then doing this.

LOE: My sense it was, yes, ten days to two weeks, something like that. Then the way we traded data back then was that we had what was called summary messages. When I at the remote site got ready to send a summary message, there was a button on the console you'd push, and it would strip out the value for cabin pressure right at that instant, cabin temperature, different voltages, just one sample of that one data, strip it out and send it on teletype to all the other remote sites and to the MCC [Mission Control Center] at the Cape. So that's the way we kept track of what everybody else was reading and some sort of a history of what had happened at the various sites, was it was all done by teletype.

BUTLER: Very different than today.

LOE: Yes. Anyway, after NS-1, I guess I did something right. They pulled me off the remote sites and we started getting ready to man up the control center, both in Florida and then, of course, we were building the one here at JSC. So by the time Gemini II rolled around—Gemini II was an unmanned suborbital lob of a Gemini capsule down range in Florida. By the time Gemini II rolled around, we had the capability here in Houston to monitor the flights, although the control center hadn't really been wrung out. So we sent one team to Florida to actually

control it, and another team, and I was part of the team that stayed here and wrung out the control center, did that for Gemini II.

Then the first Gemini flight, Gemini III, we did the same thing. We had the actual controlling team was in Florida, but we had a full team here in Houston in the control center. Then by the time Gemini IV rolled around, we were totally in Houston. We had closed down the control center in Florida, and everybody was totally here by then.

BUTLER: So at this point you were manning the EECOM console?

LOE: Yes. The Gemini systems were split into two portions. It had GNC—guidance, navigation and control—and then sort of everything else was the EECOM. EECOM stood for electrical, environmental, and communications. But we basically had all the systems that didn't have anything to do with guidance or navigation or controls.

BUTLER: Which is quite a few systems.

LOE: Yes.

BUTLER: How did you become—leading up to this point and holding such a role, how did you become so familiar with all of the different spacecraft systems to then be able to monitor them so carefully during the flights? What was your training like up until—you mentioned the simulation, obviously going out to the remote site and going through things very detailed there, but how did you gain that familiarity with the spacecraft systems itself?

LOE: We had some classes, that I recall, some training classes. We did an awful lot of just training on our own. We drew systems handbooks, they were called. They were schematics that

we needed in order to troubleshoot the systems onboard, and we'd draw these ourselves using the vendor schematics, and put them in our own book and publish them. So that really helps you learn the systems an awful lot that way.

We had some McDonnell Douglas people also assigned to our office. They were working here with us. So they were very, very helpful in any kind of questions you had out of the company that you needed about the spacecraft or whatever. The guys were good about getting those. We wrote mission rules that said for loss of this, you'll do that. In order to write that rule, you had to go back and go through the schematics and study and say, well, what could cause you to lose that certain function.

But there was not the formal training that we have nowadays. We didn't have the certification that's now required. That came later. I guess in Apollo is when we started certifying people. We had the simulations over and over and over again with the guys like [Christopher C.] Kraft [Jr.]. Kraft could ask questions that would make you go study and find things out. Great guy. Great guy.

BUTLER: I guess that is a good way to learn is to going out and looking for it rather—

LOE: You bet.

BUTLER: —than just having somebody—

LOE: Yes.

BUTLER: —tell you real quickly.

LOE: Yes. Yes. There was an awful lot of “what if” games played up and down the halls. If you stumbled across something, a quirky thing on maybe how a system worked or something, you were anxious to go running down the hall and tell all your buddies, “Hey, look at this,” and “What do you think of this?” There was an awful lot of that that went on, so we exchanged a lot of ideas.

BUTLER: Certainly a very important part of it is all the systems were so closely integrated that you had to share that information.

LOE: Yes. That was one of the neat things especially about the electrical system, because it touched all the other systems. The cooling system, the same way, it touched all the other systems, so, yes, that forced you to not only learn your systems, but also learn a little bit about everybody else’s. So that was good.

BUTLER: You mentioned simulation after simulation, that that was a very key part of all of this. As you were gearing up, as the control center was coming on line for Gemini II, Gemini III, Gemini IV, how many simulations would you run before a mission, or did it vary depending on what was happening for that mission?

LOE: How many would we run for a mission. I don’t know. That would be hard to say. I would guess—I don’t know. Let me talk on here a little bit.

BUTLER: Okay.

LOE: You would tend to simulate mission phases like ascent, launch. An ascent sim could be about ten minutes long. You’d run one, and you’d debrief that, and then you’d turn the

equipment around and run another one. You just ran ascent sims one after the other after the other. So you could probably get at least a dozen ascent sims in in a day. So now maybe tomorrow you would run entry sims. So you tended to simulate the different phases.

Of course, with the shorter missions with like the three days that we were—is it three days or three orbits? I guess three orbits that we were doing on Gemini, the first one anyway, those you'd run—I don't recall. I'm sure we'd run—I don't recall ever doing more than one a day, but we may have. We may have. Yes, I don't recall how we'd do that.

BUTLER: That's all right. Certainly you were, as you said, doing a number of different ones at different times with the different phases.

LOE: Yes.

BUTLER: You'd obviously be going between doing simulations and then doing some of this other training and evaluating and looking at mission rules during times that you weren't doing simulations or weren't actually flying a mission. Can you think of about how many days out of the week, maybe, that you would be or did it all just kind of blend together, that you would just move from one to the other?

LOE: My sense is it would all sort of blend together. Like there might be a couple of EECOMs, and maybe I'd go run sims in the morning and John [W.] Aaron or somebody would come run them in the afternoon or something to that effect. Or maybe one of us would sit there and watch the other one.

BUTLER: So you were trading off in all these?

LOE: Yes. Yes.

BUTLER: Interesting. Well, you were building up to talk about Gemini IV, as you had worked your way up through Gemini II and III and the center coming on line and Gemini IV was the first that was actually run full out.

LOE: Yes, Gemini IV was the first that was totally run here out of Houston. We had wrung out the control center as best we could. We'd do everything we could think of to try and bring it to its knees, pushing three or four command buttons all at the same time and stuff, just anything we could to try and mess it up. We thought we'd given it a pretty good checking out.

Gemini IV was our first EVA [extravehicular activity] flight. That's when Ed [Edward H.] White [II] went outside. Gemini V then was first long-duration flight. Then came VII, which was real long. We rendezvoused with Gemini VI on that one, called it Gemini 76. Gemini VI was supposed to rendezvous with an Agena, and the Agena went in the water, if I recall. So we then launched VI, and we had VII already up there. We launched VI up, and the two of them rendezvoused together—came into close contact, didn't actually touch or anything, but came into close contact.

BUTLER: How did that work from a monitoring standpoint, especially for your job? Here you were looking at so many of the systems of the spacecraft and you had two of them up.

LOE: Yes, that's a good point. As I recall, we only had the capability of really looking at one in real time. So we would have our history data, I guess, from one spacecraft and our real-time data from another one. But I don't think we could look at both of them in real time at the same time. We may have split it up to where—I don't know. I can't remember if we alternated among remote sites like said, "Okay, Corpus Christi, you look at VI," and, "Guaymas, Mexico, you look

at VII,” or how we did that. But I do recall out here in Houston we could only look at one of them in real time.

We could swap off from that. We could look at one maybe this pass and the next pass look at the other one. We could see it live here in Houston. From the time it came as they were coming up the coast, we could see it as it came down over Corpus and then all the way across the lower part of the U.S. and out in the Caribbean, some of the tracking stations out there, we could still get data back into here. But then we’d lose them again, and we’d have to wait till they came up over another remote site to get our summary message.

BUTLER: So still definitely a growing process for the network and monitoring the spacecraft.

LOE: Oh, yes.

BUTLER: Obvious for Apollo there would later be that capability to look at both spacecraft live at the same time.

LOE: Yes. And then of course as we went to the Moon and you got out a given number of miles, then one of the deep space sites always had them, the site of Madrid [Spain] or the one in Goldstone out in California or the one in Australia. I can’t think its name right, now, but Canberra, maybe. One of those sites would always see, always had the spacecraft in sight when we were on our way out to the Moon. So that was nice.

BUTLER: Certainly very different than what you’ve just been describing for Gemini.

LOE: Yes.

BUTLER: Going back a little bit to the Gemini IV mission, you mentioned that it was the first EVA. At what point did you learn that the EVA was actually going to be flown on this mission, and how did that tie in with your simulations, and actually how closely did you as an EECOM were you involved with the EVA aspect of things?

LOE: As I recall, there was one of the guys from Crew Systems [Division] came and sat at the EECOM console with our EECOM for that mission. This was done in a hurry. I mean, going back to the days at KSC when we had the control center at KSC, there was a Crew Systems person that sat next to the EECOM. As I recall, the EECOM was the guy that did the talking to the flight director. The Crew Systems guy, I don't recall participation in too many sims, especially not the dynamic simulations like an ascent one.

But the Crew Systems guy sat with the EECOM. Larry [E.] Bell was sitting with Dick [Richard D.] Glover in Florida, and Charlie [Charles N.] Crews was sitting here with me in Houston on Gemini III. So when IV came around and the EVA came around—and my sense is that the EVA was a late edition to Gemini IV—but having the Crew Systems guy sitting there next to the EECOM, I think it took a lot of the EVA prep away from the EECOM and came along with this Crew Systems person.

As far as the suits and the little handheld device that Ed used, that was all under the purview of the EECOM, but he had the luxury of having the Crew Systems guy right there next to him, so he didn't have to become as expert on those systems that he might have on some of the other systems.

Now, after—I want to say after Gemini IV, that may have been the last time that I recall the Crew Systems guys being out there with us. I don't recall them on later flights, VII or anything after that.

BUTLER: Do you recall why that might have been?

LOE: No, I don't. I don't. It may have been then that we were consolidating the engineering support for the missions under one entity or organization—and we'll talk about this later on when we talk about SPAN [Spacecraft Analysis Room]—but where flight controllers could go to pick the brains of the engineers who actually designed and tested all this equipment. So it may be that the Crew Systems guy went off then to be a part of that. But I sure don't recall them in later Gemini. I hadn't thought about that before.

BUTLER: That's certainly interesting because it does sound like they served a good role at least for the first ones giving that. Although I guess with the back rooms and the SPAN and the MER [Mission Evaluation Room], as we'll talk about, there was that support still so they hopefully were in there and giving that.

LOE: SPAN back in those days was totally run by the contractor, by McDonnell Douglas. In fact, some very high, high-powered McDonnell Douglas people would come down and man the console in the back and support us.

BUTLER: Okay. Interesting. We've talked about Gemini 76 now, which was a joint mission, which certainly was interesting in that aspect of having the two spacecraft up and the one going such a long duration.

LOE: Yes.

BUTLER: Then began to get into the later Gemini missions where they were doing EVAs more regularly and discovering the challenges of doing that, where they were having difficulties working, holding their bodies steady while they were trying to do a task. Again from your

standpoint as an EECOM, where you were monitoring these systems and helping monitor what was going on with the crew, what was your involvement as they were having these difficulties, and what were the discussions like in the control room over that?

LOE: I don't recall a lot of telemetry on the EVAs. I'm sure the doctors had probably heart rates, but I don't recall that we had very much telemetry. I'm sure we had a suit pressure maybe and not much else. So most of the discussions were along human factors lines. It was almost a medical kind of a thing, rather than a systems kind of a thing, that I recall anyway.

BUTLER: Okay. That makes sense.

LOE: Yes.

BUTLER: Because certainly what they were experiencing was them, themselves, rather than the equipment.

LOE: Yes.

BUTLER: Well, do you have any particular thoughts on some of the later Gemini missions— Gemini VIII which had to reenter early, or IX, X, XI, and XII, they obviously did get all the EVA going well. Do you have any thoughts from those or any experiences that you'd like to comment on?

LOE: Gemini VIII was the one that we had to enter early. It was out over the Pacific, if I recall. We had docked with the Agena, and we were, I guess, afraid of the Agena. We were scared to death of it. So when the whole stack started tumbling, everybody's first thought was that it's the

Agena. Turns out it was Gemini that was doing it, and the Agena was trying to hold it still. But they turned off the Agena, and then they really went wild. But anyway, got the thing under control and got them back, but that was a close call. It didn't really involve any of our systems.

Here again, we were seeing summary messages from these remote sites, so you could hear the voice when a crew was over a site, but to look at the telemetry and see what was going on, we just didn't have that capability back then, at least not back here in Houston. Now, the people at the remote site could see it when it came over, but we got to see the summary message.

BUTLER: You mentioned an interesting point there, that everyone was unsure about the Agena, and it was something new that hadn't been done before, and there had been some problems leading up, but the fact that you mention that specifically, what do you recall about the concerns regarding the Agena?

LOE: Nothing specific, and I'm not even sure if I'm telling you what I recall from back then or what I've since learned that our thought process was.

BUTLER: Sure. Well, we've heard the same before—

LOE: Okay. I don't doubt that.

BUTLER: —that there was concern about it, as we've talked to a few people and we've been able to talk to some people that specifically worked on the Agena systems, too, so—

LOE: Okay.

BUTLER: —it's been interesting. But, yes, you're not the only one that's had that thought.

Well, as you were beginning to move from Gemini into Apollo, what was the transition process like? What was your involvement in getting the control center lined up for this new ability, to be able to monitor two spacecraft, or were you still just really focused on the missions and were other people taking care of that transition?

LOE: While we were flying Gemini, there was another group just like us that were getting ready for Apollo. In fact, I remember one of the choices I was given when I came to work was Gemini or Apollo, and I picked Gemini, probably because it was the active thing going right now, and I could see that's where the action was going to be for a while.

As it turned out, I'm sure glad I did, because as we started winding down Gemini and getting ready to go to Apollo, the folks that had been working Apollo all this time, they had the systems knowledge, but my sense was back then that we had the operations knowledge, all this experience that we had gained. I just remember thinking at the time that, to me, was much more valuable than the knowledge of the spacecraft systems that those folks had. So I was glad that I'd made that choice, or if I didn't make it, I was glad somebody had pointed me in that direction.

But as we got into Apollo, a lot of the Agena folks merged into the lunar module, the LM organization, and the Gemini folks went to the CSM [command and service module]. I guess Mel [Melvin F.] Brooks was the branch chief back then in early Apollo, and Arnie [Arnold D. Aldrich] was the section head of CSM, and I guess Jim [James E.] Hannigan maybe had the section of LM controllers, LM systems people.

BUTLER: At what point was the decision made to create the new controller positions for the lunar module? I believe it was—

LOE: TELMU [Telemetry and EVA Systems Engineer].

BUTLER: —TELMU and then—

LOE: [LM] Control.

BUTLER: Yes. Was that about this time frame?

LOE: Yes, my sense is they were always there.

BUTLER: Okay.

LOE: Just like you had EECOM and GNC on the CSM side, then you had TELMU and Control on the LM side.

BUTLER: Okay.

LOE: So, yes, I think they came—somebody saw that that split had worked pretty well in Gemini and was working pretty well in early Apollo, so I think it was the natural thing to do, to split it that way with the LM also.

BUTLER: Something rather than having to try to have one person monitoring all the systems for both.

LOE: Yes. That just would have been too much.

BUTLER: Well, as you came into Apollo then, you had been working Gemini, as you said, and other people had been getting familiar with the Apollo systems, but then you still had that operations knowledge from Gemini that needed to translate over into Apollo. At what point then did you begin doing simulations for Apollo? Was it after Gemini XII in your case that you began to get into that, or did you even start a little bit before that time frame?

LOE: Our lead EECOM guy, a fellow by the name of Dick Glover, my sense is that as we wound down Gemini, that probably Dick didn't fly the last few Gemini missions, that he went off to do Apollo stuff. So, yes, we continued on with the Gemini, myself, John Aaron, Merlin [Walter M.] Merritt. We were the EECOMs on the last few Gemini missions. My sense is that Glover was off doing the Apollo thing. I think that's probably the way it happened. He was off getting that ready.

The McDAC [McDonnell Aircraft Company] people that I mentioned that had worked with us on Gemini, we had a similar contingent working for Rockwell [North American Rockwell Corp.]. The lunar module side of the house had a contingent from Grumman [Aircraft Engineering Corp.]. The guys were in the process of building handbooks and what have you and writing mission rules already and stuff, so Glover went off to head up that effort, and we finished up Gemini along with sticking our nose in the Apollo stuff every now. But, yes, we concentrated on the latter part of the Gemini.

BUTLER: Okay. And then just transitioned right into Apollo.

LOE: Yes.

BUTLER: We came across in our research a listing for an NS-2 simulation, for that seemed to be Apollo oriented. Was this similar to the one that you had mentioned earlier with the whole network around the world, or do you recall it as a specific event?

LOE: I'm sure it was. I'm sure it was probably for Apollo what NS-1 was for Gemini, to wring out the network, make sure it was ready. It didn't stick in my mind like NS-1 since I did get to go to Australia before. But I'm sure that's what it was.

BUTLER: Okay. Well, moving into Apollo, the initial plan was for a manned mission to go up first, which was Apollo 1, and unfortunately the fire occurred with that. At what point did you learn about the fire, and what then was your role in helping in the recovery process there?

LOE: I can't remember what tests we were running in Florida that night, but we were in a monitor role here in Houston. January 27th is my wedding anniversary, and I was scheduled to be on the console, but my wife was wanting to have some people over to play bridge. I got John Aaron to take my shift for me.

So I guess it was probably six o'clock in the afternoon maybe, something like that, early evening. There wasn't anybody over at our house yet. But John called from the control center, very—you could tell John was shook up. So I went back out.

My sense is John left his car out there. I drove him home, then went back out the next morning and started trying to piece together what happened. I can recall listening to the voice tapes here, and then probably at some time on Saturday I got a call and said I had been appointed to part of the investigation team down in Florida.

It was my first experience to ever ride on the NASA Gulfstream. We went out, met it out at Ellington [Field, Houston, Texas], of course, and took it to Florida. I remember an astronaut

by the name of Ron [Ronald E.] Evans was on board. That was the first time I ever met Ron. One of the big heavies, I guess it was Joe [Joseph F.] Shea, maybe, was on board with us.

Anyway, we went to Florida. I was on Jim [James A.] Lovell's team. Jim and his team, Jim and us, were tasked with looking into what would happen if this had happened in flight, what would we have done.

I remember going in one building where they had the remains of the space suits left. It was like a morgue. They had it really cold and these three suits laid out underneath these sheets, looked like three bodies there, of course. But that was a weird scene.

BUTLER: It must have been hard.

LOE: One of the things we discovered out of Jim's group was that, of course, if it had happened in flight, we would have had a big advantage because we could have decompressed the cabin had we been in our suits.

Anyway, that's sort of what I recall about the fire. I didn't have to be there that night, thank goodness. John was taking my shift for me. But here again, I can't tell you how long we were at the Cape. A good while.

BUTLER: There long enough to pinpoint what was going on.

LOE: Well, yes. Not that we were tasked with coming up with the final solution or the final cause or anything else, but our job was what would have happened if this had happened in flight. So we approached it from that direction, not necessarily worried about what caused the fire, but what could we have done to fight the fire. And that decompressing the cabin would have been a big help.

BUTLER: What changes came across as a result that particularly affected you in your role as CapCom and a flight controller from all of this? Obviously, you said if this had this happened in flight, already you could have taken care of that more easily than on the ground. But what changes were there?

LOE: Well, then I recall—seems like almost weekly trips to Downey [California] as they redesigned the spacecraft. I remember Aaron Cohen. That's probably where I got to know Aaron best, being very actively involved in that.

From a control center-wise, I don't recall that we changed too much of anything of our procedures or operations or anything. Much, much more aware of the dangers of fire. Of course, the whole system became much more aware of the kind of stuff that we were putting in that spacecraft and how it would react to a 100 percent oxygen. I heard at some point, and I can't even tell you if it's true or not, but I think it was the glue that was used to put the Velcro on the walls that, mixed in that pure oxygen like it was, or surrounded in pure oxygen like it was, that the amount of energy to ignite that was just nothing almost. Somebody described it as the amount of energy it would take to tear a piece of paper. Like I say, I don't know if that was true or not, but there was all sorts of awareness of what was going into the spacecraft. But procedure-wise, I don't recall that we changed much of anything.

BUTLER: Mostly spacecraft and materials changes.

LOE: Yes.

BUTLER: Well, during the recovery process, as you mentioned, you were going down to Downey, helping with that. What were you specifically looking at when you would go on those trips to Downey? Were you dealing with some of these materials processes, or were you looking for the systems sides of things?

LOE: We would have been looking at the systems side. I can't recall any specific changes that were made in the systems because of fire. I'm sure there were some.

BUTLER: It sounded like running the wires differently was one of the concerns.

LOE: Yes. There could have been some of that. From a systems standpoint, whether a wire ran down this side of the spacecraft or whether it ran down that side of the spacecraft, that wouldn't have affected us one way or the other. So I don't recall a lot of changes. Material-wise, like we talked about, there was a lot.

BUTLER: Well, as the program moved back into an operational status, the Saturn V was still being tested during this time frame, but once the command module was back up and running ready to go, there were some unmanned flights with that. Did you man the console for some of these? I think you might have been on console for at least Apollo 6, which was the one that had some interesting booster problems.

LOE: Well, we had the fire, and then we had Apollo 501 and 502, which were S-IC, the first one of the big stack. I don't recall Apollo 6.

BUTLER: Apollo 6, it was the full stack, the Saturn V, and it experienced the problems with the engines where it had some severe pogo problems and then actually two of the engines dropped out among the stages and ended up thrusting backwards and all sorts of interesting little events. I don't recall if you were actually on the console or not during that—probably not, if it's not coming to mind.

LOE: Well, that would have been Apollo. When you said it was the whole stack, it had to be what we called 501 or 502. It obviously had an Apollo designation, but I'm not familiar, I don't recall that.

BUTLER: Sure.

LOE: The first manned one, I guess, was 204. That was the booster number. I guess we called it Apollo 7. That was [Walter M.] Schirra [Jr.], [R. Walter] Cunningham, and [Donn F.] Eisele.

BUTLER: Were you working that mission?

LOE: Yes. I'm not sure, I can't remember what shift I had. John Aaron was our lead EECOM on that one.

No, I wasn't. I wasn't working one. I had taken off of that. Arnie Aldrich came to me one day and said—I guess by that point Dick Glover had gone on. Dick had left, and I think he went to Dryden [Flight Research Center, California]. I had been made section head. Lonely job. I didn't like having my own office back then. I liked sitting around and shooting bull with the guys. I can remember the first day, I was miserable down in that office. I'd go down and sit around with the guys.

But anyway, I mentioned to you a while ago we talked a little bit about SPAN and how somebody had seen a need for the flight controllers to be able to draw on the knowledge and experience of both the engineering people here, the NASA people here in E&D [Engineering and Development Directorate], and also the contractor. So we started this organization called the MER, Mission Evaluation Room, where all these people were brought together.

Then in order to interface the MER—and I'm not even sure it was called the MER back then, but in order to interface this group or all this knowledge with the flight controllers, we put a

thing called SPAN. It was called Spacecraft Analysis. Back in Gemini, SPAN was manned by some very high-level McDonnell Douglas people. But in Apollo, we started manning that with NASA management, flight control management.

They would then go out and task these engineering people with what questions that the flight controller might need to know, like the test history on a certain component, a pump that's acting up. If you wanted to go back and pull up all the test history that this pump had gone through ever since it was built, that request would come back through SPAN. SPAN would evaluate that, and if that seemed like a reasonable thing to ask, then we would pass them on.

Anyway, as you worked your way up in management and you got more and more involved with management duties, you had less and less time available for simulations. So the natural progression was, as you became a manager, you ended up getting off the front room consoles.

But I was working Apollo 7. Arnie Aldrich tagged me one day and said, "Come go with me. We're going over to Kraft's office."

So we went over to Kraft's office, and, by gosh, we're talking about going down around the Moon on Apollo 8. So I remember walking back and telling Arnie, I said, "Arnie, you let me the lead EECOM on Apollo 8, and I won't argue with you anymore about going into SPAN." So he did. I was the EECOM on Apollo 8, but that's why I wasn't on 7. I had broken off to go to 8 and stuff. I was trying to recall why I didn't remember too much about 7, but that's what it was. I was off working Apollo 8.

I was in the control center for 7, and that was one we had some conflict, I guess, between the ground and the control center. Wally Schirra thought he was in charge and Glynn [S.] Lunney said, "No, we're in charge," and Kraft says, "We're in charge." So all that occurred on 7.

I remember, it's funny, John Aaron was our early EECOM on the thing and had worked closer with the crew than any of them. Our main contact with the crew, even on the later lunar

landing missions, was obviously the command module pilot. You had the commander, if I recall this right, and then you had the lunar module pilot, and then the command module pilot. Our guy was the command module pilot because he was the guy responsible for the CSM systems.

But Walt was the command module pilot on Apollo 7. The day they landed, they got recovered, they were in the Atlantic someplace. First phone Walt could get to, he called John and said, "John, I didn't have anything to do with all that stuff that was going on." But none of those guys ever flew again.

BUTLER: Certainly an unfortunate situation.

LOE: Yes. Yes.

BUTLER: Definitely need the whole team working together and not—

LOE: Oh, yes. I can remember the splashdown party was down at a place in Dickinson [Texas]. It's right after you get off—in fact, it's still there, an old rundown motel. If you get off on Highway 517 and you go about a block, on your right there's an old motel there. Why we had picked that place to have our splashdown party, I don't know, but that was—no, that was not the splashdown party. We traditionally had a get-together with the crew when they got back. It would usually take them a few days to a week to get back. But they would always get together with the flight controllers. Many, many times we did it at a place called the Hofbrau Haus, which was in Dickinson. It was across the street from this motel down on Dickinson Bayou. I don't know if they were closed that afternoon or what, but for some reason we were at this motel. I can remember Wally Schirra coming in and Lunney sort of jabbing him a little bit. He said, "Come here, Wally, I want you to meet some ground-based flight directors," and introduced him to some of the other flight directors. Because I think Wally had said something about he was the

“flight director in the sky” or something like that on that mission. But, yes, there was a little tension on that mission.

BUTLER: How in general—not to interrupt, but talking about the interaction between the crew and the flight controllers, this was a unique experience with that. I mean, generally everyone got along pretty well, is that correct? Or were there some smaller incidents that just didn’t—

LOE: There were power plays, I guess that’s what you’d call them, for lack of a better word. I first saw it back at NS-1 at Carnarvon. There was some power plays going on on who was going to run the site. Was the astronaut out there going to run the site or was the CapCom that was out there going to—and the CapCom back then, it’s not like the CapCom in Shuttle today. The CapCom in Shuttle today is an astronaut. Back then the CapComs were flight controllers just out of the Flight Control Division. So there was some political infighting going on as to who was actually going to run the site back then.

BUTLER: How was that one resolved?

LOE: The CapComs from flight control ran the site, and the other guys were there as help, observers, what have you. But there was no doubt the CapCom from Flight Division ran the site.

So there was that way back years ago, and that thing that happened on Apollo 7. But my sense is that Kraft put the word out and said, “This is the way it’s going to be,” and that’s the way it was. I mean, when he spoke, the people listened.

BUTLER: Well, and he and Deke [Donald K.] Slayton obviously worked very closely together from both angles, from the flight controllers as well as the astronaut office.

LOE: Yes, I'm sure they did. Yes. But there was no doubt who was in charge: Chris. Chris was in charge.

BUTLER: Somebody definitely has to be.

LOE: Yes. You bet, yes. Yes.

BUTLER: Well, you talked about Apollo 7 and that you moved off of the console so that you could work Apollo 8, which was obviously a very challenging mission, a very bold step. What were your thoughts when they called you into the office and said, "Hey, let's go to the Moon on this flight"?

LOE: Well, like I say, Arnie and I had walked over to Kraft's office, and we were sitting up in Kraft's office, and we started talking about it. It was just being thrown out. Can anybody give us a good reason why we can't pull this off? From an EECOM standpoint, I couldn't say, "No, we're not ready because of this." So my sense is, we walked away from Chris' office that afternoon with the idea that, yes, we're going to do this unless somebody can come up with a real good reason why we shouldn't or why we can't.

I always thought it's the best mission we ever did. Of course, that's from a CSM standpoint. We did our thing then. We didn't need the lunar module along. Worked very, very close with Bill [William A.] Anders. Bill was the [LM] pilot on this one. He told John Aaron and I both that he named a crater for us on the back. I'll never see it, of course. [Laughs] But Bill was a great guy. Doing that thing at Christmastime, when he read from the Bible, that was—I'm not sure there was a dry eye in the whole control center that night. It was something else.

BUTLER: Certainly very, very moving.

LOE: Yes. Yes. Another thing that was really in our minds that probably didn't get played up in the press, but we beat the Russians. That was a big thing back then, at least in our way of thinking. We even had flags. I think Milt [Milton L.] Windler was our flight director. I think Milt's wife had even made flags. They were red, white, and blue. They were more banners than they were flags. I think they were triangle-shaped, but they had a white "#1" in it, and we were going to wave those on entry day and splashdown, showing that we were number one, we'd beat the Russians and all that. I think somebody talked us out of that, saying, no, we probably shouldn't do that. It wasn't—"politically correct" hadn't been invented back then, but they thought that wasn't the thing to do. So we waved American flags. I don't think we ever waved our "#1" banners. But that was in a lot our minds, just to know that we'd been in a race and we had beat them.

BUTLER: How much pressure had you felt from the Russians? I mean, how much were you aware of what they were doing, and how strongly did you feel that push to beat them?

LOE: My sense is we were very much aware of what they were doing, or at least aware of what they were announcing they were doing. There was no pressure, but my sense also is that everybody on that team wanted to beat them. I'm not sure it's anything anybody ever talked about, but I think it was there. At least in my mind it was.

BUTLER: Internal awareness.

LOE: Yes. Because I can remember one splashdown party, and I guess it was Apollo 8, we had moved from the Singing Wheel to over at the Flintlock, but I think it must have been John

Aaron, John and myself were standing downstairs, just standing looking out the window and hadn't even gone upstairs. Somebody came by and said, "What are you guys doing? Why aren't you upstairs?"

We said, "We're just standing here thinking how proud we are to be Americans."

So it was something at least I think we all felt in the back of our mind. There was no pressure or anything like that, though. I can't recall any of the bosses ever saying we've got to do this by such and such a time because the Russians are moving ahead, or anything like that. It was just something we felt we wanted to do, and we're proud to have done it.

BUTLER: Certainly something to be very proud of.

LOE: Yes, we were.

BUTLER: How much were you aware of at this time of events that were going on in the rest of the world? 1968 was a very turbulent year, and here Apollo 8 was a very good ending for it, very positive. But were you so caught up in the job that you weren't as tuned in to what was going on, or was that a motivating factor for you?

LOE: It wasn't a factor. You knew it was going on. I read some point Steve [Stephen G.] Bales had said that he recalled going over from the control center to Building One at one point and seeing a little group of hippies or something out around the duck ponds. I don't know if they were protesting or just singing songs or whatever. I don't recall ever seeing any of that.

But you were aware that the protests were going on, because we watched the news at night. But, I mean, I was then and still am a staunch conservative, voted for Barry Goldwater. Gerry [Gerald D.] Griffin, who later became center director, Gerry was a CSM GNC and we had become very good friends. Gerry's twin brother, Larry, was a forward air controller in Vietnam.

Larry's wife, Judy, was living here in Clear Lake and pregnant at the time. Larry is a very, very good writer, and Larry would write letters home to Judy, and then I can remember getting together over at the Griffin's house and reading Larry's letters telling us all about the war or his version of the war, what he saw.

So we were aware it was going on. We were aware there were protests, but we pretty much just sort of had our blinders on, doing our own thing, I guess is the way I'd describe it.

BUTLER: Well, you certainly had an important job to be doing.

LOE: Yes.

BUTLER: You mentioned on Apollo 8 the reading from Genesis. But what were your thoughts when they went behind the Moon for the first time and you were waiting for that burn for them enter lunar orbit? Was that a nervous time or was that—

LOE: Yes.

BUTLER: Were you pretty—

LOE: It was a nervous time, although very, very confident that we were going to pull it off, but you sure wanted to see that spacecraft come out on time. So, yes, it was nervous, but also very confident that everything was going to work right.

BUTLER: It certainly did.

LOE: Yes, it did.

BUTLER: It all went very well.

LOE: Yes.

BUTLER: Well, with the success of Apollo 8 and by this time the lunar module was then ready to fly. So Apollo 9 was a test of both spacecraft in Earth orbit. Did you also work the console for this one before moving completely into the SPAN room?

LOE: Yes, I did. I got to work Apollo 9 also.

BUTLER: Were you able to convince Arnie Aldrich to let you stay there a little longer or was there other reasonings behind that?

LOE: Nothing special. I mean, it may have just been we didn't have anybody yet trained to take over. I think Sy [Seymour] Liebergot sat with me on Apollo 8. I can't remember now who our EECOMs were on 9, but I was there, Charlie [Charles L.] Dumis. I don't recall why I worked 9 and why I didn't go immediately to SPAN, but it was either we didn't have enough people or I talked to Arnie into one more time or something, I don't know.

BUTLER: Well, do you have any particular memories from Apollo 9? Were there any new challenges? I know there were two separate consoles for manning the two separate spacecraft, but did that present any new difficulties?

LOE: Yes, because of the communications with the two spacecraft. I had talked about how the Crew Systems people used to sit with the EECOM back on early Geminis. I think on Apollo 8,

because of the unknowns about communicating at lunar distances and stuff, I believe we moved our instrumentation and communications folks out front also. I seem to recall Dick [Richard T.] Brown. Dick was a Rockwell guy. I want to say Dick Brown was sitting out with there me on 8, although I can recall Sy being out there too.

But anyway, Apollo 9, the big challenge that we had there in the control center and brought about one of the changes, was interplay of the two communication systems. Somehow out of all that came the INCOs [Instrumentation and Communications], which we then lumped both communications system into one and made a whole new position in the control center, and one person then took care of both of them.

Boy, I can't tell you when that happened, because I'm sure we started recognizing the need for it on Apollo 9, but we still had, at least from the CSM standpoint, we still had our communications and instrumentation people sitting out there with us. My sense is they were out there for Apollo 12. People talk about fate; we had absolutely the two best guys sitting there on Apollo 12. That's the one that got hit by lightning, by the way, kicked the fuel cells offline.

The two guys sitting there, John Aaron was the most knowledgeable EECOM in that area, and sitting next to John was Dick Brown, who was the most knowledgeable of anybody in that instrumentation area. But between those two guys, they recognized that we had lost our insight. I never will forget the call that they—it was SCE AUX. SCE was Signal Conditioning Equipment, and we had a switch that probably was labeled primary. Another one was auxiliary. They made that call, which I heard Gerry [Griffin] say, "I had no idea what they were going to do," but what that did, it got the signal condition equipment back on line so now they could see what they had and see what it was.

But anyway, my sense is that we still had our half of the INCO sitting out there next to the EECOM on 12. So when we combined the two, I don't know. I don't know. But all that started, the sense that we needed to do something like that, I think started with Apollo 9, we because that was the first time we had the two spacecraft out and working together.

BUTLER: Well, it would certainly take time to build that capability into the center.

Well, at this point you were beginning to move into the SPAN room then.

LOE: Yes.

BUTLER: Actually, before we go into that, I think we'll take a quick break and change out the tape.

LOE: Okay.

BUTLER: Well, we've now talked through your experiences on the console at Apollo, but you were moving into the SPAN room at this point. As you said, you were moving into a more management role already. You had moved into a section chief position and that the management role took more time, more duties, that you couldn't spend as much time on simulations. What were some of those extra duties that you had as a section chief, actually, before you even moved into the SPAN room?

LOE: Various employee paperwork that goes with employee evaluations. I can't remember what all was required, but then you were also required, of course, to look at everybody in your section or in your branch and evaluate them on how they were doing. You can do that out on the console. You sit back in the back room, maybe watching some of the guys back there run sims and what have you. So, just overall supervisory kind of duties that took time and didn't allow you to run the sims.

BUTLER: Well, as you did move into the SPAN room then, which when you were in there by Apollo 10 then, since you said you worked console for 9, explain to us the difference. You said that the personnel in the SPAN room were the interface between the mission controllers and the engineers and the mission evaluation room. If you could explain how the process worked. The controllers would call you with an issue, and you would then evaluate it to a certain extent before sending it on to the engineers, is that correct? Or would you just identify who that that would need to be passed on to?

LOE: No, we would evaluate it. You might get a request from a controller that we thought was just totally uncalled for, that was going to crank up maybe too much effort and too much expense maybe on the contractor's part, that maybe had nothing to do with really what we thought the problem was.

Some guys, we caught some people trying to—they would try and try and try to get a piece of data out of the contractor and for whatever reason they weren't able to. This would be preflight. Then be on the console, and now that they had SPAN going for them, they could resubmit this request and hopefully get it or force the answer out in real time. You wouldn't let stuff like that go on. But, yes, you'd try to evaluate the answers and maybe evaluate the questions, reword the question maybe, to make it more clear, maybe combine it with somebody else's question that you knew was in the works, and then just give it an overall management blessing before it got passed on to the engineering folks or the contractors.

BUTLER: This was obviously for things that were of a longer time frame, not for quick problems that needed quick solutions.

LOE: Right. Right.

BUTLER: What are some examples of issues that you would work with in the SPAN room from some of the later Apollo missions? Obviously Apollo 13 probably had quite a few, but maybe some of the other ones.

LOE: I'm drawing a blank right now. We'll have to go back to that one, I guess.

BUTLER: Maybe as we talk about the various missions, things will come up.

LOE: Okay.

BUTLER: For Apollo 10, that would be the first one, they took the command module, lunar module into lunar orbit and did a dress rehearsal for the landing, did everything except for land itself. In fact, they did experience a problem. This was probably more of a short-term problem, where as they were separating the ascent and descent modules, as they were separating to rendezvous with the command module, they had some gyrations. I believe a switch was in the wrong position, which prompted an interesting response from the crew members that brought some questions. That was very quickly resolved and they went up and docked, but do you remember any other incidents or anything from Apollo 10 in particular? I think they were pretty noneventful.

LOE: Yes. No, I don't. I don't recall.

BUTLER: Well, Apollo 11, obviously the big mission for landing on the Moon for the first time. As you said, from your standpoint Apollo 8 was a big deal because you beat the Russians to the Moon and that was the big challenge there. But to actually land on the Moon, they did experience some computer alarms during the landing, which they cleared and were handling.

But after they landed, there was a blocked fuel line with, I believe, a frozen plug or something that was looked at for a while. Do you recall if that was something that came through the SPAN room at all or maybe after they landed, if they talked about the computer alarms at all?

LOE: No. Even in SPAN, we were broken into CSM and LM.

BUTLER: Oh, okay.

LOE: So you had one person that was like FOD [Flight Operations Directorate], or whatever we were called back then, head, and then you had a CSM person and a LM person. So I wouldn't have been very familiar with any of the LM problems that they might be working, unless I just overheard them and was curious. But, no, I don't recall anything about a fuel line.

BUTLER: How many people were in the SPAN during a mission? You mentioned the division there.

LOE: There would be an FOD. At the consoles, anyway, there would be an FOD head. He'd have a CSM person. I'm recalling the room now. The CSM person was on the right console. The consoles run this way. CSM person was on the right, the LM people were down on the left here. We had North American people that worked in the CSM area and we had Grumman people that worked in the LM area, and on at least one shift, our Rockwell leader would be there. Bill [L. William] Blair was his name. So that would be the FCD [Flight Control Division] folks.

Then there was a secretary that sat by the door that was provided by the Apollo Program Office. Then there would be a table back behind the consoles here. At the table would be Aaron Cohen or somebody. I remember many missions Aaron being there, because he was head of the Apollo Program Office. So Aaron would be back there. He would have a very high-ranking

Rockwell person or North American person back there. Aaron's counterpart in the lunar module program would be back there, and his Grumman help.

So we're talking about one, two, three, maybe five or six FCD people at the console and probably another five or six program office people sitting back at the table, at least one secretary, and then a runner that would take the chits. Once we filled out a chit that asked the question, it would get logged in and then taken over to at that time by then I guess MER was in Building 45, be taken over to the MER, and they'd do their thing with it over there. Had guys like Don [Donald D.] Arabian and Joe [Joseph E.] Mechelay were over in the MER.

BUTLER: You mentioned the consoles. Was it one row of consoles—

LOE: In the SPAN, yes. And the CSM probably had two tubes to look at and the LM probably had two tubes, and then probably the FOD manager had a couple of tubes to look at. So probably six tubes across there.

BUTLER: Did you have the capability to look at whatever telemetry that you needed to?

LOE: Yes.

BUTLER: You could switch when you needed to?

LOE: Yes.

BUTLER: What communication did you have in the SPAN with the flight controllers? Could you talk to which ever ones you needed to?

LOE: Yes. We had all the loops, including the flight director's loop. But that was very, very rare that SPAN ever talked to the flight director, because he was getting all his inputs from the EECOMs and GNCs and what have you. But, yes, we had all the loops, had monitor on the air-to-ground loops, just like everybody else in the control center, only the CapComs had talk on their air to ground. But, yes, we had every loop in the building that we wanted.

BUTLER: Did you run any simulations from the SPAN? Were you there—was anyone there—during simulations runs?

LOE: Occasionally, yes, we would call up the—this may have happened on Shuttle later on and not so much on Apollo, but, yes, occasionally you would call up the entire team, including the E&D folks and the contractors, and run a simulation. But like I say, I bet that was more Shuttle and we may not have done that on Apollo. SPAN never participated in ascent or entry simulations, just because they were so dynamic you didn't have time to—

BUTLER: Sure.

LOE: Nobody needed to be calling SPAN during that anyway.

BUTLER: Right.

LOE: But it made a great place for us as managers to go plug in and listen to the operation and see what's going on and evaluate the troops, because we had all their lines we could hear what they were talking to their back rooms about. It was a good way to eavesdrop on them, and we had their displays to look at, and you could sort of evaluate how their thought process was going.

Because one of the hardest things when we were moving into SPAN was that you would be sitting in the back room and you could see a problem being worked and you could just tell that the guy out on the console was working this problem in a different way than you would. You're probably both going to arrive at the same answer, but you were going about it a different way. I can recall that being frustrating the first time or two that I sensed that was going on. But that was a little different life back there.

BUTLER: Yes. Very different. But still an important role to fill.

LOE: Yes. Yes.

BUTLER: Well, on Apollo 11, did you have any thoughts as you were watching the landing?

LOE: I must have been on the console in SPAN for the landing, although something tells me I wasn't. I was in the control center. John Aaron was the EECOM, and Kranz was flight director.

After we were down, and I guess that team got off, I can recall John and Kranz and I going to eat. I can't even tell you the name of the restaurant, but my sense is it's right in Clear Lake City [Texas] close to where the Coliseum [restaurant] is now. Maybe it was the Coliseum. Anyway, we went there and ate, and then went back to the control center for the first EVA.

We had a room up above the lobby in Building 30. You had the admin wing and then the MCC wing, and then that lobby that goes across. Well, on the third floor above there, there was a bunk room. We had bunk beds, showers. The theory was back in some of the early days, guys wouldn't go home; they'd just stay out there. You could even go to the medics and tell them that you were off shift and having trouble sleeping, and they'd give you a nice little bottle of brandy to take up to the room with you. But we had nice easy chairs and TVs and stuff up there to just

supposedly help you relax and stuff. But I can remember going up there and watching the EVAs or at least the start of it.

My sense is that I went on home at some point, because I must have had to come back into work early the next morning or something. But, yes, I went up there and watched the EVA. Went out to eat after the landing and went up there and watched the EVA and then on home. That's funny. That's about what I can recall of the thing.

Of course, the CSM was just humming along and we weren't having any problems at all, so we were pretty much just sitting back and watching it.

BUTLER: As you said, Apollo 8 was a big mission for you, and that was a little more memorable.

LOE: That's right. I love telling the LM guys that, that we had really done our thing.

BUTLER: That's right. Well, going on to Apollo 12, you talked about that briefly earlier, how it was struck by lightening during launch. Obviously that was a launch situation where nothing was sent back to the SPAN at that point in time, but once they got into orbit, the spacecraft did need to be evaluated to see if everything was still good for the mission.

LOE: My sense was that that was the first mission, now that I think on it, I bet you that was the first mission I had not been in the control center somewhere for launch. Because I think I was home. I think I was watching that on ascent on commercial TV, and, of course, couldn't hear what was going on in the back rooms or in the flight directorate or anything, but just hearing what was on TV. So I think that was probably the first one I just decided, well, this is going pretty good. I'll stay home for this one.

BUTLER: Surprise, surprise.

LOE: Yes.

BUTLER: Well, did you get a call later informing you as to everything that had gone on?

LOE: No, I don't think so. Folks didn't usually call unless they needed you to come in. I'm sure I was due in for the next shift or something like that, so, yes, I was probably in there within a few hours anyway.

BUTLER: What I way to find out.

LOE: Yes. Well, I did get to see it on TV.

BUTLER: Yes. Well, that's good. Well, everything did go well with Apollo 12, despite the lightning.

LOE: Yes.

BUTLER: Apollo 13, however, was a different story, which did involve everyone at the center.

LOE: That one I did get called, yes.

BUTLER: Were you at home when they—

LOE: We were actually bowling. We were in a mixed league, my wife Tina and I, had been bowling and came home, and the babysitter said, “You had a call from the control center. They said for you to call.”

I called out there, and I think the CSM guy talked to the guy that was on the console there, was Larry [Lawrence S.] Canin. Larry filled me in a little bit on what had happened. My sense is, I changed clothes. I maybe even showered. Tina put some coffee on. I can remember her walking up to the car with me and saying, “Is everything going to be all right?”

It’s funny, there was absolutely no doubt in my mind that—and maybe I just wasn’t smart enough to realize how much trouble we were in, but I remember telling her, “Absolutely. This is a piece of cake. Yes, we’ll get them back easy.”

My whole sense of Apollo 13 was that there was never any doubt that we could pull it off and get those guys back. So for that reason, I’ve thought that the movies and the books have all been a little overdramatic. My sense was—and here again, maybe I couldn’t even see the forest for the trees or whatever, maybe I couldn’t see the big picture, but my sense was that it was just an everyday go-to-work thing and we were out there doing our job. Like I say, I never had any doubts that we were going to get those guys back.

We did change our operation a little bit. We pulled together an offline team that John Aaron went off to work on, doing all this LM power-down and all the survival stuff that we had to do in the CSM. One of the things that kept in my mind, and I’ve told some people that here since then, we had gone through so many of those scenarios back on Apollo 8 on what happens if you get out there and you lose oxygen or something and we don’t have a LM to count on. So my sense was we had in our back pocket an awful lot of the things that ended up being done, because we had talked about them, planned some of them during Apollo 8. So that was probably one of the things that I had in the back of my mind, telling everybody not to worry, or at least telling my wife not to worry.

But we had the offline team working that, and the online teams were just doing the day-to-day following the spacecraft and making sure nothing else got any worse. So rather than having three teams like we normally did doing eight-hour shifts, we went to two twelves and had the offline guys go off and do their thing.

Then we did the same thing in SPAN. We took one whole SPAN team and dedicated it to the offline guys and said, “Hey, look, if you’ve got any questions that you need to fire in, funnel all those through here,” and some of us stayed in with the spacecraft and helped out the guys that were in the control center watching the ongoing mission.

BUTLER: Did you stay in the active then with the spacecraft?

LOE: Yes, I stayed in the active. I’m guessing maybe Arnie went off to work with the online bunch, I’m not sure. The SPAN guys back then probably would have been—although I mentioned Larry Canin, but I was thinking it would be Arnie and Neil [B.] Hutchinson and myself, but maybe not. Maybe Arnie wasn’t even working the mission or something. I don’t know. I don’t recall.

BUTLER: I’m sure we can check that in the manning lists.

During Apollo 13, did you stay there at the bunkrooms that were available, or did you go home occasionally, or do you even recall?

LOE: No, I never stayed at the bunkrooms. I’d go up there and unwind a lot after getting off consoles, but I always went home. I never figured anybody was going to need me that quick that they’d have to come wake me up in the middle of the night there, that they couldn’t reach me at home. Home was thirty, twenty minutes away, maybe. No, I never stayed there.

BUTLER: Do you recall any particular events during Apollo 13 that you worked specifically, any of the issues? There were so many.

LOE: There were. No, I don't recall any specifics. We worked a lot of them about charging batteries and powering down and powering up and things getting so cold, but, no, I don't recall any specifics.

BUTLER: I'm sure you were involved with parts of all of everything that was going on and there was so much that needed to be looked at. But it did all go well. The crew did come back or were able to get the crew back, so your confidence there panned out.

After that time frame, obviously a little bit of time was spent investigating what had happened and if anything should change for future missions. Do you recall if there were any particular changes that affected the areas that you worked in, at least?

LOE: I think we quit stirring the cryos [cryogenics] or at least the oxygen. The cryogenics had a funny way. We learned early on in Gemini that they would stratify and get different layers of different densities and different temperatures. Then when they would destratify, they could absolutely look like the tank had gone totally empty on you. It'd just wipe out the instrumentation system that was measuring the quantities and the pressures, too. So we had fans on board in the tanks that would actually stir up the cryos and try to keep them a homogenous mixture all the way through the tank, because when you turn the heaters on, the heater would, of course, heat up the cryo that was right next to the heater element. That's the way you maintain pressure in the take. You'd heat it up. But then when you're in zero G, you don't have the normal thermal flow going for you, so you had these fans that you'd stir the stuff up and hopefully get it homogenous all over the tank.

Well, that's what happened on 13, was that something, and I can't recall now what, got into that heater or got into the fan, I think it was. Something got loose in the tank, got into the fan, and that's what caused the explosion. So I'm think we stopped stirring. I can't remember what else we might have done. I don't recall any big design changes, but there sure may have been. There probably was some external-internal design changes this those tanks, but I don't recall what they were.

BUTLER: Well, the program did move right along into Apollo 14, after a little bit of time to make a few major changes and find out what had happened.

LOE: We did then what we probably should have done after *Challenger*; we should have gotten right back up and flown it again.

BUTLER: Apollo 14 went pretty well, although they did have a few problems, that actually probably one of them that came through the SPAN room at least in your area. They had problems docking at first after they had gotten up into orbit and went to turn the command module around and retrieve the lunar model. They had a docking problem there and had to work through that. Were you at all involved with that discussion?

LOE: Yes. I don't remember a lot of details, but I can remember Larry [Lawrence G.] Williams—I think Larry was the docking guru, and I can remember Larry bringing a docking probe in the SPAN room and demonstrating to all the managers how this thing worked and it's supposed to work and speculating on what maybe was the problem and stuff. I don't recall many specifics about it, but I can remember Larry in there with his docking probe.

BUTLER: Sure. I think the ultimate solution was keep trying, hit it a little harder and—

LOE: Yes. I think you're right.

BUTLER: —hold it together.

LOE: Yes.

BUTLER: Although I think in his book, Alan [B.] Shepard [Jr.] mentions he was ready to go out and pull the spacecraft together. It probably wouldn't have worked too well. [Laughter]

Well Apollo 14 had a few other—as it was landing, it had, in the lunar module though, they had abort button problem and actually I believe a radar problem as well. That probably wouldn't have fallen into your area—

LOE: No.

BUTLER: —since it was lunar module. The rest of the Apollo 14 went pretty well then.

Moving on in our research, in our listings, we didn't find you listed on the SPAN listing for Apollo 15 and 16. Is that inaccurate, or do you recall if you worked those missions? I know the lists we have were published some days before the mission, so sometimes they were changed.

LOE: The manning lists?

BUTLER: Yes.

LOE: Yes. Yes, I'm sure I was. Some of us may have been off working Skylab by then. But I'm sure I was. In fact, I just ran across a whole bunch of temporary badges from one of those

missions. We'd have temporary badges made up. I'd probably get a dozen of them or so each mission. What we'd use them for was guys out at the MER, if we wanted to bring them over to talk to the controllers or talk to us, then we'd send a temporary badge down to the lobby and get them badged to come on up. I just ran across a bunch of those that somehow ended up in my desk, and it ended up coming home with me when I retired. So, yes, I'm sure I was around for 15 and 16. It may not have been on the manning list.

BUTLER: Okay. Well, on 16 they had a problem with the engine on the service module. I think it was a gimbal problem before they went down to the lunar surface after they had undocked though, Ken [Thomas K.] Mattingly [II] was testing the system and found an error there. Do you recall that particular incident?

LOE: Just vaguely. I don't recall any specifics about it.

BUTLER: Okay. I know they did ultimately resolve it, and it was a problem with the backup system, I believe, and they resolved that and went on to have a good mission for both 15 and 16. Both went well. And Apollo 17 was pretty error-free.

LOE: Yes.

BUTLER: But it was the end of the Apollo Program. Did you have any thoughts on the program coming to a close, or were you ready to move on to Skylab and Shuttle?

LOE: Yes, I don't recall any sadness or anything that Apollo was coming to a close. I'm sure it's just like that's the way things are supposed to work, because that's the way Gemini had worked

and that's the way we heard that Mercury had worked. So it was time to finish this program and go on to another one.

We were heavily involved in Skylab by that time. In fact, I guess I had the branch by then. I had Arnie's. Arnie had left. Getting ready for Skylab, at some point I was made Carl [B.] Shelley's deputy branch chief.

BUTLER: Is that in the CSM?

LOE: No, Carl had an Experiments Branch. It was called Space Science and Technology Branch. I was Carl's deputy. So maybe that would explain why I wasn't around on 15 or 16 or 17. Maybe. I'm not sure.

But anyway, we were getting ready to fly Skylab and all the Skylab experiments, and we were preparing systems handbooks, mission rules, all that sort of stuff for all these experiments, ATM [Apollo Telescope Mount] experiments and the medical experiments.

Then at some point Arnie decided to go. Arnie took a job over in the—I guess in the Skylab Program Office. I came back then to systems. I left the Experiment Branch and came back to the systems area and took the CSM Branch, which at that point was also included the Saturn workshop, which was the total Skylab stack. The guys that were working on LM, most of those guys went off to their experiment world. We had ATM experiments, had medical experiments, and what they call corollary experiments. A lot of the LM guys went off into, I guess, all those worlds. I was Carl's deputy for a while and then went back over and took over the Systems Branch. So I was there for—I want to say I was back in the systems area for the last of Apollo and, of course, all through Skylab.

BUTLER: While you were Carl Shelley's deputy, you said you were working in the experiments, working on developing systems handbooks, mission rules, that was obviously a very different

process than what you had been doing for the Apollo missions, for the Gemini missions. The experiments are a lot more detailed, longer duration. What were some of the differences in planning for those Skylab experiments?

LOE: Well, the handbooks and the mission rules and everything were exactly like what we had gone through in Gemini and Apollo. I think that's why Kranz wanted me to go do that, because I had all that experience, or at least that's the way we approached it, that we would treat an ATM telescope, an X-ray telescope, for instance, we'd treat it just like another system on the spacecraft. We'd write our rules and procedures and draw our schematics and everything, just like it was another system. So that's sort of the way we approached that. All that fit in very well, I thought.

BUTLER: Did you work with any of the primary investigators on these experiments while you were developing these rules and handbooks?

LOE: Our guys did, yes. Yes, our guys did. Here again, we would have contractor support like we'd had all through Gemini and Apollo where we'd have McDonnell and North American people. We had people from Ball Brothers and Naval Research Lab that would come down, and they were our, quote, "experts" on these various instruments. Then, yes, the PIs [Principal Investigators] would come down occasionally and we'd get to meet them, work with them. Our guys worked with them a lot. Carl and I didn't too much, but the guys did a lot, yes.

BUTLER: The experiments, it was all decided beforehand which they were. You didn't have any involvement in the selection of them, is that correct?

LOE: No. No.

BUTLER: Just the planning on how they were going to be done.

LOE: Yes.

BUTLER: At this point was there discussion on time lines at that point as well for the larger mission as a whole, or was this still more just the initial planning for how the experiments would be done on the—

LOE: My sense is that, yes, that we were starting to time-line some of that stuff, at least in a gross sense, saying we'll allocate this many hours per day on ATMs and this much on whatever. But, yes, my sense is there was some of that going on.

BUTLER: Okay. When you moved back then to the Systems Branch that then now included the Saturn workshop, did that also include the simulators for the workshop?

LOE: No.

BUTLER: Okay.

LOE: No, that was a different organization back then. They had the sim guys, and then we had the—yes, they were a separate organization.

BUTLER: Okay.

LOE: I'm trying to think if we were even tied together at the top. I guess, yes, we were. Yes.

BUTLER: So you were just dealing primarily with still the systems of command module and then system within the Sky—

LOE: In the center workshop.

BUTLER: Okay. What were some of the differences with those systems? Here now you're looking for long-duration flight, obviously very different than what you'd been doing for the orbital missions. Even Apollo, even though some of them were longer duration, they were still very short in comparison. What were some of the systems' differences to be able to maintain those longer-duration flights?

LOE: Well, of course, we didn't have fuel cells; we had solar arrays. Had solar arrays on the center workshop and solar arrays on the ATM. We had coolant loops on each, on the ATM and also on the workshop. We had a refrigeration loop that maintained our refrigeration equipment. Housekeeping equipment, showers, kitchens, a lot of new stuff like that that we had not really worried about in the past. It was all brand new.

No more cryos. We still had them on the CSM, of course, but not on the workshop. Had a mixed gas atmosphere. I guess we had gotten away from the oxygen that we had at the time of the fire, so we had a mixed gas atmosphere and controllers that controlled the amount of nitrogen that you had in the air and stuff. Yes, there was some new—Skylab was an interesting, really interesting project from the EECOM standpoint because of those different kinds of—it was becoming more and more like the house you lived in, rather than a spacecraft.

BUTLER: They certainly were going to be living for a while, so you want it to be comfortable.

LOE: Right.

BUTLER: Do you recall any of these new systems being particularly challenging during that process of development, any of them causing any particular or having any particular problems?

LOE: No, I don't recall anything during the development phase.

BUTLER: Or even during missions.

LOE: At least specifically. We spent an awful lot of time going back and forth to Marshall. Of course Marshall Space Flight Center [Huntsville, Alabama] was building the Saturn workshop and the ATM. The engineering folks here at JSC were totally not involved in it. Boy, if you had a question of a simulation like the MER, you had to go to Marshall to get that information on Skylab.

So we spent an awful lot of time going back and forth to Marshall on various reviews, whereas on Apollo you could walk across the campus to a meeting. Here you had to go get on an airplane and go to Marshall for the meetings. Even had a charter plane, an old Lockheed Electra that would go out to Marshall twice a week, I think it was. Flew out of Ellington and into the Redstone Arsenal up there that we used, and of course the Marshall guys used coming this way.

Then when we got ready to fly, what used to be SPAN now became the FOMR, the Flying Operations Management Room. We had it broken down similar to what SPAN did. We had the flight control people all on the consoles. We had a FOMR manager. Then I guess we had FOMR systems that sat over here, and we had a FOMR experiments guy, which was also a flight control guy, that sat over here. Then we had, rather than having Apollo Program Office people behind us at the table, we had Marshall people back there.

So, yes, a lot of the Marshall folks came here for the duration. We became very, very good friends with a bunch of them. I've got guys I still run around with and play golf with that I met because they were here working in the FOMRs.

BUTLER: That's good.

LOE: Yes.

BUTLER: How was that relationship between Johnson Space Center people and Marshall Space Center people? Did it start out that well?

LOE: It got very strained. Here again, it was almost one of these "who's in charge" things. The JSC guys, I think our sense was "We're the flight controllers and we're going to fly it, and if we need your help, we'll ask for it." The Marshall folks, understandably said, "Hey, we built it, we designed it, we know more about it than anybody else, and we'll make our inputs into it." They weren't against if we wouldn't take their inputs, they'd go to Headquarters and try to bring them down the other way. There was a lot of that.

But we had a remarkably good bunch in the FOMR. I think everybody really got along good, and no lasting enemies. We had our differences for a while, but it was a good time. Everybody worked well together. A few rough edges.

BUTLER: The team came together.

LOE: Yes.

BUTLER: Well, as the Skylab then began the missions, the launch obviously was a challenge. Several things went wrong on that.

LOE: Oh, yes, the wing tore off.

BUTLER: Were you in the FOMR at that point during the launch or actually even during the missions?

LOE: Yes.

BUTLER: Did you still have an active role there?

LOE: I stayed in the FOMR the whole time. I can't tell you if I was in there for the launch when the wing came off or not. I just can't recall.

BUTLER: Once the launch problems were identified, whether you were in the FOMR or working other duties, do you recall what your involvement was with figuring out to help fix the problem, or was that pretty much done through other areas since they knew that it was reengineering basically had to be done?

LOE: No. I can recall some of the various EVA tools that were developed and gone over, and helping evaluate those things, watching guys try to cut through what we thought was holding that one wing that hadn't deployed. Not any real specifics, though, but I know we stayed—

BUTLER: It involved—

LOE: —stayed awful busy getting that thing finally settled down and habitable.

BUTLER: Do you recall as the crew got up there and began working and trying to fix it, do you recall that experience?

LOE: I think that was [Charles “Pete”] Conrad [Jr.] and [Joseph P.] Kerwin.

BUTLER: Yes.

LOE: Was that P.J. Weitz on that one?

BUTLER: Yes.

LOE: Okay. No specifics. Just way in the back of my mind I can remember the EVA and hearing Pete. When he finally got it loose, I think he let out a big yell or something.

BUTLER: [Laughs] Sounds about right.

LOE: Yes.

BUTLER: Well, as the three missions were up and running, the first one, once they got everything working again, once they got the fixes done, things went pretty well, although there were some I believe gyroscope problems along the way.

LOE: The CMGs [control moment gyros], yes.

BUTLER: A few other systems began to have problems throughout the program. I think by the end they were having problems with the dehumidifier and things.

LOE: Yes.

BUTLER: Do you remember any of the various problems they experienced and some of the effects of those?

LOE: No, I don't recall any specifics. We stayed awful busy, not only working with Marshall, and just the distance made it harder than having somebody over in the MER.

BUTLER: Sure.

LOE: But Skylab was so massive, there were so many systems onboard that it was—because you also had a CSM, don't forget, still attached to the thing, so any problems that came up with it had to be worked, but I can't remember any CSM problems during all of Skylab. That's amazing.

BUTLER: I think there was one where they had some thrusters that began leaking and actually even talked whether they would need to send up a rescue crew. It was on the second mission. There was leaks in a couple of thrusters and they ended up just turning them off and with the amount of time it would have taken to get the rescue crew turned around, it would have been close to when they would have been coming down anyway.

LOE: Okay. That vaguely rings a bell.

BUTLER: That's the only one that I specifically remember—

LOE: Okay.

BUTLER: —for the command module.

LOE: But on Skylab, the thing was so massive and so many systems, it seems like it was always something. It was a fun mission to work. But I can't recall any specifics.

I can recall one morning we were undocking and we lost our refrigeration loop, I think. I can't remember now if we got it back or we worked our way around it or something, but I just remember the refrigeration loop going down. Because that happened by the time I was on my way into work and I had just gotten in and somebody said that, I remember, "We just lost our refrigeration loop."

On Skylab we went to—the guys, somebody went off and studied how oil companies shifted. We came up with a scheme whereby you would work seven days on. If I recall this right, if you were coming off days, you got a day off and then you went to midnights. I guess then you went to evenings, and then you worked the like four to midnight shift and you'd work seven days on. Then I think you got two days off. Then you went into midnights, working midnight to eight. After you came off midnights, then you got four days off before you went back to the day shift.

So Skylab was different than Apollo in that way in that you weren't—in Apollo and all the other missions we'd ever worked, you were always handing over to somebody that you had just—you had just left the console sixteen hours ago at the most when you came back in to catch up. Here on Skylab, you'd be off for days and you'd come in and you'd have to read through the log and catch up with what was going on.

So that was a big difference, trying to stay abreast of the whole thing. You almost had to force yourself to get out of the office and leave. On your four days off, you didn't want to be going over in the office and stuff.

BUTLER: Right.

LOE: We bought a boat and a camper, and we did a lot of camping during that time.

BUTLER: Well, that's good.

LOE: Yes.

BUTLER: A good way to relax.

LOE: Yes.

BUTLER: The individuals then in the FOMR and the Mission Evaluation Room, did they follow that same rotation schedule then?

LOE: Yes, yes. In fact, we put the FOMR guys on the same shift as the flight control teams. In other words, we called the EECOM EGIL back then. We changed his name to EGIL. That was Electrical, General Instrumentation and Life support, I think was what that stood for. GNC was now called GNS [Guidance Navigation Systems], because we still had EECOMs and GNCs that were taking care of the CSM.

But the FOMR team followed the other team, so we'd work with the same flight director, same EGIL, same GNS for the whole time.

BUTLER: Must have been challenging adjusting your body to that kind of a schedule.

LOE: It wasn't as bad as I had imagined it was going to be. I always tried to just totally change things around. Like when I got off work, the only place we found you could get a beer at eight o'clock in the morning was the coffee shop at the Ramada Inn, which was across the street. So quite often we'd get off shift and go over there. It'd be like going to the Singing Wheel or something after we got off normal shift we'd go over there. Get some strange looks from—

BUTLER: [Laughs] I bet.

LOE: —the patrons in the place, but go over there and have a few beer and unwind and go home and take care of whatever chores you had around there and then try to go to sleep. But that's the way that helped me get through is trying to get on a schedule like that.

BUTLER: As long as you found something that worked for you there.

LOE: That's right, yes. Yes, I never had any trouble sleeping during the day. I was one of the lucky ones. Some people did. Some people really found that hard to do.

BUTLER: Certainly get turned in to the light and dark schedule—

LOE: Yes.

BUTLER: —and it can throw you off.

LOE: Yes, I think my wife put up dark curtains or something. We could keep the house pretty dark.

BUTLER: The last Skylab crew experienced some difficulty. The first one had had all the recovery from the launch—

LOE: Yes.

BUTLER: —to deal with. The second crew had had more time, they had been able to adapt and get a lot done while up on orbit. The last crew, since they were going to be up longer, had even more tasks. They had some difficulties since they were still adapting to working in space but then trying to do their tasks, so there was some conflict that grew between the crew and the flight controllers. Do you recall that situation?

LOE: No, I don't recall any specifics. Now that you mention it, just in the background I can say, yes, I can recall some of that going on, but I don't recall any specifics about it.

BUTLER: It probably didn't affect too much. It wasn't something they could send to you all to find an engineering fix for.

LOE: Right.

BUTLER: They did eventually resolve that and work it out, a good schedule that worked for everybody. All three missions were very successful ultimately.

LOE: Yes.

BUTLER: Skylab went very well.

Well, at this point I think we're probably at a good point to stop before moving into your work with Shuttle, unless there's any particular areas that we haven't touched on from when you were working on any of these early programs or even the transition.

Oh, we didn't talk about Apollo Soyuz. I don't how much you were involved in that.

LOE: Oh, yes, that came along way at the end of Skylab, about '75.

BUTLER: I think at this point you were now chief of the Electrical Environmental Systems Branch.

LOE: Had we split them up by then? Okay.

BUTLER: Apollo Soyuz [Test Project, ASTP] was '75, so I think.

LOE: You're right, at some point we—up until then, CSM systems had all been one branch and lunar modules systems had all been one branch. Arnie had the branch and then I had the branch. But then comes Shuttle, and maybe we did this for ASTP. The systems were getting so being and so complicated, that we decided that's at least two branches worth, probably three. Well, three I guess. So we split it up to sort of an EECOM-oriented branch and a GNC-oriented branch and then an INCO kind of oriented branch, instrumentation communications. So that's what the title of this thing.

Then I guess we could split it by ASTP. Don't remember a lot about ASTP. We tried very hard to get along with the Russians that were here. I can remember a lot of parties that we had with those guys.

Somebody lived over in the apartments in Nassau Bay, was a bachelor, and so had a swinging bachelor apartment, and knew somebody that was with one of the airlines, Delta or somebody, and some of the Delta folks would come out here and party with the Russians. So we did a lot of socializing with the Russians.

We had done the same thing with the Marshall guys just to get to know them when they first started showing up down here on Skylab. I can recall a number of parties where somebody—over at Clear Lake on the corner of El Camino and Reseda. There's an apartment complex there.

BUTLER: Okay.

LOE: Some of our guys had actually lived there and had access to they had a party room there. But I can remember some people throwing parties for the Marshall guys, and it was just to get to know one another kind of a thing.

BUTLER: Trying to build that time.

LOE: Yes, yes. It was good reason to party, too.

For some reason now that we get to ASTP, we've moved, and we're not partying over here anymore. We're across the street at Nassau Bay. I can remember some good parties with the Russian guys.

Had a few of our guys that went to Russia. I think Sy went and Steve [J. S.] McLendon, I think, went over. Steve was one of our EGILs on Skylab and Sy was, too. Sy had been an EECOM on Apollo. Steve and another guy, Craig Staresinich, came in right at the end of Apollo, and we started grooming them for Skylab. They were two just absolutely outstanding EGILs on Skylab. But I remember Steve going to Russia and Sy going to Russia.

I can't recall a lot about the mission. We had a new position that was Frank [C.] Littleton, out of the program office did it. He was sort of a—what did we call him? Joint Flight or something like that, where he was sort of overseeing the joint activities that we did with the Russians. Because I'm sure here again we had this who's in charge thing. I can imagine it going on amongst ourselves, but then I can also imagine it's must have been horrible with the Russians. Now, Glynn Lunney went and worked all that, thank goodness, and I didn't have to get involved with that, but I can just imagine it went on. But other than Frank and that new position in the control center, I don't remember an awful lot about the mission.

BUTLER: I know from a systems standpoint with the docking module and I believe they had different pressures in the two different—

LOE: Yes. Yes.

BUTLER: —spacecraft they had to regulate so I don't know if that—

LOE: Yes.

BUTLER: —caused any—well, probably some discussion.

LOE: Yes, you probably right. Probably a lot of discussion, but I can't remember any big problems or anything with it.

BUTLER: I think everything went pretty well.

LOE: Nothing that jumps out at me. Yes.

BUTLER: Until landing they did leave open—

LOE: Oh, yes. That's when Vance [D. Brand]—

BUTLER: —something on landing.

LOE: I think it was Vance got blamed for that, left open a valve and, yes, we sucked some fumes in, yes. Yes.

BUTLER: You mentioned working with the Russians and partying with them.

LOE: Yes.

BUTLER: What were some of the challenges? Were there cultural challenges in working with them and getting to understand each other and getting to know each other and the language barrier?

LOE: Oh, yes. We didn't—at least I didn't trust them. I don't think they trusted us. Yes, they were still the enemy, as far as I was concerned, but an enemy we were at least working with. *Enemy* is probably many too strong a word.

But my sense was that and I think we had been told that when you get a group of them together, at least one in that group's going to be KGB [Soviet secret police]. You won't know which one it is, but count on it. One of them is going to be KGB. So my sense was that they didn't feel real free and couldn't be as open maybe as they would have liked to have been or maybe we would have liked them to have been.

My sense is that total project was that they learned an awful lot from us, and we didn't learn anything from them. Our spacecraft was so much more advanced. They had the luxury ever since they'd started of having the big boosters, so they didn't have to worry about weight and stuff like we had to fight all those years. So we were just more sophisticated. We had to be. We had to develop that sophistication, and they didn't. So like I say, my sense was they learned a lot from us, but we didn't learn anything from them on ASTP. They weren't as easy to work with just because they weren't capable or allowed to be as open as you would have liked them to have been.

BUTLER: Well, that formed a foundation that later was built on with the Shuttle-Mir program—

LOE: Yes. Yes.

BUTLER: —which is interesting, so we'll probably touch on that at least briefly—

LOE: Okay.

BUTLER: —toward the end as we talk. At this point I'd like to ask Kirk and Kevin if they had any questions on the stuff that we've talked about so far—

LOE: Sure.

BUTLER: —is that all right?

RUSNAK: Yes, I had couple of general thoughts. When you came here from Boeing, you said you had general through this process where you went through a couple different branches of their

engineering, whatever, you thought maybe tests was what you wanted to do. Why did you go into operations when you came here? What were you expecting out of that, and did you consider going into any other areas at the Manned Spacecraft Center?

LOE: No, I think operations was sort of the ultimate test. The fact that it was up there performing and you were evaluating the performance. I sort of look upon that as an ultimate test.

We really came here with the idea of only staying about three years. Back in those days, somebody had even done a study up at Boeing, and they tracked two people that had hired in. One guy had stayed at Boeing, the other person had moved around every three years or so. And after, I don't remember what it was, ten years or whatever, came back to Boeing and actually hired in at a higher level and a better position than the guy that had stayed there. So the theory back then was that in aerospace that was the way to get—that was the nice way to do it.

So Tina and I had sort of talked about using aerospace to see the country. We had been in the Northwest, then had spent a little while in New Orleans, and thought our next one we'd like to go to New England and even had picked out I think it was Pratt & Whitney was up there.

But anyway, we got here, and it was so much fun, and it was going on fast and everything that thirty-seven years later we're still here, so we never did make our move. The idea when we came here was it was going to be a short-term thing. Plus getting NASA on the résumé, because the folks at Boeing had said that'd be a good thing to do.

RUSNAK: I take it you haven't regretted not switching around every three years?

LOE: Not a bit. Not a bit.

RUSNAK: The other one I had involved your position as EECOM and leader as branch chief where you had the EECOMs underneath you. I was wondering if you could give us a sense of

the personality and style of the different people who manned that console that you either had the chance to work with or as their boss. Because you've got different sorts of people doing what is the same job, but maybe, as you suggested, approaching problems from a different way. But ultimately the different ways are successful. So I was wondering if you could maybe share some of your perspective with us on that.

LOE: Yes. You're right, it really varied from person to person and personality to personality in how they use their people and work with their background people.

John Aaron, John always impressed me. John was so smart that you wondered if he really needed a back room. John just knew. He had a photographic memory. He could see something one time and it was there, logged in. Myself, I'd have to read something over ten times, a dozen times maybe, to get it to stick in memory. So John was that way.

Dick Glover, who had been EECOM before us, Dick was a lot like John. He was very smart, although Dick wasn't as personable as John was. John always got along with everybody good, it was just that he was so smart. He knew so much. Dick didn't have the talent of getting along with people so much. There were a lot of people that weren't Dick fans.

Who else came along? Charlie Dumis. Charlie was smart, but he was probably closer—Charlie was more professor smart. But his personality was probably more like mine. He was probably more of a mingler and a socializer.

Sy was—here again, nobody was as smart as John, so Sy was more of a needing a team kind of a guy.

I can remember having to get on John and not just me, but Arnie too, saying, "John, let your back room work and help you solve some of these problems. How else are they going to learn?" Because they'd throw a problem at John, and John would a lot of times just solve it right off the top of his head, just bang just like that it was, "Okay, flight, let's do this."

So you'd have to tell him, "John, make those guys in the back room earn their keep, too. Let them learn a little bit."

RUSNAK: Okay. I just always like to get a sense of the other people who were working here. But that was all the questions I had.

BUTLER: Okay. Kirk?

FREEMAN: Actually, I do have one question. When you first came from Boeing, what was your training like when you arrived here? Was knowledge from college and from Boeing enough that you really didn't need much training?

LOE: No. No. The college and the Boeing experience was nil. I mean, it helped knowing enough of the physical science, I guess, that you picked up in college to understand how some of the systems worked and why they worked like they did, but you sure didn't sit down and write formulas and stuff or solve formulas.

The Boeing experience was helpful in that I learned to take a system and analyze it and figure out how it worked. My first job at Boeing right out of school, I was in their spares. I was what was called a spares engineer. I was working on the Bomarc, which is an anti-missile, anti-aircraft missile, and our job was to allocate spare parts to the various depots around the country where these things could be worked on.

You'd take a system and you'd analyze it and look at it and say, okay, this is how this works. Here it's got an O-ring in it here, and this O-ring's liable to wear out, so we'll put X number of O-rings here. It's got a piston over here that's doing something, and pistons don't wear out very much, but maybe piston rings do occasionally, so you put some rings over here, but you won't bother with putting the whole piston over there. So that was sort of a common

sense approach, and that helped a lot when I got here, because flight control was a lot of common sense and just figuring out how things worked and why they broke and why they were liable to break. So this thing here didn't look reliable, so let's keep our eye on it and that sort of thing.

But nothing applied directly, and I can't recall any formal training classes. I'm sure we had them. Had a book I know on Gemini. It was called a SEDR 300, S-E-D-R 300. It'd had a lot of pictures and systems descriptions and descriptions of how the systems worked. In fact, that was what I was doing when I left Boeing. I was writing similar books for some of the ground support equipment over there. So that was helpful, I guess I'd say. But as far as formal training, I don't recall a lot. We were giving these books to study and schematics to study and away we went.

Now, Apollo, in fact we were talking about this yesterday. I was out on a boat with some old Apollo partners, and I do recall going to formal classes. Arnie sent us up for formal classes out in Downey. In fact, the entire branch went out for two weeks. Half the branch went the first two weeks and then the other half of the branch went the other two weeks. So we did get some formal training there, but nothing like that ever on Gemini that I can recall.

FREEMAN: Okay. Just one other question. I was just sort of curious when you started off you started off right from college, what inspired your interest growing up to make you want to go into engineering and maybe even pursue a career in that field?

LOE: I think I was probably over here at NASA working when it finally dawned on me, yes, this is what I really want to do. This is fun. I'm glad I took engineering.

I grew up in Beaumont. Mobile [oil] refinery was over there. My dad worked for Mobile for years and years. It seemed like as I grew up you knew that your folks wanted you to go to college. That was just something you knew they wanted you to do. All the good stories that you heard were guys that had gone to college, their dad worked there at the refinery, and they went to

college and became an engineer, and then they got to go and work engineering out at the refinery. So that was probably in the back of everybody's mind.

But when I got out of college, I think all the guys with the good grades got picked to go work in the refineries, and the guys that can't have the real good grades, like myself, had to look elsewhere, and so I was lucky enough to find Boeing. I thought at the time when I got out that I really would have liked to have gone into engineering sales where you'd sell a product or a process. I had talked to one company—I can't remember now who it was. It might have been Phillips—about it, where once you had sold this process or this equipment, you'd now then go into the company's plant where you sold it and you'd actually move into there and help them get started, help them set it up and all that start of stuff. I always thought that would be a lot of fun, but then I got the offer from Boeing, and we decided to take that.

Tina's dad had been stationed up there during World War II when he was in the Navy, so that was a great opportunity to see that part of the country and everything. It was beautiful up there. You said you all have done some travel up there so. Yes, that was—

BUTLER: Fortunate to make that trip.

LOE: Yes. Hope you had good weather.

BUTLER: We did.

LOE: Good.

BUTLER: We did. We went twice. Once we went we had very nice weather, the other time it rained. But even that was kind of nice because it was nice cool rain.

LOE: Oh, okay.

BUTLER: We had left nice hot Houston, so—

LOE: We moved up in the end of January and first of February. One day in May we were driving to work and all of a sudden there was Mt. Rainier, and that was the first time we'd ever seen it after all those months.

BUTLER: Oh, my goodness.

LOE: We almost wrecked the car.

BUTLER: [Laughs] I can see why. That would be rather startling to all of a sudden have a mountain.

LOE: We knew it was there because we had driven up to it, up into the snow and stuff, but you still couldn't see anything. Everything was just total clouds.

BUTLER: How interesting.

LOE: That was a good experience living in Seattle. We loved it.

My son Greg, when he got married, he presented me with this write-up that he had done. He recalled going with me one day—well, he recalled a lot of things. He recalled going down to the Singing Wheel. That was our hangout then, down in Webster. Going down there with me and playing shuffleboard and stuff.

But then in his little write-up he said he recalled going to—it must been a Mother’s Day, and we were going out to look for flowers and came down to—there was a flower stand. It’s on what is now NASA Road One. He can remember having to go across this bridge over a deep ditch. But there was a guy in this little stand, and [unclear] and Greg said he remembers the guy kneeling down and talking to him and everything. I had totally forgotten this until he wrote this thing up and gave it to me. But he said then he remembers as we were going home in the car me saying, “Do you know who that was?” And Greg said, no, he didn’t know who it was. Turns out it was Neil [A.] Armstrong.

BUTLER: Oh, really.

LOE: Yes. So Greg said that really impressed him because that was in May, and I guess his mission was in July.

BUTLER: Oh, that’s neat. That’s neat.

What did your family think about your involvement in the program and were they cognizant of what was really going on?

LOE: No, I don’t think. It’s funny, we were talking about that the other day. I think the kids’ sense was that Daddy went to work in the mornings and Daddy came home in the afternoons or maybe late at night, and, no, I don’t think they really had a big sense as to what was going on. Because a son of mine, another son, we were talking about that the other day, that they really didn’t. They’re starting to ask questions now about what was this like, what was that like. At the time, no, I don’t think they did.

BUTLER: Well, maybe your oral history here you can pass it on to them and they can—

LOE: There you go.

BUTLER: —see what you were involved with.

LOE: Yes.

BUTLER: Well, unless you have any other—did you have any other questions? Okay.

LOE: No.

BUTLER: Well, if you had any other thoughts from your early part of your career or any other comments you wanted to make there.

LOE: I just thought a while ago I might mention the evolution of splashdown parties.

BUTLER: Oh, yes.

LOE: Back during Gemini, it was all at the Singing Wheel, and it was all guys. There weren't any lady flight controllers then. All guys. I think on Gemini XII, the Gemini Program is over, we're getting ready to go into Apollo, and somebody said, "Let's invite the secretaries to this one. They've never been to a splashdown party." We had a gal that worked for us. She was Arnie's secretary. She was an ex-Navy, I guess Navy was called WAVES [Women Auxiliary Volunteers for Emergency Service].

BUTLER: Okay.

LOE: Gosh, what is her name? Lived up off Edgebrook. But anyway, she came to our splashdown party and had the best time. So to my way of thinking, that was the start of the Apollo-era splashdown parties that then became famous.

So then when Apollo came along, a lot of the hotels around the area got involved, because you had CBS and NBC and all the news places, and they'd open up and you had a press club usually over at the King's Inn, and so then everybody started getting involved in splashdown parties. Gosh, I guess people from all over Houston were driving down here to partake in splashdown parties. It all started out at the Singing Wheel.

That building is still there. We were talking yesterday about it's too bad somebody doesn't open it up again. It was a good place.

BUTLER: Certainly sounds like it. We've heard a lot of good times were had there.

LOE: Yes. Yes, yes. I see on your list you've interviewed [John S.] Llewellyn [Jr.], so Llewellyn could tell you a lot of Singing Wheel stories.

BUTLER: [Laughs] Well, he definitely had a few stories. He did stick mostly to business-oriented approaches, but after a good hard day's work you do have to unwind and relax a little bit.

LOE: We did that, and that's an interesting point. We worked hard, and I think we partied pretty hard too in the afternoons after we'd get through or early evenings or maybe even later some nights.

The young folks nowadays don't do that so much anymore. A good friend of mine who went on to become the Rockwell head out there within flight control, he said he asked a couple

of his young female engineers, said, “Why doesn’t anybody go out and party like we used to do? We used to do that every afternoon. You’d always go stop and have a beer somewhere before you went home or something.” They told him there just wasn’t that much interest in it anymore, said the young guys nowadays go home and get on their computers and play games and stuff.

But we had an awful lot of comradeship. That was a big, big part of our total operation, I think. We were a very, very close-knit group.

BUTLER: Spent so much time working together and putting in—

LOE: Yes. That’s right.

BUTLER: —extra hours, that that’s what your life revolved around.

LOE: Yes. Yes.

BUTLER: Certainly was an interesting group of people to work with.

LOE: Yes, it was. Bunch of good folks.

BUTLER: Well, we appreciate you coming in—

LOE: You bet.

BUTLER: —to talk with us today.

LOE: You bet. I’ve enjoyed it.

BUTLER: We have as well. I'm glad you have.

LOE: You've made it very, very painless.

BUTLER: Oh, good. We try to. Shouldn't be any pain involved, just reflecting on your experiences. Certainly would like to follow up with you on Shuttle oriented—

LOE: Okay.

BUTLER: At whatever time would be good for you. I don't know if you want to talk about that now or if you would want to look at your calendar.

LOE: My calendar is pretty empty.

BUTLER: Okay. Next week.

[End of interview]