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CHARLES R. LEWIS
INTERVIEWED BY JENNIFER ROSS-NAZZAL
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ROSS-NAZZAL: Today is June 28th, 2022. This interview with Chuck Lewis is being conducted for the JSC Oral History Project in Houston, Texas. The interviewer is Jennifer ROSS-Nazzal. Thanks again for joining me this morning, really appreciate it.

LEWIS: Good morning.

ROSS-NAZZAL: Last time we had talked a little bit about your role as assistant flight director and you mentioned Apollo 11. You felt like you were just sitting there. I wondered what are your memories of the mission besides feeling like you were just watching and listening to Gene [Eugene F. Kranz] and the flight control team.

LEWIS: As they progressed through the decent, the assistant flight director [AFD] did not have an active role at that time. But I was into it! I knew the timeline and the planned trajectory. I was like everybody else that could afford to watch. Some of the systems guys were watching data from the systems, they weren't watching the trajectory screen tracking the Lunar Module's [LM] descent. You could feel the adrenaline increase. I felt like I was part of it. I guess I felt that way because so much had gone into getting us to this point, all of Gemini and the early Apollo flights were devoted to preparing for Apollo ll.

Thinking back, we flew Apollo 8 in December the year before we landed on the Moon,

then we did Apollo 9, 10 and 11. We did those four flights in about five months that rapidly, once we got started. The reason we could do that was due to Gemini. Once they got the Apollo vehicles built, we had worked through critical procedures and how we were going to do things. The crews had trained on the Gemini spacecraft for rendezvous and station keeping and things that we knew we'd have to do and do well during the Apollo flights.

During descent my adrenaline increased rapidly when the Lunar Module fuel started dropping to the point where it was becoming a concern. It was breathtaking! I was feeling and enjoying the adrenaline rush. That was a thrill. When asked what are the highlights in your career, obviously that was one. Although I didn't work actively at the flight director console, I was at the console watching Gene. At that instant in time the AFD is a nonexistent being. The flight director has got his eyes and brain focused on a safe landing. I never felt like I wasn't a part of it. I just wasn't in an active rule at the point. Yes, it was one of the highlights in my career. Years of work and we pulled it off on time and safely.

ROSS-NAZZAL: What about Apollo 12 or 13? What was your involvement?

LEWIS: At that time, we were looking ahead at Skylab. Apollo 13's oxygen tank exploded. I had no specific role. We used the people that knew the most about the specific areas where we had to focus to get the crew back. Power and carbon dioxide management was critical. John [John W. Aaron] was our power guy. He and T.K, [Thomas K. Mattingly] worked in the simulator to develop the power down checklist sufficient for crew survival. Another team solved the CO2 problem.

If that had happened on Apollo 8 when we didn't have the Lunar Module, we'd have

lost the crew. We did have a lifeboat, so to speak. Tommy [W.] Holloway called it a lifeboat. He had already worked up emergency procedures in case a serious problem were to occur in the Command Module on the way to the moon. The "what-if" games we played. That's what our flight rules and procedures are comprised of: What if this happens? What are you going to do?

We'll talk later when we get to the Shuttle. We had already run a "what if" case for loss of a fuel cell when we lost the fuel cell on flight two [STS-2]. We knew when it happened it would terminate the flight. That's the name of the game, a lot of it, homework. Anticipation and attention to detail are the critical elements of flight control.

ROSS-NAZZAL: I was looking at the manning list. I see that you were working in one of the Staff Support Rooms [SSRs] for Apollo 15.

LEWIS: That was just getting me badged into the Control Center.

ROSS-NAZZAL: I thought that was unusual to go from the front room to the back room.

LEWIS: Yes. That just got me badged back into the SSRs where some of our guys were. No big deal.

ROSS-NAZZAL: You transitioned to being a deputy flight director. How did that differ from being an AFD?

LEWIS: I don't even remember the word deputy. I went back and looked at that too. I said, "Deputy? When did they ever make us flight directors?" We went right into Skylab as flight directors.

ROSS-NAZZAL: I think I found it in Milt's book [*Go Flight! The Unsung Heroes of Mission Control, 1965-1992*, by Milt Heflin and Rick Houston]. I just wanted to ask about that. You did work as a flight director for the last two Apollo missions, 16 and 17.

LEWIS: Yes. That was sort of very early training and perhaps kind of breaking us in during the easy shifts on the last couple of Apollos. In other words, the translunar or trans-Earth part of the flight, crew sleep periods. Probably somebody in the back room watching us to make sure we didn't screw anything up. I'm just kidding.

The training people didn't have any mercy on us when they threw the simulations at us. We did get some on flight director console training in a real sense on the simulations, because they threw everything they could think of—multiple failures—at us to see how we'd respond. I don't think it was designed by management to test the deputy before an assignment as flight director. I think they'd made their selections, it was just a matter of getting us a little bit of console time before Skylab, because Skylab was coming up pretty fast. That was just an early exposure.

It was good because one of the things I thought about when I got selected was being on the flight director loop; the whole world listened to it. I'm saying to myself, "God, I might say something stupid or say something dumb." I worried about that, because I knew it was monitored everywhere. Flight director loop and air-to-ground were the two that had speakers

in half the offices at JSC probably and at [NASA] Headquarters [Washington, DC]. But I finally got to a point where I said, "If I screw up and say something dumb, it's just going to happen. I'm just going to be myself." That's what you have to do. You got selected, and they did that for a reason. Be yourself and do the best you can.

ROSS-NAZZAL: Did you put together an application for the position?

LEWIS: No. There were no applications. The flight director selection was not done like it is today. I do not know who or how flight director selection was done. My guess is that Flight Operations Directorate division chiefs could propose candidates and the directorate chief could select. I would guess [Christopher C.] Kraft made the selection when he was the directorate chief. For example, the group before Don [Donald R. Puddy], Neil [B. Hutchinson], Phil [Phillip C. Shaffer], and me was Milt [Milton L.] Windler, Pete [M. P.] Frank, and Gerry [Gerald D.] Griffin. They were selected by Kraft. It just happens that Milt Windler was in the Landing and Recovery Division. Pete Frank was in the Mission Planning and Analysis Division, MPAD. Gerry Griffin was in Flight Control Division.

The next group selected was for Skylab and our group of four. We were selected by Kranz, chief of Mission Operations Directorate. Add Milt Windler and you have the five that did Skylab. As we ended Skylab we were coming up on Apollo-Soyuz [Test Project, ASTP], which was kind of a bump in the road, and then Shuttle was next.

ROSS-NAZZAL: How did you find out that you'd been selected as a flight director? Were you surprised?

LEWIS: I don't remember. I remember I had to be pleased about it. I'd get away from that assistant flight director business, because we didn't need that one. Don Puddy, I knew very well, I was surprised and happy for him. Neil, I didn't know that well.

How I got selected? I never asked Gene because I didn't want to know who didn't want me. I guess whoever wanted me had to be the guy that made the final decision. I figured it was Kranz.

ROSS-NAZZAL: You selected bronze as your color. Why did you decide to go with bronze?

LEWIS: The only color left was yellow. Now, would you like yellow?

ROSS-NAZZAL: Kind of sunny.

LEWIS: My decision was easy. Neil beat me to silver. It was available but he got word about his selection before I did. Or I didn't think about it quick enough. I thought Puddy cheated a little bit. He picked crimson. I felt that had too much red, which was Kraft's color. It was OU's [University of Oklahoma] color, his alma mater.

ROSS-NAZZAL: That's funny.

LEWIS: Red was retired. That was Chris Kraft's color [Red Flight].

ROSS-NAZZAL: What are you going to do?

LEWIS: Yes, what are you going to do?

ROSS-NAZZAL: You were working on Skylab planning while Apollo was going on.

LEWIS: I really wasn't working on Skylab in any detail. I was gathering info and studying some of the new vehicles or elements we were going to have, that kind of thing, but not anything formally. Then Apollo-Soyuz was coming up, and I was selected to lead the American Operations Team in the Soviet Union Control Center. I traveled back and forth to the Soviet Union three or four times over a period of several months. Getting ready for that consumed time. In 1975, we started to work on Shuttle operations development.

ROSS-NAZZAL: Let's focus on Skylab itself. You were a flight director for Skylab, very different from these shorter missions. Talk about what it was like having a mission that was up for a month or more at a time, and operations ongoing. How was that different?

LEWIS: It was different in that all previous flight durations, Gemini and Apollo, were less than two weeks. They were all scripted from liftoff to landing. For Skylab you can't script months because you know a few things are going to fail or break and there will be unknowns to deal with. You will have to change the timeline.

For training, it was a matter of emphasis. We had simulations where we got some training for orbit systems problems. The workshop training focused on unmanned and

manned workshop activation and deactivation and launch and rendezvous sims with the next flight crew. Because activation and deactivation were critical, they were scripted which helped with Mission Control Center [MCC] and crew coordination.

There would be a significant amount of unmanned support. The only unmanned flight I had supported was the Lunar Module flight Apollo 5. The flight was automatically controlled by an onboard computer with some limited MCC backup command capability. We would have unmanned periods between the Skylab manned flights. We would be babysitting the vehicle because there were some active systems.

When Skylab 1 launched we had a near catastrophic failure. A workshop failure caused the loss of a thermal shield and solar panel. Some people might have given up. We didn't. We had four teams at that point. We didn't have five. You needed five at a minimum, over a long haul—for several months—because four teams weren't enough. There was insufficient time off available. We ended up using our training people, the Lunar Module flight controllers from Apollo, to form the fifth team. But that took a while.

When the workshop lost the thermal shield and solar panel during launch, we had just the four flight control teams. We split them into two: two teams to work on-console supporting the vehicle and two teams off-console supporting other program organizations to define, gather, and package what was necessary to repair the workshop and to launch Skylab 2 as soon as possible. That went on for about ten days. I was on console. I don't remember now who the other flight director was. Twelve hours was one shift, but then you had another hour to debrief the media and add handover time. You'd come in and read the log of the previous flight director and see what's happened, what's failed, or what you need to do. Then you hand over to the next guy. So you ended up with about a fourteen–fifteen-hour day. Your

time was filled.

During the ten days before we could launch Skylab 2, the two on-console teams had to frequently rotate the spacecraft to manage power and thermal issues. Because at the location where we lost the thermal shield, the food stored inside the workshop would reach unacceptable temperatures if left in the sun too long. We were trying to maintain a balance between temperature and power because once we rotated to the shade, we decreased the amount of sunlight thus limiting the amount of battery charging we could do, so the batteries would slowly start discharging again. At that point we only had ATM [Apollo Telescope Mount] solar panels power plus limited power from the remaining workshop solar panel.

Our job during the day was rotating the vehicle so that we'd leave the missing thermal panel area in the shade as long as we could, watching the charge on the batteries dropping off. When it'd get down so far on the knee of the curve on the discharging batteries, we'd rotate it back to get the solar panels in the sun. We did that for two weeks to save as much food as we could and have enough power to keep the vehicle operating.

The Skylab 2, crew [Charles "Pete"] Conrad and [Joseph P.] Kerwin, did the EVA [extravehicular activity] that freed the solar panel to deploy and got the thermal shade—a parasol—deployed, which relieved the thermal issue. We got back half the power that we'd lost. We were still down one workshop solar panel. Skylab was one of the highlights in my career because I thought we saved the program.

Once the Skylab 2 crew finished the solar and thermal fixes and completed onboard systems activation, we started the MCC real-time flight planning. For Skylab 2, we had four flight control teams and gradually expanded to five teams. To provide twenty-four hour per day support we used three teams with eight-hour shifts each. The shifts were graveyard (0000

to 0800), execute (0800 to 1600), and planning (1600 to 2400). The graveyard shift finalized the teleprinter with that day's flight plan and any supporting info to be available for crew at wake-up. The execute shift supported the crew accomplishing the flight plan. The planning shift developed the next day's plan.

We used a teleprinter to up link information to the crew. The teleprinter was an invaluable communication tool due to the limited acquisition time in orbit. It printed a text message three inches wide. We had three messages one for each crew member. Each received his individual flight plan with a common time span. Each plan used a common sequence of time and what their individual activities were. That worked out well in most cases. We got pretty good at it. We got too good it turns out.

On Skylab 4 the crew was having difficulty getting all flight plan activities done on time. The crew was struggling. We were giving them too much in the time available. Several factors contributed but being the last crew they had the least amount of training. MCC operations were becoming more efficient. The crew sent us messages on the tape recorder, and we finally caught on and decided we needed to let up and give them a break. I remember telling Don Puddy and Phil Shaffer, "What they're telling us is they just need ten or fifteen minutes between experiments to get their mind's clear for their next job." We were ahead of them, and they were becoming frustrated.

The MCC did a detailed review of all flight activities and asked the crew to do the same. Suggestions would be discussed openly on air-to-ground communications. The conversation between Dick [Richard H.] Truly and the Skylab 4 crew occurred on 12/30/73. A portion of Truly's concluding remarks were, "Let me say one thing, Dr. Kraft and Deke [Donald K. Slayton] have been here and listened to all these passes and they're very happy

with the way you're doing business, and I think and they think we've made about a million dollars tonight." That operational issue was corrected, and Skylab 4 proceeded to be a big success.

My stomach was giving me problems, and I needed stomach surgery. Kranz took my team, he probably thinks he did the whole last flight. They finished up, and I went to the hospital for stomach surgery. That was my glorious end of Skylab. It was great. We literally saved the program and got more out of it than originally planned.

We learned other things. I tried to stress some of this later after I started working on Space Station. Station was planned to operate for many years like Skylab. It needed to be designed with maintenance in mind. In Skylab we had multiple failures and managed to repair, replace, and replenish needed capabilities. We lost a control moment gyro. We lost what we referred to as a gyro six-pack, gyroscopes that we were using for rate control on the vehicle. We had a coolant leak. We took coolant up and replenished the coolant system. There were a number of things.

For long duration flights you have to maintain things, and you need to have access to it. Not have to tear something else up to correct a problem. Design by modules. For example, where you can take a system module or component out to repair or replace. Then in EVA you need restraints. You're going to do maintenance on something, and you're using your hands pulling and tugging. The law of physics, in zero G everything you push is going to push back at you, so you have to have hand and foot restraints. I think we learned a lot about maintenance. How well we carried it over to the International Space Station must have been pretty good. We are using it today.

ROSS-NAZZAL: Oh yes.

LEWIS: That was critical. That'd be a big lesson learned.

LEWIS: Before leaving Skylab, I remembered an incident in the Soviet Union related to Skylab. After arriving on my first trip to the Soviet Union, I found out they had listened to the Skylab air-to-ground communications.

ROSS-NAZZAL: How'd you find that out?

LEWIS: One of the Soviet flight directors told me a joke that Hank [Henry W.] Hartsfield, my CapCom [capsule communicator], had passed up to the Skylab-3 flight crew. He told me the joke. He said they thought that was so funny.

ROSS-NAZZAL: Wow.

LEWIS: Probably we knew that. But at the time I didn't know they were listening to our communications. Hank asked me before he sent it up to the crew, "Flight do you mind if I send this up?" I looked at it, said, "I don't guess I'd get into too much trouble."

ROSS-NAZZAL: What was the joke?

LEWIS: Crew had a day off; Sundays was their day off. Hank called them up and says, "Okay,

guys, you're going to have a day off day. I've got good news and bad news. The good news is everybody gets to change underwear. The bad news is Jack [R. Lousma], you change yours with Al [Alan L. Bean]; Al, you change yours with Owen [Owen K. Garriott]." I thought how in the hell did he know that?

ROSS-NAZZAL: That's funny.

LEWIS: They were listening.

ROSS-NAZZAL: Would you talk about the Splash Gordon mascot, and how you kept morale up? It sounds like you were working pretty hard long days on Skylab.

LEWIS: The initial Skylab twelve-hour shifts ended once we got the Skylab-2 crew up. After we got that first crew up, we went to four flight control teams and started expanding to five teams. How often to rotate days, a team from one shift to another, was something we experimented with. It was difficult. That was how often should we rotate a team from the graveyard shift to execute shift, or how often should you rotate. We'd had experience with industry down here, the oil refineries; they worked shift work. It seemed like we rotated more frequently than we needed to because you'd get used to one, and then you'd be going to another one. It seemed like circadian rhythm was just constantly changing.

I can't remember. Some rotations you'd work four days and then you'd be off three. It was a mix, and it was probably driven some by what the flight plan activities were going to be and where most of the expertise was for that activity and what team would be best. They'd

try to set it up that way. It was—I wouldn't say brutal—but it was tough. We were young, so we managed to get through it. As the fifth team came on board, it gave us more time off and eased up a little bit on the scheduling. Neil and I both ended up with health issues. Due to a bleeding ulcer, I didn't have any choice. I had to get something done before the end of the Skylab Program.

ROSS-NAZZAL: I bet. How did your mascot get the name of Splash Gordon?

LEWIS: There were two experiments on board I remember. One was a fish, and I don't know what they were doing, except maybe studying how it oriented itself in zero G. They had a spider experiment. I think that was to see how spiders would build their web in zero G. I don't know who started it, but somebody said, "We need a mascot." That's what we called it. I don't know who chose the fish but then the contest was on. What are going to call our mascot? Give us your suggestions for a name.

"Okay. Tomorrow, I want you guys to bring in, or you girls"—we had a few girls, not many but some—"I want you to bring in some ideas. We're going to put them in a pot and pick out a name. If you've got an idea and you want to sell it. Go talk. You can work with others." We ended up with Splash Gordon, the fish. The mascot was a fish in a space helmet and space suit. That made sense to us. We probably gave a prize. Neil used the spider. He had a spider display. His team named it Annabelle. We had the guys in system display develop a system display projection plate inscribed with our mascots. Scratched those I think onto the glass.

ROSS-NAZZAL: Oh, the glass plates, yes.

LEWIS: I think that's how they did it. I think Shaffer did purple polka dots. I don't remember Puddy's.

ROSS-NAZZAL: I thought that was of interest, I hadn't heard that before.

LEWIS: That's the story.

ROSS-NAZZAL: I thought it'd be good to get that down. Was there anything that you enjoyed working on? Sounds like you had some challenges. But is there anything that you look back on?

LEWIS: The most joy I got out of it was the fact that we would fix stuff and keep it going. A lot of that was teamwork. We had engineers from E&D [Engineering and Development Directorate] and contractors supporting us. It amazed me that we could replenish the coolant loop. It doesn't amaze me now that I think about it, but back then—well, how are going to do that without the risk of releasing coolant into the cabin. I can do that with a saddle valve. There's ways to do it. Then getting to where the leak was for repair? That may have been the most difficult thing, finding the leak.

The satisfaction was just getting the longevity we got out of it. I wasn't paying that much attention to the experimentation being done, but a lot was done with the solar activity that was recorded. Medically, the crews, their length of stay, their exercise, went in a study

and how well their bodies coped with it. EREP [Earth Resources Experiment Package] was new. I took pride in the fact that I thought we pretty much saved the program. Not just us, but the crew and everybody that pitched in, got that parasol up. First time we watched the Command and Service Module approach and the thrusters were firing, it was forcefully waving from impingement of thruster press. I thought, "Oh, crap, we're going to blow it right off." Of course, it didn't blow away. It did what it was intended to do.

ROSS-NAZZAL: You mentioned the Skylab-4 crew. I thought it might be useful for other people to have here. There's always that discussion about was there or was there not a strike in Skylab. Where do you fall on that for Skylab-4? Have you heard about that?

LEWIS: Strike? You mean quit?

ROSS-NAZZAL: There's always a debate about did the crew purposely turn off the radio and were they striking in space because they were working too hard.

LEWIS: No, I don't think so. As I mentioned earlier, they made comments about their schedule problems on the recorder, and we dumped the recordings and listened to their comments. I think some of their medical reports were done that way so we weren't exposing any medical issues that might come up. I remember we got cross ways with the scheduling because we were just giving them too much too do. That's what I tried to explain earlier. I never heard anybody or any of the teams indicate that the crew were threatening to strike.

They were having difficulty, and they were trying to tell us that. I believe they were

trying to tell us without saying, "We can't get this done." That's what I thought. Puddy and Schaffer seemed to be the two working that one. Truly was Shaffer's CapCom. That's probably why Dick got the task of reading and discussing it with the crew. As I described earlier, I just don't think it ever got to a point where I'd call it striking. I pointed out earlier that the issue was resolved, and we had a very successful Skylab-4 flight.

The other interesting thing, I didn't know this until I read that transcript, and I found it somewhere. I don't know where I got it. I think it's Don Puddy's copy. I found it, and I want to get it over to the archives. Truly wrote this up working with what we got off the tape recorder and in air-to-ground discussions.

The discussion occurred over, I don't remember the exact time, but over several hours or several revolutions, because we only had so much time over a site. I don't remember now. They started off talking about the issue openly, freely. Jerry [Gerald P. Carr] was the one doing most of the talking, occasionally one of the other guys. He was talking with Truly. Then it went back and forth. There was enough time in loss of signal periods that the crew could tag up. Truly made some recommendations, and the crew made some recommendations, and some actions to follow up on. Then I found out that near the very end Truly said, "Well, Deke and Kraft have listened to this." I don't remember the exact words now. Basically, they've listened to this discussion and think we've made a million dollars today.

I didn't know that they were listening, but they were. They didn't say anything. But that's the way Kraft worked. He would let the subordinates do the work. Just like the time I messed up talking about the Shuttle tile with the media. He called Kranz, he didn't call me. Tell Chuck, "Don't be afraid to say, 'I don't know.'" That squared it away.

We slowed the activities up. They even gave us time back on some of the Apollo Telescope Mount work in the evening, once they got settled in. We had an issue on Apollo 7 early on with [Walter M. "Wally"] Schirra. You may have read about that.

ROSS-NAZZAL: Yes.

LEWIS: I think Glynn [S.] Lunney one of the flight directors on Apollo 7 was the one catching hell about a lot of it. Finally, he said something to Kraft and Kraft told Al [Alan B. Shepard], if I remember right, he was head of the Astronaut Office. "You need to go talk to Wally tell him what the MCC is here for." That stopped that. But that's how Kraft worked.

ROSS-NAZZAL: I thought we could talk about ASTP because you had a very interesting position associated with that mission.

LEWIS: Yes. Basically the agreement between the U.S. and the Soviet Union was we would have an American flight control team over in their Soviet Control Center and they would have a Soviet control team over in the U.S. Control Center. I think the rationale was if we got into a problem, we would have somebody locally that might help in some way, interpret, whatever. That was the intention. Of course then you get into what we wanted and what we got. They operated totally different than we do because of the secrecy. It was the Soviet Union, not Russia. Russia is probably just as bad now as it was then.

We asked that we be able to monitor their flight director loop and air-to-ground. Of course we gave them our flight director loop and air-to-ground. I don't think we ever got their

real air-to-ground. We got what to me sounded like more of a PAO [Public Affairs Office] type loop or communications. I don't think we ever got anything like our flight director loop. Just didn't seem that was the case. I complained about that. "No, we want the flight director loop." "Oh, yes, yes, yes."

Everything was secret. You would be monitored no matter where you were. Just be aware of that. Where you go, where you sleep, where you eat. We were told that. Another warning don't sell you Levi's on the black market, they'll buy them right off your back. Stay away from the black market. Don't get in trouble with that. Exchange your money at an official exchange. In other words, stay out of trouble because they're going to be watching you.

They did. I could go through numerous examples of how we knew they were monitoring us. Your room was monitored. If you wanted something all you had to do was talk to the wall, and you'd usually get it.

ROSS-NAZZAL: Was there something that you wanted? Did you try it?

LEWIS: One of the prime examples is we were in the cafeteria, the American team having a meal. I made a comment at our table. "I don't know why they don't serve us water. They never do serve us water." The next day we had a decanter, beautiful decanter, with matching glasses on our table with water.

In the Rossiya or the Russian hotel in Moscow, the big one where we stayed, you come and go from your room, and they have a "key lady" that sits in the middle of the hallway where she can see up and down the hallway who's coming and going. That's where you'd leave your

key, and you'd pick up your key. Just another way to keep an eye on you. We go to the restaurant. The availability of things was kind of short and limited. We'd go to the restaurant in the hotel, a nice restaurant. Nice big menu, all kinds of stuff on it, looked like you're going to really have a great meal. You'd look at something, and you'd guess. We had interpreters too. We'd say, "Okay, I think I'll have whatever." Waiter would come, and you'd point to that, "Nyet." Point to this, "Nyet. Nyet." Menu looked good but not much there.

They'd set their bottled beer in the sun; it seemed like on purpose. The only alcohol I drank overseas was beer. It would be hot. I don't know how they kept from blowing the bottles up. I kind of backed off of the hot beer because it was just not that good. I was afraid to drink the water.

Printers, you'd never find them there. If we wanted to print something back home, we'd just pick it up and walk down the hall to the printer, make a copy. You couldn't find a printer in the Soviet Control Center, not where we were. You would ask. You'd go out. Have I described the room that we were in? I don't know that I have.

ROSS-NAZZAL: No.

LEWIS: I better back up a little bit. Back up and describe where we were positioned in the Soviet Control Center. We were given a room in their Control Center off a nondescript hallway. Off that hallway was a large room, where they had a TV set. They had a secretary at a desk, and a chair sitting by the secretary. You went by her to go into the next room. That's where they had consoles for us. We were off the hallway, through a big room where the secretary and somebody else always there to be helpful, I guess, and then our console room.

We had several consoles and tables, and we could spread out in there.

Bob [Robert F. Overmyer] was the astronaut that was on my team, and he walked out of our console room into the big room one day. There was a hockey game on the TV. He goes out there to watch it. The chair next to the desk by the secretary was the only chair there, so he wanted to move it to get closer to the TV set. He tried to move it, and he finally jerked on it. It was wired, and the wire ripped right out of the carpet. They watched and smiled and said nothing.

Bob got pulled into a side room over near the GUM department store by the police for photographing women unloading a truck in the back alley of the store in Red Square. He had two cameras. They took one camera and exposed the film and gave it back to him. He left. They didn't expose the second camera. I thought, "Was that on purpose?" There were no threats that I remember. He said they just politely took him upstairs and probably said, "Nyet," no more. That was another incident.

Let me describe their culture as illustrated by a coffee break. You never saw any coffee, always vodka with a small glass. Whoever the host was would start the toast, and we would follow with our toast. The would fill up the little shot glasses then it was down the hatch. That was the coffee break. They very seldom had any kind of food. Occasionally a little bit of something would be on the table, mostly for show, I think. First thing I would do, and I told my guys, get something on your stomach as fast as you can, because you're going to be chug-a-lug-ging. Always had multiple coffee breaks.

ROSS-NAZZAL: Very interesting.

LEWIS: On days off, usually on weekends, they'd take us on a tour, usually to a church, which seemed strange for an atheistic country. The weekend tours included at least one church. There were people in some of the churches. You could see the décor, lots of icons. I'd been warned about one of the weekend trips by someone who had been to the Soviet Union earlier. "Watch out for this trip."

It was an active Russian Orthodox or Greek Orthodox, whatever is the most popular one there, I guess Russian, to meet the priest of the church. During our tour, we started having coffee breaks with members of the clergy. That went on for a while. By the time we loaded up on the bus to get back—I was careful. There had been a lot of "coffee breaks." Some weren't as careful as they should have been. You always had company on these tours. They never introduced themselves. We were told they were secretaries. They were male secretaries, at least a couple who were always there. They participated in everything. That was the eyes on you constantly.

I had a discussion with the priest at this church. I don't know how it started. The memory is almost faded away. I got into a discussion with him about buying something in America compared to there. I told him I'd gone to the GUM department store, and I wanted a can opener. I found one, and I bought it. I went back to the room. I'd gotten some food from the American embassy, and I was going to open the can. I said, "It wouldn't work. I couldn't get it to open the can. I couldn't take it back. I'd have to go back to the same place and get the same thing again." There wasn't any point in doing that. I said, "Now, in America if I went and got one like that, I'd take it back and get another one. I'd get a different brand; I wouldn't buy the same thing because it wouldn't work." That kind of conversation.

It was strange. If I had to describe Russia back then I'd say six or seven shades of gray.

Not a place you'd want to live. I left some documentation over there on one of the trips, thinking that it would be there when I got back. Some of the other guys did too. The documents weren't there when we got back. I complained, and suddenly they appeared. They'd been mousing around and probably copying everything we had, but we got them back. It was strange.

ROSS-NAZZAL: Was that an assignment that you volunteered for, or was that something you were assigned to?

LEWIS: I didn't volunteer for it. Kranz is the one that must have picked me to do it, maybe because of my travel earlier on, in Zanzibar. Be ready for the unexpected kind of thing. Although, they weren't going to hurt us, that's for sure. They were going to make sure we didn't get into trouble that could be detrimental. We were basically protected. We had a couple of guys that didn't behave themselves. They'd go out to night clubs. They had clubs too. You knew who the girls were. They were there on purpose—the KGB—they were nice-looking. There was some of that, a little bit.

I had a problem with one guy on my team. He got a little bit too involved with a young woman in the cafeteria. She had a sister that worked in the cafeteria too. He got a little too cozy with her. I told him, "You better watch yourself. Don't get involved with that." I think she met him at the Rossiya when we got ready to leave for the airport. Next trip she wasn't there. The sister was there, but she wasn't. She was gone. I said, "You were told and know better."

They warned us about that stuff. I'm being deadly serious. When I got back usually

I'd be debriefed by people that would care about everything we observed, for example what our displays were like as far as technology. It looked like an old back-and-white nineteen-inch TV that they were imaging from a camera displaying large letters. Of course, you've seen the Mission Control Center, a small screen but with high density data displays. Unless they were not showing us what they really had and that could have been the case too. You couldn't trust them. It was the Cold War for sure.

ROSS-NAZZAL; You were debriefing Flight Ops. Were you debriefing another federal agency then?

LEWIS: Yes.

ROSS-NAZZAL: What was that agency if you can share?

LEWIS: Up in DC.

ROSS-NAZZAL: NSA [National Security Agency] or DoD [Department of Defense]?

LEWIS: I don't know that I can name whether it was CIA [Central Intelligence Agency] or National Security Agency. I don't remember. But it was people in one of the organizations, one of those probably. I'd just come up to DC and tell them about what I observed. Ask some questions, and that was about it.

I said, "If their displays represented their technology, we're way ahead." At the end of

the flight, I was taken into the Soviet Control Center's main room where they supposedly did their flight control. There wasn't anything on the consoles. They looked like they'd just been completely wiped off, cleaned off. There was a bunch of consoles. It was a big room. Nothing left. They removed everything. They had the big screens in front. They didn't have anything displayed.

I met some of the big shots, Soviet space personnel, for photos; not that I'd ever remember who they were. Some of them were in uniform. That was the extent of my visit into their "Control Room." We were in the building but it was all cleaned off. There was nothing to see. I didn't expect to. But I wore my United States of America T-shirt or polo shirt designed for this flight. It was an American flag, and the Apollo-Soyuz patch had red, white, and blue. Had a cap to go with it. We wore those immediately in the Soviet Control Center after the flight and until we got back to the hotel.

ROSS-NAZZAL: Do you have pictures of that?

LEWIS: I do somewhere.

ROSS-NAZZAL: That would be interesting to attach to this.

LEWIS: Bob Overmyer, a Marine, and astronaut designed it. Could you imagine. Somebody over there offered to buy it. I still have mine. I don't have it with me, but I do have one, yes, I do. I think I know where they are. I'll bring one in next time.

I thought I was going to be in deep trouble. Here I am, we're on TV and back home

they're all looking at us. Kranz said something to me when I got back. They didn't say anything to me while I was over there. But I thought, "Oh, somebody will say something. You idiot." We were proud of them.

ROSS-NAZZAL: Like you said, it was the middle of the Cold War.

LEWIS: We were proud to have them.

ROSS-NAZZAL: You mentioned that you came and went, and other people came and went. How often were you going, how long were you staying?

LEWIS: I think I went over there three times. One of them was a meeting for some procedure reviews, flight ops type procedure reviews. I think one was supposed to be a simulation. I don't remember much detail about them, I really don't. They had some special or specific missions that they were going to discuss, the operations side of it. We must have had some kind of training exercise. I call it a simulation, but not like we do it back here.

I know that on one trip four of us routed ourselves back through Germany. Hofbrau Festzelt was going on in Munich, and we went where all those huge tents are, where they drink all that beer, where the women carry big trays around like this [demonstrates]. We went there, three or four days, spent most of the time at one of the big tents. It was a lot of fun. Usually, we'd end up at a table with a family, a big family: grandpa, grandma, mother, dad, and the kids. Usually, the kids could speak English, enough that we could carry on a visit with the other members of the family. That was fun. We'd be drinking beer and eating turkey

legs and sausage and pretzels. Exciting times.

ROSS-NAZZAL: I guess a little different from your time in Russia.

LEWIS: Yes. Totally, totally different.

ROSS-NAZZAL: Did you learn any Russian before you went over?

LEWIS: No, Overmyer did. He learned some. How proficient he was, I didn't know. We had a couple of translators. Most all the Russians we worked with, and the Soviet flight directors, spoke English. Now they wouldn't speak English if it was a formal meeting. They went through their interpreters, and we'd go through ours. But occasionally we'd get off by ourselves like one of those coffee breaks, and we'd visit with them.

One of them was a hot rod enthusiast. He complained about how ugly the Soviet vehicles were. I thought he was going to get himself in trouble. They'll send him to Siberia. He'd rant and rave about how bad the cars were over there. They were. You couldn't find a windshield wiper on a car. They were gone. They were either stolen, or they were never exposed except when it rained. They'd come around, put them on, because you couldn't get them, I guess. The shortage of goods was an issue. Stupid stuff like that. You think, what the hell? It was weird.

Now when they came over to see us, I was responsible for entertaining the ops group, their ops team, and the flight directors would come with them. One trip I took them to see an Astros ballgame. I called the Astros and said, "I've got some Russians here, I'd like to expose

them to some American baseball." "Oh, yes, yes." They gave us caps, and they announced them when we went into the stadium. Another one, I took them to the Huntsville, Texas, prison. They happened to be here when we were having the prison rodeo. They did it for years. Every year they would have a rodeo, and the riders were the prisoners. They were wearing their whites and were the guys riding the broncos and chasing the bulls. I thought that it would be a great experience. Take them to a prison where we let them see our prisoners doing a rodeo. That was funny.

Huntsville is about an hour and a half away. There was a picnic area off the freeway, you could pull off to it. It had a few tables. It wasn't a rest area; it was a pull off. We stopped at a Kentucky Fried Chicken. I said, "Okay, guys. Here's where you get your food." They went in. We got their chicken and stopped at the picnic area for lunch. Got on the buses and went to the rodeo. That was the two trips I remember.

Another thing, you'd see them shopping at night occasionally. Depended on where you were and what they were doing. Usually Soviet Cosmonaut Yuri Gagarin was with the Soviet team. I believe he was the first Soviet cosmonaut to fly. I saw him one night at the old Hancock's Fabric store in Clear Lake City. He was there with a bunch of the Russians shopping. Probably needed to take home material to their wives. I don't how hard it was to get material over there, but they'd be shopping for material to take home.

ROSS-NAZZAL: Did you feel like you developed a camaraderie with these guys or a friendship?

LEWIS: I think I could have with two or three of them. You're never alone with them. I think

the only guy that got away with bringing them to his house, and I'm not sure they didn't have "secretary" eyes there, was Glynn. He brought the astronauts, cosmonauts, and our crew together a couple of times. But Lunney was number one on the U.S. side.

Once you get to talking with them, they've got some of the same interests. The guy with the car, he was a sports car enthusiast. He'd talk about them. Some of the guys I knew he could probably talk to, because they were rebuilding cars. They had something in common. But yourself never were given much of an opportunity to spend enough time together to get too friendly. I'd put it that way. But they were pleasant.

ROSS-NAZZAL: You have any memories of the mission itself? Anything that stands out from the flight?

LEWIS: No. I don't remember much. If we heard anything on the air-to-ground, I guess we must have had English loops. I don't know. Or our interpreters would interpret for us. I don't remember much about it. We were isolated. We had these crazy-looking displays. Didn't give us a lot of data. I don't think they wanted you to find out too much. Like I said, we never did get what I thought would be a flight director loop.

They had this guy, a position, if I remember right—he was called the analyst. The way they described it was a position that gathered data. He was an analyst gathering data and analyzing data. But it was never really clear who he was. I thought that maybe that's a flight director but never could get it pinned down. Don't remember anything about the flight. I don't think that was the trip we went through Munich. Not a whole lot I remember, just a few incidents mostly as opposed to anything congruently.

I don't think any of us were there as a flight controller. We were just U.S. representatives of different disciplines that we had back home. I think it was the last trip, the flight, there was a Soviet in the U.S. MCC. I guess he was one of their flight control people. He had an emergency appendectomy or kidney stone issue. They took him to a local U.S. hospital. Everybody else except one other person went back home. They left at least one other person to take care of him. They don't leave anybody by themselves. I'm sure it was a "secretary" like we had that stayed here to keep an eye on him. I don't think they left two people. I think they left the guy with the emergency and one other. It wouldn't surprise me if they left two to insure no one had a chance to stay. It would have made more sense the way they operated. Always got "secretaries" watching everybody else. God, crazy.

ROSS-NAZZAL: Where did they put the Soviets here in the Control Center? Was it a back room?

LEWIS: I don't remember. I wasn't there. Had to be one of the Staff Support Rooms.

ROSS-NAZZAL: I was wondering about that.

LEWIS: It might have been a simulation area, for example.

ROSS-NAZZAL: I thought we could talk about your role as chief of the Training Branch.

LEWIS: Okay, we didn't get that far. Did we get to women?

ROSS-NAZZAL: We haven't. No, but we can talk about that, because you did have some women on your Skylab team. You had a couple of folks in the photo, which I thought was interesting.

LEWIS: As part of the buildup for Shuttle I got three open positions for the Training Branch. The positions were for a general-purpose, technically savvy, engineer type to hire in. You're going to teach the systems, and you're going to work on a single systems trainer. I don't recall being pressured or even encouraged to hire women, but I'm convinced there was probably some encouragement. I already had Anne [L.] Accola—she was super. I didn't have any problem working with women personally. I thought a lot of Anne; she was a good trooper.

I hope she comes in for this reunion, I haven't seen her in a while. The pandemic really messed a lot of reunions up. Last time I contacted her we were taking a trip back east and she was in Charlotte, South Carolina.

ROSS-NAZZAL: I think she's in Charlottesville.

LEWIS: Charlottesville.

ROSS-NAZZAL: Yes. In Virginia. I think.

LEWIS: I contacted her only to get some information about what to do there and where to stay. Why these three, they all came across as somebody that we could bring on board and we had

time to get them on board and join whatever job we had in the Training Branch. I don't know why I was picked to be chief of the Training Branch.

It wasn't time to start flight director work. There was a lull after Apollo-Soyuz. If I remember right, although I go back and look at some of the phone books, and it doesn't make sense to me. Doc [Donald E.] Stulken was the branch chief at the time. I became his assistant branch chief or acting. I think that happened because he was getting ready to retire. Gene told me, "I'm going to put you up in the Training Branch." Why? I guess I was available.

I ended up as the branch chief. Bob [Robert K. Holken], Jake [Jasper C. Smith], Leo [Leo A. Reitan], and Bob [Robert L. Myers] were the section heads. I got in about the time that they were developing workbooks for classroom material. We had just started on what we called a single systems trainer. The next step would be development of the fixed base and motion base simulators. We provided the simulator training teams for the crew flight training. If we had an integrated sim with Control Center, we tied the Control Center in with the simulator. We'd provide the integrated training team. Accola was a Sim Sup [simulation supervisor] or Ronnie [R.] Lanier or somebody like that would conduct the integrated sim. That was the scheme of things. Single systems trainer, we would not have enough hardware to allow the crew or the flight controllers to receive "hands-on" cockpit interface training. We had only the fixed base and motion base simulators. In my mind I would have thought, and they may have integrated some of that and come up with a multi, not just a single system, but maybe two or three subsystems. Shouldn't have been that hard, but I wasn't there that long. Anyway, got started on that. I had one occasion that I recall specifically. We had the class of '78 coming in, thirty-five new guys and girls. They have a name for themselves.

ROSS-NAZZAL: Yes, instead of Thirty-Five New Guys, it was Thirty-Five "Something" Guys.

LEWIS: Yes. That was a load of new students. How long would it take somebody to work their way up to getting into the simulator? Getting hands on experience? That was another reason the single systems trainer was in our mind.

As we started the workbook training, I don't remember now what section headed that up. I think it might have been Bob Holkan. Whoever headed the workbook stuff would complain that the crew weren't taking any of the tests. The test wasn't there to test them. It was for improving the workbooks and offering some kind of feedback. The only way you are going to get feedback is from whoever's taking the course and the test. Our instructors complained that the chief of the Astronaut Office, John [W.] Young, didn't want testing. "My guys aren't taking tests." It's a typical attitude. If you do it that way then you have people that would compare test grades. "Well, this guy made a better test grade than that guy," to determine assignments. That may be the logic behind that. I don't know.

I thought, "I'm never going to change John Young's mind. Let's face it." I went over and talked to [Director of Flight Operations] George [W.S. Abbey]. "George, I need some help. John doesn't want to take the tests that we've got for our workbooks. My guys are complaining that without tests there is no feedback for improvement." Abbey called John to come over to discuss my concerns. "Chuck wants to do this."

I don't know how he put it, but George told John, he said, "Chuck is right." I don't think he said, "You need to support testing," but he needs the feedback. I don't recall thinking back now what happened except that it was no longer an issue. I think I may have put it to John Young that we need the feedback. The only way we knew to do it was test crews. Maybe

that's a bad word. Maybe it was just the word itself. Maybe we should have said, "We'd like your evaluation." I thought to myself walking back to Building 4, "I probably won the battle but lost the war, maybe." Nothing developed more than that. We went on and kept plugging away.

Another thing I had to do. We were the responsible users in both the Control Center and the simulator work. We were the user of the Control Center, the ultimate user. We wrote our requirements. That's what we expected. Simulator same thing, we were the people that were going to sit down at the simulators and run simulation cases with the crew, because we knew how to set up simulations. We knew what training they needed for systems. We had another division in both cases that was between us and the contractor. The Flight Support Division sat between us and the Control Center. The Flight Simulation Division was sitting between us and Singer-Link, the simulation contractor. We didn't have direct interface with the contractor, so if you had a problem you had to go through the NASA organization. It was bureaucratic BS.

I called Abbey and told him, "We're not getting there fast enough. We're not going to have a simulator that's working when we need to start simulations." We were looking months ahead. Too many problems and they weren't getting resolved by the contractor, not enough to satisfy us. I wanted management's attention on the status, not the Control Center. That was working. We'd done that with the Control Center. I hadn't worked with Singer-Link much.

I don't remember whether it was biweekly or monthly, but we started a status meeting. I don't think Abbey would have attended. It was probably me and Dick [Richard G.] Snyder who was a branch chief in the Flight Simulation Division, a NASA guy that chaired the meetings. The intent was to identify issues or problems that needed to be resolved and put a

priority on them. I wanted it faster. Every two weeks would have made sense. You need a little time to work them. Then bring the status back. If it wasn't getting sufficient work attention, kick the priority up. Do something.

We set that up. I think back to the Flight Operations concept of "tough and competent." We had to get tough because we weren't getting the delivery. They accepted simulator delivery and contract completion, and it was a disaster. Typical NASA, the Flight Simulation Division took control over the contractor and then the contractor makes money making changes.

The reason it was a basket case, in my judgement, was something needed attention, and George supported me on that one for sure. George was a head of a directorate. I think it would have been Bill [Howard W.] Tindall as the directorate chief of the Simulation and Support Division.

We worked, and we worked, and finally Neil, Don and I were called up as the Shuttle flight directors. Bob Holkan took the Training Branch. He would have been my choice. I don't remember what happened. I think back, and I never did go up and see how they did on that single systems trainer. Just too much else going on. Never went back and looked.

ROSS-NAZZAL: You were busy. I thought your comment was interesting. I think I've heard from Frank [E.] Hughes that he also thought that the SMS [Shuttle Mission Simulator] was kind of a basket case maybe it was Anne. I've heard that from somebody else. It just didn't work right.

LEWIS: It was, it was terrible. We had to do something. The only thing I could do was get

upper management to recognize and be available to us, if not report back to our directorate chief. George could have called Tindall and said, "Hey, my guys are still unhappy." Or Tindall could have said, "We're doing all we can." They could have tried to work it out some way. But we managed to get to a point where our guys could see some progress. I wouldn't be surprised if Hughes, Anne Accola, and others weren't bitching a lot.

ROSS-NAZZAL: I think this would be a good place to stop. We can pick up with training for STS-1 next time.

[End of interview]