

ORAL HISTORY 2 TRANSCRIPT

JOHN S. LLEWELLYN, JR.
INTERVIEWED BY KEVIN M. RUSNAK
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RUSNAK: Today is February 14, 2000. This interview with John Llewellyn is taking place in the offices of the Signal Corporation in Houston, Texas. The interviewer is Kevin Rusnak, assisted by Sandra Harvey and Carol Butler.

I'd like to thank you for joining us today. If we could start, I'd like you to tell us about growing up, what interests you may have had in physics, math, engineering, or aviation that might have led you into the career you ended up in.

LLEWELLYN: I grew up in York County, Virginia, real close to where NASA was, Langley [Research Center, Hampton, Virginia], on the York River. I was a farm boy in those days. I grew up with limited resources, I guess, and my daddy was a fisherman, worked in the Chesapeake Bay. Of course I learned all about sailing. I mean, that was second nature to boys. We knew about sailing, star backgrounds, navigation, so I spent a lot of time, when you think back on it, I spent a lot of time on the Chesapeake Bay and looking at stars at night. So I already was fascinated and I just understood. So from that standpoint right there that's—I also at that time grew up in the era that things were going with astronomy, in that you could get out of your Boy Scout magazine or things like the galaxies and how many stars there was in the Big Dipper and all those incredible numbers, at that age you couldn't—well, nobody, not many people knew what was going on in the forties.

So I say I did it and did it like anything else, I grew up, played sports, and did pretty good in school. I liked chemistry and physics and biology and stuff like that, but I really wasn't a real physics kind of person like some of the boys that were going to be physicists and chemists. I wasn't that kind of guy.

But then I joined the Marine Corps and I went to Korea real quick, and really that kind of changed the way I looked at stuff, because I was in the First Marine Division and we made Inchon landing and went up to Chosin. I did all this before I was like nineteen, which really, I mean, when I look back on it, that part and that in itself, I don't know whether anybody knows about Chosin Reservoir, we won't waste too much time here talking about it, but that was really some serious thing that went on there.

RUSNAK: It's gone down in Marine Corps legend.

LLEWELLYN: Oh, yes. So I did that and got out of that and I stayed in the Marine Corps another two years, got out and went to school. I started off at Randolph Macon [College, Ashland, Virginia] and ended up at [the College of] William and Mary [Williamsburg, Virginia]. In the meantime, I was going to be a lawyer, believe it or not, and the history department, I didn't agree with what they were teaching, so I kind of got in the math department, and I really was a kind of mathematician in the classic sense. We didn't take a whole lot of physics. We took math and philosophy and kind of did it, and logic, which was really good, because nobody hardly ever did set theory and Boolean algebra and all that. Well, that really was the basis for computers. I mean, I fell into it, and that kind of thing got me turned around, because when we first started in the computer business at NASA, most engineers wrote their own programs and punched their

own cards out and ran their own stuff. And if you had any idea at all about how that was put together, you became an expert in it, so that's how I got into real-time systems that we ended up.

I worked at NASA during the summers. I was a co-op student. So I was way ahead, and I was at Wallops [Island, Virginia]. Tell you a little bit about Wallops. Wallops Island is a kind of interesting situation for NASA because we were really, the guys that worked down there, were called the Pilotless Aircraft [Research] Division [PARD]. How that name ever got in it, but we were the ones that were testing rockets off of Wallops. And probably if anybody in the United States, I know the Germans in the meantime were at White Sands [Missile Range, Las Cruces, New Mexico], but as far as really launching rockets, and this is [Maxime A.] Faget and all those guys were involved in it, we used to go out there and put stack rockets, Sergeants and WACs and all our own stuff and run transfer tests. Heating, that's what I did, reentry heating.

Interesting enough, that probably, as far as anybody even with the military, and I'm sure that the guys that were involved commercial, I mean the industry guys, were launching Atlases and that kind of thing, but I mean as far as government guys, we probably had some hands-on experience. So it turned out that the Space Task Group, which started manned spaceflight, started at Langley, and basically in the same building that the PARD was, because we had the shops or stuff like that. So from my standpoint, I started with it, and that's how I got in the Space Task Group.

It was tough to do it those days, because they want—see, I was just out of school, and they didn't want guys, they wanted more mature engineers, but they had a hard time getting it, believe it or not. But a lot of people didn't think that was going to work. This was before [President John F.] Kennedy. This is during [Dwight D.] Eisenhower. I mean, we went back

that far with this program. A lot of people—this space thing started before all that. That was just a lunar political thing, but we were hot on getting a man into space, us and the ones at Huntsville [Alabama]. The Germans had already kind of looked at a space station—I mean, a space vehicle. This is my opinion, as lots of—but it chronologically is correct. What the opinions of who was doing what, that's up to whoever's writing these books.

But anyway, that's how we did it, and then I finally was able to transfer into Space Task Group, and I worked in the same thing I was doing before in reentry heating problems. That was a real serious problem, because the nuclear weapons stuff had to have some kind of device to shield it coming back in from space, and that's what all these things started with. NASA was interested. NACA [National Advisory Committee for Aeronautics] was interested.

They actually started doing ablating stuff, because this is like ice will melt and carry heat away. Well, in fact, we used to make ice models and see how that worked. Basically, as I say, we were able to make the Mercury spacecraft because we came up with a heat shield that didn't weigh much, and that really was a help, because at that time most of the heat protection schemes were very big pieces of heavy metal, like copper and brass, and they would just melt and they would be ejected and then the payload would come through. So that's how that worked.

That's how we got it, and that led me, and my ability to program, led me into flight operations, because NASA was looking—by that time we had changed to NASA and we had got this manned spaceflight going and we were working at the Cape [Canaveral, Florida]. They were looking for people who were operations, and not many people knew what that was. But I didn't have a choice; they just stuck me out on a remote site, and that was best thing that happened to me, because I don't know if anybody knows it, we built—and it's probably in one of these lectures—we built a remote site network that actually could cover the satellite as it went

around the Earth. We always had them in some kind of—tried having a radio contact from the time it left the Cape to the time it got there. There was some dropouts, but we finally worked that out. So right around the equator we had ground sites.

RUSNAK: How did you feel about getting away from the things like working on reentry heating into something like operations?

LLEWELLYN: Well, that was true, because I was getting my master's at the time, and I realized—and that time was very important to me. I had just gotten out of school and I really wanted to get my degrees. You know how you do that. You go through that.

But then when I realized what we were doing, I just couldn't not be involved in it, because when you think about taking and going on top of a Redstone—and I knew Redstones, okay, because they were tactical weapons. I was a weapons officers in Camp Lejeune, North Carolina, and I knew those things, and when somebody told me that that's what we were going to do, I couldn't believe it, because it was so ineffective. So that's how I just couldn't get off of it. I mean, I just wanted to be in this thing, because I knew that it was going to be the biggest thing that we'd ever done since the Manhattan Project. And you don't get a chance like that. That's how I did it. Now, I don't know about what anybody else says.

I think back on it, I probably couldn't have articulated that at that time. Probably, about twenty-five, I probably couldn't sound like that, but that's what I was doing, and I didn't care anymore about going back to college or any of that or what I was doing. I was married and had two kids, too, but I wanted to get in this thing, and it meant moving from Virginia. I knew that.

We were supposed to move to Goddard [Space Flight Center, Greenbelt, Maryland], and then we were going down to Florida, and then we ended up in Houston, which was really neat.

But that's how I looked at it, and I just couldn't believe that I was involved in anything like this. God, it was so out of it. I mean, we didn't know how to do anything. That's the reason we built those remote sites, and the involvement in building those with people who had built ranges before, because by this time there were a whole bunch of people who were in the business of building tracking stations because the military got involved, and we learned so much from it. I mean, how radars work and how telemetry systems work. Actually, because we were NASA, we'd go and stay on these things for weeks. The only thing you'd do is, when you're not doing a mission or simulating, you sat down, and what else to do but sit down on some damn things and learn all that stuff.

I was on a ship one time. I don't know how long that was, for [Alan B.] Shepard's flight. God, it must have been two weeks. You know, it was right down in the area, you guys won't believe this, but you know, Bay of Pigs went on right when I was there. The Bay of Pigs went on before Shep's flight. [Laughter] Isn't that incredible?

RUSNAK: Not a good place for you to be at the time, I don't think.

LLEWELLYN: No. Boy, we had a lot of company, a lot of Navy ships flying by. [Laughter] All of a sudden the Atlantic became full of people, because up to that time it was nothing as far as you could see. I used to get up in the towers and kind of just sit back during the day and look out.

RUSNAK: So how did you train to become a remote site controller?

LLEWELLYN: Well, we kind of were “OJT,” on-the-job training. We had a simulator, I should say, it was an analog simulator of the Mercury spacecraft, but it was not much more than what you can go in a store and buy. It wasn't a whole lot, but it did give us procedures. I knew the spacecraft good anyway, because I helped built it. I could go look at it. So it wasn't like it is now. I mean, if I wanted to see what a parachute is, I could there and find it and see it. So that's one good thing about in those days you could actually feel it and see it and see the heat shield and see the equipment and we knew all the parts of it. That was a major thing as a flight controller in those days, is how did the thing work and then get the schematics out and be able to "what if" it, and if something did happen, knowing quickly what to do. That's what we trained in. We trained the systems, all of them and everything, you know.

Then we had to learn—this is something really crazy, is C.W.—we had to learn Morse code, because that was a way, and we actually trained doing it. I mean, if you didn't do it, we had to get something—I think it was some ridiculous thing, wasn't anything high, but we had to be really proficient, about nine or ten minutes, words per minute, because that was part of when the thing came over. Each remote site had to do it, and they would take those tapes and read them back, and it was kind of like a post-game briefing every time we got into these things. So that's how we did that.

We had some unmanned flights, remember. Some of them we lost, never knew where they went to, like MA-3. That gave us some brand-new mission rules we still use. We never launch in a rainstorm. [Christopher C.] Kraft said that that day. We didn't know where it went

to. Until this day nobody knows. So we had them all, you know, we had the big ships and we had the unmanned orbital, suborbital flights that I was involved in.

But the real big one we knew and we learned so much from lost things, was looking for the first manned flight. That was a big one. We understood that. That was so, to me, almost unbelievable, we were trying to do it. And we tried so hard. I don't know how many times—Glenn must have gotten in and out of that thing about thirteen, fourteen times. I mean, we started like, it was almost to this time of year before—I think we were almost—we were into February when we launched the first one, because it was right around Valentine's Day. I remember coming back from Canary Islands right around—but that's how long it took us. And I was on Canary Islands for that.

Is that the kind of thing you need?

RUSNAK: Sure, yes. If we could back up just a little bit, though, what was the first unmanned flight that you worked as a controller, and do you remember where you were?

LLEWELLYN: I started down at MCC [Mercury Control Center] at the Cape, reducing data and some of the abort charts and stuff like that. In those days, you know, you'd get the strip charts back and you'd measure the slopes and then you'd program it, these programs we had for heat transfer, so those were the first ones.

The first real flight that I had as a flight controller, though, it was really interesting how I got it. We'd had MA-3 and I went out to Mexico, at Guaymas, and they said, "Come back." So I was one of the first guys back in Houston. They were going to get ready for MR-3, that's Shep's flight, and so they got me on an airplane and flew me to Florida and put me on a

destroyer and took me out, and I high-lined it out to the tracking ship. I mean, I've been in the Marines. You don't want to get on a high-line, especially with the Air Force running the other end. I mean, the Navy's bad enough, but at least they know what they're doing. [Laughter] I mean, me and this guy went across, and I was thought to myself—and it was big waves, you know. I don't know if you've ever been on one. The high-lines is the way you got from one ship to the other. You'd shoot a thing and they'd rig up a cable and then you would go from one, then the ships would kind of be under way and into the—then you'd go across. And it's really scary. [Laughter] I did it anyway. I got across, and I knew when I got off they was going to come get a boat, because I was going to start sending messages back to MCC. That's the last time, because I'll stay on it. We stayed out—I mentioned earlier.

Because of that long period, the training, when you talk about it, I learned almost every position that they had, that telemetry supervised on, and I actually got to know what they really were doing.

See, most engineers and guys like me never actually get involved at that level, but since I was out there, and that really did me a lot of good for my future, because when you get back to it, to be a good hands-on engineer you have to know, or operation, we have to know how the equipment works. I mean, if you want to see—when my daughter came to work out here for Boeing, out at Rockwell, she was doing the same job I did as flight dynamics. I told her, if you want to see one of these things, look at—because she was more specialized at Booster—you have to go see the actuators. You've got to go see them work.

RUSNAK: That makes sense.

LLEWELLYN: So that's exactly how we started, and most of the guys ended up at the control center, which was the next move up. I didn't particularly want to go, because I was having such a good time going all over the world. I mean, that's got to be the best job I ever had. I mean, we went almost everywhere in the world just to get to those remote sites. I mean, in those days, getting to Kano, Nigeria, you had to fly all the way up to—I forget, somewhere in East Africa and fly down. They were one of those places you ever heard—Khartoum and all, all the way down. That's how you got there. So I mean, we went everywhere.

Then I went to the control center after MA-6. In fact, I was on [John H.] Glenn's shot, I was the Retrofire—reentry officer for Shep's flight. Not Shep's. It's M. Scott Carpenter, which was really the last. That's a good one to get started on.

RUSNAK: Would you like to tell us that story?

LLEWELLYN: That was really something. Yes, that's what it was. Of course, it took training and the adjustment to being in the control center. I don't know anybody else who's talked about that, but that was a very—that was kind of a competitive place to be in, you could get in there and get out real quick. For some reason we had a lots of different people and real different people come in to be the flight controls and they would be there and they would go. So from that standpoint, I was lucky I was able to hang around. I was one of the first guys there, too.

RUSNAK: How did you get picked for the Retro [retrofire officer] position specifically?

LLEWELLYN: I think because of the background I had in real-time systems, because that's what really surprised me, the trajectory background and most of the heating things. I'd worked so much on it, I knew the shield. I mean, I ran most of the tests for it. In those days, to be a—that was a discipline all by itself. I mean, it was more physics than it was engineering because you had such high temperatures and shockwaves and recombination and all that stuff going on. That's generally what you use and you learn. Engineers generally use just plain old thermodynamics and stuff like that. But that really got to be—you know, the heat protection schemes became kind of knowing what that picture was in your mind. It certainly did help me understand what I was doing, because you had to have a picture of this spacecraft and what it was doing and when you'd turn, because in those days we didn't have any simulators. I mean, you had to go through each step. In fact, I used to set my test chair, because you'd come in like that and the lift vector's up, straight up. I knew where it was, and I would just see. And, of course, the Earth is underneath you and you're looking, and I was going to see how those guys could, by the hand controllers and their jets rotate the spacecraft and all that to make sure the lift vector was going the way it was, up and a roll rate.

So, I mean, you had to understand and then you also knew that you had that really ionized shell all around you and the picture, it certainly was distracting. I think I really looked at it. I don't think I could have sat there and not looked at it. So to answer your question, I think, plus the fact I must have been good. [Laughter] I must have been one of the better ones, anyway.

RUSNAK: Did you have any more formalized training for this position?

LLEWELLYN: Oh, yes, I did. When I really went into one, that's where we did most of the time, went to Goddard and learned the real-time system and kind of started writing procedures and launch abort mission rules and all that stuff that we had to do. But, see, we invented ourselves. There was a retrofire guy before me, but he didn't know more than I did. So we actually sat down and knew our position and created our positions and made sure that they would work with the other team. It's just like any other team. We'd all been on teams and we knew exactly what our responsibilities were and what our requirements were, and from that we put the team together. Of course, Kraft was the flight director and everybody would report directly to him. So that was a kind of easy thing to remember. [Laughter]

RUSNAK: Do you remember anything else about any of the other early flight controllers from that time?

LLEWELLYN: Oh, yes, I knew them all.

RUSNAK: Is there anything you'd like to share about any of the people in particular?

LLEWELLYN: Well, Glynn [S.] Lunney and I were in—he was the Flight Dynamics Officer [FIDO] and I was the reentry guy. And before him was a guy named—a Canadian guy. Damn, what's his name? I'm sorry, I'll think about it. I just can't load my software quick enough. It's got bad time tags on it. [Laughter] But Carl Huss was the retrofire guy, and then they had—have you guys ran into the Canadians yet?

RUSNAK: Yes, we have interviewed several of them.

LLEWELLYN: That was a really good group, neat bunch of guys. They came in from AVRO [Canada]. You know all about them. We had surprising a number of those with us. It was a lot more Canadians out of the Space Task Group than there was American citizens. For some reason they decided—I mean Flight Operations—I don't know how they got so many, but they were there. And they did a good job, too.

Lunney had been out at the Barbados with John Hodge. He'd never been back at the Cape, and he came up. So he and I had the first job. That was our first job together, then Shepard's flying, because they were breaking in these guys that had been there. By this time NASA really was expanding. This was before the Rice [University, Houston, Texas] talk. This was before Kennedy, when I got in. Then they really changed. I mean, when he did that, everything started expanding in hiring. The place in Houston got big and we really did need to bring in more flight controllers on, and that's what I spent a lot of my time doing, training flight dynamics people and billing systems, and it was a really neat job.

RUSNAK: What did you think of Kennedy's announcement at the time?

LLEWELLYN: I really thought it was neat that he did that. I thought that needed to be done, because, see, nobody knew what we were doing. I mean, really, I mean, not many people in NASA knew about the Control Center at the Cape. Most people hadn't seen it. Gilruth hadn't. Gilruth had never been down there. He was doing Apollo and all that stuff and gotten himself all involved in Gemini. I mean, we really were doing something. I mean, it was tough. After

John Glenn's flight and that debriefing here and all that, it was done here in the Rice Hotel, he got interested in that whole thing, and made that speech. I think it was kind of the best thing that could have happened, because nobody knew what we were doing. I mean, I had neighbors, I'd tell them what I was doing and they' kind of—I mean, "What are you doing?" I told him, "I work at NASA." Most of these people living on Telephone Road didn't know what that was. That's where I lived when I first got here.

So that was good to do that. Even after Glenn's flight, the world knew what we were doing, but most people had no idea what I was doing. Most people you talked to didn't. I mean, most of my friends and stuff, I mean, I talked to them. I mean guys at NASA. My brother worked at Langley and he knew all about guidance and control, but he didn't know anything about real-time. The only thing he knew about it was what the hell I was doing.

Let me tell you something. The thing that amazed me, talking about coming in the flight control and being a trajectory guy, we could take RA&E, that's range, elevation, and—from radar data, pure signals, put them on what we called a high-speed data link, and 56 kilobytes, that was high speed. Sent it to Goddard. Goddard took RA&E, these points of data, and made a curve out of it, simple curve, this curve-fit. Then took that vector, okay, and integrated it and got a point and got the overall trajectory and put it back on my plot board in three seconds. At that point we had nominals, what things should look like, and that point would go right up that thing. I said, "Man, Newton never saw anything this neat." It's really working. The whole thing works.

I got an experiment that you could not run in college to prove any of this stuff, because I knew all the steps. Can you believe that? I mean, that to me—and now we do it all the time. I mean, people grow up now and it's Nintendo forever, you know. They don't even think about it.

But that's something, I mean, to take—and I mean, we did it and it had to be good because we had our abort lines had three-second delays in them. So we had to know what we were doing, because you do not want to do anything based on not knowing what you're doing. And that's what made our job, Lunney's and my job, such a good one, because we had a hell of a responsibility, because you didn't want to make a mistake on powered flight.

Then we got into orbit and then we had to reenter, and that's my job. That's probably one of the toughest jobs I had had in business out there, because we always, in those days, we always kind of messed around until we were in a position that we really had to come in. That was pretty tough, because the places we had to come in, even to practice, were hard to get to.

RUSNAK: You mentioned that not a lot of people knowing what you guys were doing with the real-time stuff, the operations things. What did you think of the relationship in Space Task Group between the Engineering side and the Operations side?

LLEWELLYN: That's good question. We kind of started getting arrogant, like everything else. I mean, you—it's competitive. We felt like the operations guys were really the top of the line and anybody else was like—that's the kind of thing that happens. It carried on like that for a long time. It may still be going on. I got out. It didn't take me long to get out of it, because as soon as I got in Operations, you know, I kind of got to the point. But I think we really, it was that kind of feeling between us and the engineers, and I'm sure the engineers thought the Ops guys were out of it, because they didn't do anything. That was their point.

But I think the problem was that we didn't understand each other's jobs and we didn't have time, because, remember, young man, we did all this in ten years, from about '59, that's

when I kind of started. Well, I got out of school in '58 and I worked for Langley. But '59 to '69 we did it, and we came a long ways. I just told you about how immature we were in terms of the awesome responsibility that we were getting ready to get hold of.

So it really was incredible. So it was difficult to really pay a whole lot of attention to that kind of thing. That seems to be more of a problem now than what we did. We actually did not talk to each other very nicely. I mean, if you made a mistake, everybody knew it. It was known. I notice that's not the way, but it really was. So it was more of a, I don't know, as today to try to describe it, it's very—from what I do—and I still go over a lot and work—it's not the same thing. Flight controllers today are not like the ones we had and neither are the crews. I mean, goodness, look at the people. Look at some of the crew members we had. We had top guys that nobody's ever seen it like that since. [Walter M.] Schirra [Jr.] and Shepard, guys like that. [L. Gordon] Cooper. [Virgil I.] Gus [Grissom]. Look at Gus.

RUSNAK: Is there anything you want to say about the crew members from Mercury?

LLEWELLYN: Oh, they were great. And I got along real well with them. We had our ups and downs to try to figure out who was in charge. It goes on. That's basically what it was, I think. But what we ended up doing, and I think Kraft did more of that than anything, is fixed it so that there was a definite division and it was well understood, and in order for this thing to work and get more sophisticated like we finally did for [Apollo] 13, we really had to stop all that and start really working together, being almost like we thought like the same as they did, and like I say, we did it.

Gemini did that. The experiences we had with those, all those different things we did and learning phase in Gemini really got us to the manned awareness and having a guy in space versus unmanned or robot and all that, God, that was really very clear to me during Gemini, because it got away from being like the Mercury where every one of those things was such an experience, you hardly realized what you were doing. But we really got down and started understanding this space business with Gemini.

The new crews came in, and that made a difference. You had some good ones good guys, and finally ended up with Apollo. You know the rest of the story.

RUSNAK: We've got just a few more minutes today, so I wanted to ask you about the last Mercury flight where I think finally you've got two shifts going on since—

LLEWELLYN: Oh, yes. That's right.

RUSNAK: How did that work?

LLEWELLYN: Worked real good. We didn't sleep much. You know, how can you? In fact, I remember when I got off, I sat around and kind of listened to it for a while, because I—but to get back on that, I did okay. Yes, that was good. "Coop" was flying. That was different, though, and that really showed that we could go a long way, more than just those small hours, was really flight planning and that's when the work schedule came out. I mean the first one. It was a lot. We kept what we called our work schedule for the flight, which became a time line which everybody uses now.

The flight crew became incorporated all in the flight plan, but it was basically the stuff that we'd come up on the Flight Dynamics Branch, because we were the only ones that had any real acquisition/LOS [loss of signal] times for the sites we were computing. That was a big deal then, because they were changed because the orbits would decay. We were in fairly low orbits, and it would change.

And that proved to be an interesting problem, too, you see, is making sure that we understood the atmosphere and the spacecraft would not change its orbit rapidly, deteriorate it because of drag, because we really didn't know all of that then. We were just getting there. So all that stuff was good, and the systems stuff was—you know, having equipment last that long.

RUSNAK: What were some of the other key things you learned from the Mercury program as a controller?

LLEWELLYN: I don't think I ever—I think the thing that happened with Shepard's flight—I mean M. Scott Carpenter, where he was on retro attitude and that whole series of things, and you ask him about that, that was really, you know, very difficult for a guy like me. That's my first time and actually we couldn't fire the retros because we fire them from the ground. Shepard talked him into it.

Then the job the first time and the second manned flight, in orbit, we didn't know where he was, and no telemetry, did he get the chutes open, because there was a big discussion about [unclear] and all that stuff. That's really too esoteric. I guess that's covered in other people's talks, but as far as the job that we had in the control center, it was pretty difficult to start off with.

I was thinking one time in the middle of all of that, and I was being asked questions and questions, I mean, expected answers in fifteen seconds and it would take an hour to even discuss the options or something, you know. We didn't have the [unclear] headsets. If you've ever seen those folks who used to do switchboard operations, had a thing, black. And mine, I turned on the corner one time and my headgear shifted because I was sweating so much. I think I've never seen anything but sheer panic. I panicked, but I felt it was there. Hell, is this going to end? I mean, I was there. And I think that's the point that we all get into, and you're finally into the point that your responsibilities and so on, you get you can handle it. But that was tough.

It was not that the simulations didn't do it to you, because I never did do anything after those experiences but handle each simulation like it was a reality, because I could not afford not—you didn't never want to get caught like that. Because I can't think of anything worse than to lose a guy in orbit. To do that thing, that's what it was. I mean, controlled panic or something. I don't know what it is, but to me, and I don't know what anybody else is thinking. I think that's the first time I've ever mentioned that in public, but I've talked about it, but to like friends. But it truly was. It was really in the corner over there where Lunney and I went, because that's the only place that we had to get any idea where he was. I guess there's a lot of stuff written about that, but it turned out that Carpenter had a very interesting ride back in himself, he was bouncing around, and because of it he had lost attitude control fuel and all that.

But I know one thing I walked away with that, and I don't know who else was there that day, and I'm sure Kraft will never do this again, I'll never, ever get so that we don't have control of this damn thing. Ever. That's what I felt about it. But every one of them had—and Apollo 13 was really so, I mean, that was—but all the training we had to get that, I'm sure somebody else has articulated it better than I have, all the training from all the missions from the kind of

guys that ended up doing that thing had had the experience in going through those kinds of things to get there. Because, see, we fly all of them.

RUSNAK: Well, it's about ten o'clock, so I would like to thank you for joining us today, and next time we can pick up where we left off.

LLEWELLYN: Well, we'll do that. Let me know when you want me back and I'll do it.

[End of interview]